



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ
ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper
Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ
ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ
ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು
ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ
www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು
ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ
ಆಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

Handwritten signature and date: 29/10/21
ಕುಲಸಚಿವರು.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Biotechnology

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Biotechnology for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

*** Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected**

Name of Course (Subject):B.Sc., (Basics/Hons) Biotechnology

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in **B.Sc., (Basics/Hons)** students will be able to:

- PSO 1** : Understanding concepts of Biotechnology and demonstrate interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology
- PSO 2** : Demonstrating the Laboratory skills in cell biology, basic and applied microbiology with an emphasis on technological aspects
- PSO 3** : Competent to apply the knowledge and skills gained in the fields of Plant biotechnology, animal biotechnology and microbial technology in pharma, food, agriculture, beverages, herbal and nutraceutical industries.
- PSO 4** : Critically analyze the environmental issues and apply the biotechnology knowledge gained for conserving the environment and resolving the problems.
- PSO 5** : Demonstrate comprehensive innovations and skills in the fields of biomolecules, cell and organelles, molecular biology, bioprocess engineering and genetic engineering of plants, microbes, and animals with respect to applications for human welfare.
- PSO 6** : Apply knowledge and skills of immunology, bioinformatics, computational modelling of proteins, drug design and simulations to test the models and aid in drug discovery.;
- PSO 7** : Critically analyze, interpret data, and apply tools of bioinformatics and multi omics in various sectors of biotechnology including health and Food.
- PSO 8** : Demonstrate communication skills, scientific writing, data collection and interpretation abilities in all the fields of biotechnology. Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises or CROs.

B.Sc. Semester – I

Subject: Biotechnology
Discipline Specific Course (DSC)

The course B.Sc., (Basic/Hons) in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): **FUNDAMENTALS OF BIOTECHNOLOGY**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1 : Understanding concepts of Biotechnology and demonstrate interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology

CO 2 : Understanding of basic structure of cell and its functions

CO 3 : Understanding of basic of genetic s and it application in basic biology

Syllabus- Course 1(Theory): Title- FUNDAMENTALS OF BIOTECHNOLOGY	Total Hrs: 56
Unit-I	14 hrs
Chapter No. 1 Biotechnology: A Brief Introduction. Historical Advancement of Biotechnology, branches of Biotechnology	3
Chapter No. 2 Introduction to the living world: Cell theory, Cell ultra-structure and functions of cell, Different types of cells. Difference between prokaryotic and eukaryotic cells; Difference between animal and plant cell. (plant and Animal).	5
Chapter No. 3 Ultra-structure of cell organelles Cell wall, Plasma membrane, Mitochondria, Chloroplast, Ribosomes, Golgi complex. Endoplasmic reticulum. Nucleus, Lysosomes. Peroxisomes, Vacuole. Cytosol and Cytoskeletal structures	6
Unit-II	14 hrs
Chapter No. 4. Concept of genome and Chromosomes Discovery Morphology and structural organization: number, size and, fine structure, heterochromatin and euchromatin. Special types: giant chromosomes (Salivary gland and Lampbrush).	6
Chapter No. 5. Cell study techniques. Fixatives, Principles of staining, Types of stains, Auxochromes.	4
Chapter No. 6. Cell cultivation methods - Nutritional requirements (Bacteria and plant), laboratory facilities, growth curve, Single cell suspension cultures and their applications.	4

Unit-III	14 hrs
Chapter No. 7 Science of Genetics- Mendel's Laws of heredity, Mono and di-hybrid crosses, Test-cross, Incomplete dominance and multiple allelism. Cell cycle, mitosis and meiosis, mitotic apparatus, centrioles, spindles, cell plate formation, cell synchrony and significance. Amoeboid, flagella and ciliary motility, Spermatogenesis and Oogenesis.	11
Chapter No. 8. Cells for cloning: <i>E.coli</i> , <i>Bacillus subtilis</i> , <i>Saccharomyces cerevisiae</i> .	3
Unit-IV	14 hrs
Chapter No. 9. Concept of Genetic Engineering: Definition; Tools used in recombinant DNA Technology: Plasmids, Transgenesis: Production and significance of transgenic plants (Golden rice) and animals (sheep); the Basic concept of genetically modified organisms.	9
Chapter No. 10. Role of biology in allied fields: Role of biology in Information Technology (Bioinformatics), Nanotechnology (Nanobiotechnology), Micro-electromechanical systems (Bio-MEMS), and Sensors (Biosensors)	5

Books recommended.

1. Sudberry P. 2002, Human Molecular cytogenetics. Prentice hall publication
2. Knudson A.G. 1998, Anti – Oncogenes and Human cancer. Proceedings of the National academy of sciences USA 90: 10, 0114 – 10921
3. Lodish, H., Ber, A., Zipursky, L.S., Matsudaira, P., Bahimore, D and Darnell J. 2001, Molecular Biology W. H. Freeman G Co 47
4. Preeti G. 2011, Fundamentals of Biotechnology. Galgotia Publications.
5. Sabiha Khan. 2020, Fundamentals of Biotechnology. Lenin Media Pvt. Ltd.
6. Firdos A. K. 2020, Biotechnology Fundamentals. Third Edition CRC Press.
7. Bazlur Rashid. M. 2016, Methods in Biotechnology 1st edition Wiley-Blackwell.
8. B. Alberts. D. Bray, J. Lewis, M. raff K, Roberts and J. D. Watson 2008 Molecular
9. Biology of the Gene. 2012, Garland Publisher Inc., New York
10. Gerald Karp 2004, Cell and Molecular Biology. John Wiley and Sons. Inc
11. Elliot and Elliot, 2001 Biochemistry and Molecular Biology. Oxford University Press.
12. Celis J E (Eds): 2008 Cell Biology: A Laboratory Hand Book. Vol I & II Academic Press.
13. Pollard J.P. and W.C. Earnshow 2002. Cell Biology, Sunders
14. Tamarin, R.H, (2000): Principles of genetics, 6th Edn. WMC Brown Publication. London.
15. Snustad, P.D, Simmons, M.J 2019: Principles of genetics 2nd Edn. John Wiley and sons, Inc. New York.
16. Fairbanks, D.J and Anderson, W.R 1999: Genetics – continuity of life. Brooks and Cole Publication Company. New York.
17. Lewin, B (2020): GENES VII. Oxford University Press, New York.
18. Strickberger, M.W (2000): Genetics Prentice - Hall of India private limited, New Delhi.
19. Miglani G.S 2000 Basic Genetics Narosa publishing New Delhi.

B.Sc. Semester – I

Subject: Biotechnology Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **FUNDAMENTALS OF BIOTECHNOLOGY**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

- CO 1** : Learning and practicing the Laboratory skills in cell biology, basic and applied microbiology with an emphasis on technological aspects
- CO 2** : Learning and practicing the concepts of Biotechnology and practical skills in interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology

List of the Experiments for 52 hrs / Semesters

1. Study of fixatives and stains: Preparation of formaldehyde (4-10%), Alcohol (70%), Bouin's fixatives, Carnoy's solution, Borox carmine (alcoholic), Eosin (alcoholic), Iron (Haematoxylin). Leishman's Stain, Ringer's Solution, Acetocarmine, Acetoorcein, Schiff's reagent (Feulgen), Giemsa's stain.
2. Mitochondrial staining
3. Micrometry
4. Cell counting methods: Heamocytometer and other aids.
5. Squash preparation of onion root tips to study stages of mitosis.
6. Smear preparation of grasshopper testes and flower buds to study stages of meiosis.
7. Smear preparation to study salivary gland chromosomes
8. Buccal epithelial smear and Barr body observation.
9. Extraction of cellular materials in saline buffers, solvents and precipitation.
10. Demonstration of laws of inheritance by using colour beads
 - a. Laws of segregation
 - b. Laws of independent assortment.
 - c. Solve genetic problems
11. Study of different types cells using permanent slides
12. Spotters

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 10 Marks
2. Minor Question ----- 06 Marks
3. Identify and comment ----- 3X1 = 03 Marks
4. Viva-----03Marks
5. Journal----- 03Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Preeti G. 2011, Fundamentals of Biotechnology. Galgotia Publications.
2. Sabiha Khan. 2020, Fundamentals of Biotechnology. Lenin Media Pvt. Ltd.
3. Firdos A. K. 2020, Biotechnology Fundamentals. Third Edition CRC Press.
4. Bazlur Rashid. M. 2016, Methods in Biotechnology 1st edition Wiley-Blackwell.

B.Sc. Semester – I

Subject: Biotechnology
Open Elective Course (OEC-1)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course: **Biotechnology for human welfare**

Course Outcome (CO):

After completion of course, students will be able to:

CO 1 :Understanding importance of Genetic engineering in Industry and bio-therapeutic proteins

CO 2 :Applications of molecular Genetics in Forensic science to solve criminal cases by DNA analysis

Syllabus- OEC: Title- Biotechnology for human welfare	Total Hrs: 42
Unit-I	14 hrs
Industry: Protein engineering; enzyme and polysaccharide synthesis, organic compounds, alcohol and antibiotic synthesis Environment: Application of biotechnology in environmental aspects. Bioremediation, solid and liquid waste management.	
Unit-II	14 hrs
Forensic science: DNA finger printing, Solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods.	
Unit-III	14 hrs
Health: Biopharmaceuticals, development of non-toxic therapeutic agents, recombinant vaccines, insulin, gene therapy, molecular diagnostics using ELISA, PCR, monoclonal antibodies and their use in diagnostics and therapy, human genome project Reproductive Biotechnology: <i>In vitro</i> fertilization, IUI, nuclear transfer, embryo Transfer	

Books recommended.

1. H.K.Dass (2018)Text book of Biotechnology., Wiley India publication
2. B.D.Singh (2017)Biotechnology new horizon., Kalyani Publishers
3. R.C.Dubey (2015)Text book of Biotechnology, S.Chand and company
4. U. Satyanarayan (2005) Biotechnology. BOOKS & ALLIED (P) LTD.-KOLKATA.
5. W.T. Godbey(2014)An Introduction to Biotechnology, 1st Edition Academic Press.
6. K. Pranav, V. Praveen, M. Usha (2017). Biotechnology A Problem Approach, Fifth edition Pathfinder Publications.
7. Rup Lal (2020). An Introduction to Biotechnology - A Genetic Manipulation Perspective, First Edition Dreamtech Press

B.Sc. Semester - I

Subject: Biotechnology SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: BIOTECHNOLOGICAL SKILLS

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Content of Course 1 (one hour theory followed by 2 hours practicals)	Total 30 Hrs
Unit –1	7
Rules and regulation, Safety measures in Biotechnology laboratory. Titrimetric Analysis , Concept of Molarity, Normality, Preparation of solutions of different Molarity/Normality of titrants, Preparation of reagents.	
Unit –2	7
Concept of Buffer and pH , its importance in Biological experiments, Preparation of buffer solutions of different pH. Sodium acetate-acetic acid. Phosphate buffer etc Preparation and Sterilization of Glassware and media 1. Calculation of Molarity, Normality and Molality 2. Calibration of pH meter using standard buffers 3. Preparation of Buffers- Phosphate Buffer, Acetate Buffer and TRIS Buffer.	
Unit- 3	7
Study of Biotechnology related laboratory instruments. Understanding principles of general lab instruments: Autoclave, hot air oven, incubator, Laminar Air Flow, Centrifuge, Colorimeter and Spectrophotometer. Colorimetric estimation of protein by Biuret method/ Barford's method.	
Unit –4	9
Principles of chromatography. Types of chromatography, Paper chromatography and applications. Demonstration of Chromatographic techniques (Paper Chromatography of amino acids) Extraction of protein from plant and animal source. Salt precipitation and organic solvent methods. Protein estimation.	

Books Recommended:

1. H.K.Dass (2018)Text book of Biotechnology., Wiley India publication
2. B.D.Singh(2017)Biotechnology new horizon., Kalyani Publishers
3. R.C.Dubey (2015)Text book of Biotechnology., S.Chand and company
4. William J. Thieman, Michael A. Palladino (2008), Introduction to Biotechnology Publisher: Benjamin Cummings
5. Colin Ratledge(2012),Basic Biotechnology: Cambridge University Press
6. Boyer, R (2017) Concepts in Biochemistry. 5thint. edn – Brooks / Cole, Australia.
7. David Leader RLP Adams, John Knowler (2020) The Biochemistry of the nucleic acids. 11thedn Chapman and Hall.
8. W.T. Godbey (2014)An Introduction to Biotechnology, 1st Edition Academic Press.
9. K. Pranav, V. Praveen, M. Usha (2017). Biotechnology A Problem Approach, Fifth edition Pathfinder Publications.
10. M. Bazlur Rashid (2016). Methods in Biotechnology1st edition Wiley-Blackwell.

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

CO 1: Basic principles of reagents preparation and physic chemical nature and its application in Human life

CO 2 : Understanding basic of chromatography and its role in Pharma Industries

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 10 Marks
2. Minor Question ----- 06 Marks
3. Identify and comment ----- 3X1 = 03 Marks
4. Viva-----03Marks
5. Journal----- 03Marks

Total 25 marks

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

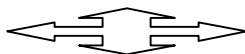
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Biotechnology
Discipline Specific Course (DSC)

The course B.Sc., (Basic/Hons) in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): **Microbiological methods**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1 : Understanding of Microbes and their handling , culture methods, etc.,

CO 2 : Learning of various methods for identification of microbes.

CO 3 : Microbiological diseases from bacteria, fungi and virus, its pathological significance

Syllabus- Course 2(Theory): Title- Microbiological methods	Total Hrs: 56
Unit-I	14 hrs
Chapter No. 1 Introduction and Scope of Microbiology: Historical perspectives. Importance and scope of microbiology as a modern science. Branches of microbiology and allied sciences.	3
Chapter No. 2 Sterilization techniques: -Physical, dry heat, moist heat, chemical and radiation methods of sterilization. pasteurization, Tyndalization, Filtration, HEPA, Principles and Applications. disinfection sanitization, antisepsis and fumigation	4
Chapter No. 3 Stains and staining techniques. Bacterial and fungal staining - Simple, Differential and Structural staining. Capsule, cell wall, flagella & endospore staining.	3
Chapter No. 4 Microbial taxonomy: Concept of microbial species and strains, Taxonomical characteristics of microorganisms, Classification of bacteria based on – morphology, Molecular identification of microbe, numerical taxonomy, Bergey's manual	4
Unit-II	14 hrs
Chapter No. 5. Ultra-structure of virus, bacteria and yeast: Typical bacteria, cell wall structure, flagella structure, plasmid, tobacco mosaic virus (TMV), Bacteriophage- λ phage, <i>Saccharomyces cerevisiae</i> .	3

Chapter No. 6. Culture of microorganisms: Culture media, Types of culture media, Preservation and sub culture of media. Lyophilization and long term storage media	4
Chapter No. 7. Microbial growth: Nutritional requirements of microorganisms. Bacterial growth curve. Factors influencing growth, Counting of Bacteria.	3
Chapter No. 8. Pathogenic microorganisms: Bacterial diseases of humans - Tetanus, Tuberculosis and Cholera, Viral diseases –HIV (AIDS), Hepatitis, Ebola & Corona virus.	4
Unit-III	14 hrs
Chapter No. 9. Applied Microbial methods: Environmental Microbial methods- Quality of air, water and soil sampling methods Food and dairy Microbial Methods- Food quality, health and hygiene of food Industrial Microbial methods- Microbial measurements and limits in industrial assessments.	4
Chapter No. 10. Introduction to Immunology: History and Scope of Immunology, Types of Immunity- Innate, active, passive and acquired immunity. Humoral and cell - mediated immunity Organs of the Immune system: Bone marrow. Thymus, lymph node and spleen.	3
Chapter No. 11. Antigens and Antibodies: Types of antigens, Super antigens, haptens, epitopes, paratope, Role of Adjuvant in immunogenicity (Fraud's Complete Adjuvant and Fraud's Incomplete Adjuvant) Blood group antigens; Antibody Structures, types, properties and functions of immunoglobulins	7
Unit-IV	14 hrs
Chapter No. 12. Advanced Microbial Methods: Identification and sequencing of unknown microorganisms (Culturable and non-culturable). High throughput sequencing. Mechanism of immune-precipitation, Agglutination, Complement fixation, Mechanism of immuno-toxin reaction, Immuno-blotting, Immuno-Fluorescence	7
Chapter No. 13. Hypersensitivity: Types of hypersensitivity - IgE mediated (type - I). Antibody mediated cyto-toxic (type-II), Immuno complex mediated (type-III) and T-mediated (type-IV) hypersensitivity reactions.	7

Books recommended.

1. Ananthanarayan R. JayarmanPaniker 2005: Textbook of Microbiology. 7th Edition, Orient Longman publication
2. Aneja K R 2017: Experimental Microbiology Plant Pathology and Biotechnology. 5th Edition, New age International. New Delhi
3. Ronald M Atlas, Richard Bartha, and David Atlas 1998: Microbial Ecology: Fundamentals and application 2nd Edition McMillan publishing Co. New York
4. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
5. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. (2021). "Brock Biology of Microorganisms", 14th Edition. Pearson.
6. Peleczar, M.J.. Chan. E.C.S and Krieg, N.R. (2020)"Microbiology"7th Edition. Tata MaGraw Hill Book.
7. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition. Pearson Education.
8. Ronald M Atlas, 1988: Microbiology: Fundamentals and application 2nd Edition McMillan publishing Co. New York
9. Ronald M Atlas 2005 Handbook of Media for Environmental Microbiology 2nd Edition, Taylor & Francis

10. Auro, P.T Kapoor, K.K. Yadav, K.S 2019: An introduction to Microbiology, 3rd Edition, New Age International Pvt. Ltd.
11. Gerhardt, R.G.E. Murray, W.A. Wood and N.R. Krieg 1996: Methods for general and
12. molecular bacteriology. American Society for Microbiology. Washington DC.
13. Bergey, D. H., Boone, D. R., Staley, J. T., Garrity, G. M., Krieg, N. R., De
14. Vos, P., Goodfellow, M., Brenner, D. J., Castenholz, R. W. (2001). Bergey's Manual® of Systematic Bacteriology: Volume Two: The Proteobacteria (PartC). Germany: Springer.
15. Kumar, H. D and Swati Kumar 2004: Modern concepts of Microbiology. 2nd Edition, Vikas Publishing House Pvt. Ltd. New Delhi
16. Michael J Pelczar, JR, E.C.S Chan, Noel R Krieg 2015: Microbiology – Tata McGraw Hill Publication

B.Sc. Semester – II

Subject: Biotechnology
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **Microbiological methods**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1 : Understanding of Microbes and their handling , culture methods, etc.,

CO 2 : Understand and identification of methods for microbes.

CO 3 : Analyze microbial diseases from bacteria, fungi and virus, its pathological significance

List of the Experiments for 52 hrs / Semesters

1. Safety measures in microbiology laboratory
2. Cleaning and sterilization of glass wares
3. Study of instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow, centrifuge, colony counter etc
4. Media preparation : Nutrients agar, Nutrient broth and potato dextrose agar
5. Inoculation technique: Stab, point, Streak, pour plate and spread plate
6. Isolation of bacteria and fungi from soil, air, and water – dilution and pour plate methods and study of colony characters
7. Bacterial staining techniques -simple and differential (Gram's)
8. Counting of micro-organisms – Total count (Haemocytometer)
9. Biochemical tests – Starch hydrolysis, catalase, Gelatin liquification
10. Preparation of bacterial and fungal antigens
11. Total RBC and WBC count
12. Estimation of haemoglobin in blood
13. Demonstration of ELISA and RIA
14. Study of Rocket electrophoresis

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. Major Question ----- 10 Marks**
- 2. Minor Question ----- 06 Marks**
- 3. Identify and comment ----- 3X1 = 03 Marks**
- 4. Viva-----03Marks**
- 5. Journal----- 03Marks**

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Aneja K R 2017: Experimental Microbiology Plant Pathology and Biotechnology. 5th Edition, New age International. New Delhi
2. Ronald M Atlas, Richard Bartha, and David Atlas 1998: Microbial Ecology: Fundamentals and application 2nd Edition McMillan publishing Co. New York
3. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
4. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. (2021). "Brock Biology of Microorganisms", 14th Edition.Pearson.
5. Peleczar, M.J.. Chan. E.C.S and Krieg, N.R. (2020)"Microbiology"7th Edition. Tata MaGraw HillBook.

B.Sc. Semester – II

Subject: Biotechnology Open Elective Course (OEC-2) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: **Applications of Biotechnology in Agriculture**

Course Outcome (CO):

After completion of course, students will be able to:

CO 1 : Competent to apply the knowledge and skills gained in the fields of Plant biotechnology, in pharma, agriculture, herbal and nutraceutical industries.

CO 2 : Application of Bio based nutrient and growth promoters for agriculture yields.

Syllabus- OEC: Title- Applications of Biotechnology in Agriculture	Total Hrs: 42
Unit-I	14 hrs
Agricultural Biotechnology: Concepts and scope of biotechnology in Agriculture. Plant tissue culture, micro propagation, entrepreneurship in commercial plant tissue culture. Banana tissue culture - primary and secondary commercial setups ,Small scale bioenterprises: Mushroom cultivation	
Unit-II	14 hrs
Transgenic plants: The GM crop debate – safety, ethics, perception and acceptance of GM crops GM crops case study :Bt cotton, Bt brinjal Plants as bio-factories for molecular pharming : edible vaccines, nutraceuticals	
Unit-III	14 hrs
Bio-pesticides: Baculovirus pesticides, Mycopesticides, Post-harvest Protection : Antisense RNA technology for extending shelf life of fruits and shelf life of flowers. Genetic Engineering for quality improvement: Seed storage proteins, Flavours– capsaicin, vanillin.	

Books recommended.

1. Primrose. S.B. and Twyman R.M. Principles of gene manipulation and genomics. Seventh Edition. 2006. Blackwell Publishing, Australia.
2. Sandhya Mitra. (1996). Genetic Engineering. Principles and Practice. Macmillan India Ltd, New Delhi.
3. Das. H.K. (2007). Textbook of Biotechnology. Third Edition. Wiley India Pvt Ltd, New Delhi.
4. David A Micklos and Greg A Freyer. (2005). DNA Science, a first course. Second Edition. I.K. International Pvt Ltd, New Delhi.
5. Gupta. P.K. Biotechnology and Genomics. 2008. Rastogi Publications, New Delhi.
6. Winnacker E.L. (1987) From Genes to clones, Introduction to gene technology. VCH, Verlagsgesellschaftmbh, Weinheim, Germany.
7. Channarayappa. (2006) Molecular Biotechnology, Principles and Practices. University press (India) Pvt. Ltd, Hyderabad, India.
8. Becker. J.M, Caldwell.GA, Zacgho. E.A. (1996) Biotechnology, A laboratory Course. Second Edition.. Academic Press. INC, California.
9. Principles of Gene Manipulations (1994) by Old and Primrose Blackwell Scientific Publications.
10. DNA Cloning: A Practical Approach by D.M. Glover and B.D. Hames, IRL Press, Oxford. (1995).
11. Molecular Biotechnology 2nd Edition by S.B. Primrose. Blackwell Scientific Publishers, Oxford. (1994).
12. S.M. Kingsman and A.J. Kingsman (1998) Genetic Engineering and Introduction to Gene Analysis and Exploitation in Eukaryotes by, Blackwell Scientific Publications, Oxford
13. PCR Technology - Principles and Applications for DNA Amplification by Henry A. Erlich (Ed.) Stockton Press. (1989).
14. Biotechnology: A Guide to Genetic Engineering by Peters.
15. Genetic Engineering – (2000) by Nicholl.
16. Recombinant DNA and Biotechnology: Guide for Teachers. 2nd Edition by Helen Kreuz. (2001). ASM Publications
17. Molecular Biotechnology: Principles and Applications of Recombinant DNA. 2nd Edition. (1998) by Bernard R. Glick and Jack J. Pasternak, ASM Publications.
18. From genes to clones by Winnaker.
19. Manipulations and expression of recombinant DNA by Robertson.
20. Gene targeting – A practical approach by Joyner.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

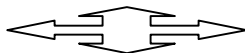
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
 'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
 2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
 3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
 4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
 5. ಎಲ್ಲ ಆಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
 6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
 7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
 8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
 9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
 10. ಎಲ್ಲ ಸ್ನಾತಕ ಆಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
 11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
 12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರ್ಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

(Handwritten signature)
 ಕುಲಸಚಿವರು.

ಆಡಕ: ಮೇಲಿನಂತೆ
 ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಭಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: BOTANY

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in BOTANY for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

*** Student can opt digital fluency as SEC or the SEC of his/ her anyone DSCC selected**

Name of Course (Subject): BOTANY

Programme Specific Outcome (PSO):

On completion of the 03/04 years Degree in BOTANY students will be able to:

PSO 1: Skill development for the proper description using botanical terms, identification, naming, and classification of life forms especially plants and microbes.

PSO 2: Acquisition of knowledge on the structure, life cycle, and life processes that exist among plant and microbial diversity through certain model organism studies.

PSO 3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.

PSO 4: Ability to explain the diversity and evolution based on the empirical evidence in morphology, anatomy, embryology, physiology, biochemistry, molecular biology, and life history.

PSO 5: Skill development for the collection, preservation, and recording of information after observation and analysis- from simple illustration to molecular database development.

PSO 6: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology, and Molecular Biology for further learning and research in all branches of Botany.

PSO 7: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC, and others.

PSO 8: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PSO 9: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies, etc at the right opportunity.

PSO 10: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and their professional career.

B.Sc. Semester – I

Subject: **Fungi, Microbiology and Plant Pathology** Discipline-Specific Course (DSC)

The course **Fungi, Microbiology and Plant Pathology** in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): **Fungi, Microbiology and Plant Pathology**

Course Outcome (CO):

After completion of the course (Theory), students will be able to:

CO 1: Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures.

CO 2: Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.

CO 3: Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.

CO 4: Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.

CO 5: Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies. Identify the common plant diseases according to geographical locations and device control measures. Conduct experiments using skills appropriate to subdivisions

<p align="center">Syllabus- Course 1(Theory): Title- Fungi, Microbiology and Plant Pathology</p>	<p align="center">Total Hrs: 56</p>
<p>Unit-I Introduction to fungi and classification: Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota, Oomycota and allied fungi</p>	<p align="center">14 hrs</p>
<p>General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification (Alexopoulos). Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organization; Reproduction; Life cycle with reference to <i>Synchytrium</i>, <i>Rhizopus</i>. Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis, and parasexuality; Life cycle and classification with reference to <i>Saccharomyces</i>, <i>Penicillium</i>, <i>Alternaria</i> and <i>Peziza</i>.</p> <p>Basidiomycota, Allied fungi, and Oomycota: General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat <i>Puccinia</i> (Physiological Specialization), loose and covered smut (symptoms only), <i>Agaricus</i>; Bioluminescence, Fairy Rings and Mushroom Cultivation. Allied fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies. Oomycota: General characteristics; Ecology; Life cycle and classification with reference to <i>Phytophthora</i>, <i>Albugo</i>.</p>	
<p>Unit-II Symbiotic associations and Applied Mycology</p>	<p align="center">14 hrs</p>
<p>Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza- Ectomycorrhiza, Endomycorrhiza, and their significance. Role of fungi in biotechnology; Application of fungi in the food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical Mycology.</p>	

Unit-III Introduction to the microbial world, Viruses, and Bacteria	14 hrs
<p>Microbial nutrition, nutritional types, growth, and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine, and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).</p> <p>Viruses and Bacteria: General characteristics; classification (Baltimore), structure and replication of DNA virus (T4 and λ), lytic and lysogenic cycle; RNA virus (TMV), viroids, and prions. General characteristics; Archaeobacteria, Eubacteria, wall-less forms (mycoplasmas); Cell structure; Reproduction and recombination (conjugation, transformation, and transduction). Binary fission and endospore.</p>	
Unit-IV Phytopathology	14 hrs
<p>Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.</p> <p>Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Late blight of potato, Black stem rust of wheat, White rust of crucifers.</p>	

Books recommended.

1. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
4. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Wiley, J.M, Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill International.
7. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text-Book of Microbiology. S Chand and Co, New Delhi.
8. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
9. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

B.Sc. Semester – I

Subject: **Fungi, Microbiology and Plant Pathology** Discipline-Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **Fungi, Microbiology and Plant Pathology**

Course Outcome (CO):

After completion of the course (Practical), students will be able to:

CO 1: Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures.

CO 2: Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.

CO 3: Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.

CO 4: Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.

CO 5: Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies. Identify the common plant diseases according to geographical locations and devise control measures. Conduct experiments using skills appropriate to subdivisions

List of the Experiments for 52 hrs / Semesters

1. *Rhizopus*: a study of the asexual stage from temporary mounts and sexual structures through permanent slides.
2. *Aspergillus* and *Penicillium*: a study of the asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
3. *Peziza*: sectioning through ascocarp.

4. *Alternaria*: Specimens/photographs and temporary mounts.
5. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.
6. *Agaricus*: Specimens of button stage and full-grown mushroom; sectioning of gills of *Agaricus*, fairy rings, and bioluminescent mushrooms are to be shown.
7. *Phytophthora infestans* – vegetative structure and reproduction.
8. *Albugo*: Study of symptoms of plants infected with *Albugo*; asexual phase study through section/temporary mounts and sexual structures through permanent slides.
9. Lichens: Study of growth forms of lichens (crustose, foliose, and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs).
10. Electron micrographs/Models of viruses – T4 and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.
11. Gram-staining of root nodule and curd.
12. Phytopathology: Herbarium and live specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat, and White rust of crucifers.

General instructions:

- Q1. Give specimens A, B, and C from fungi**
- Q2. Give root nodule/curd for simple/Gram staining of bacteria (D)**
- Q3. Diseased specimen E-viral disease/bacterial disease; F-fungal disease**
- Q4. Give slide 'G' Fungi/mycorrhizae; 'H' slide/specimen from fungi**
- Q5. Study tour report**
- Q5. Viva voce**
- Q6. Journal**

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. Identify, classify and write the salient features observed of specimen A, B, C **6 Marks**
2. Perform simple/Gram staining using material 'D'. Show the preparation to the examiners **4 Marks**
3. Identification of the disease and explain symptoms observed in specimen E and F **4 Marks**
4. Identify and describe the features observed in the slides/specimen G, and H **4 Marks**
5. **Study Tour Report 2 Marks**
6. **Viva voce 2 Marks**
7. **Journal 3 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Ashok Bendre and Ashok Kumar (2009) A textbook of practical botany, Rostakge Publications.
2. Sharma, O.P., and Sharma, K. D. (2017) Practical Botany-I, Pragathi Prakashan, Meerut.
3. Raghuram, M, and Rao, M. V. (2018) B. Sc. Practical Book of Botany First Year, Technical Publishers.
4. Verghese, N., Joy, P.P. Microbiology Laboratory Manual, Kerala Agricultural University.

B.Sc. Semester – I

Subject: Mushroom Cultivation Open Elective Course (OEC-1) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-1: Title of the Course: **Mushroom Cultivation**

Course Outcome (CO):

After completion, of course, students will be able to:

- CO 1** : Identification of various types and categories of mushrooms
- CO 2** : Demonstrate various types of mushroom cultivating technologies
- CO 3** : Examine various types of food technologies associated with the mushroom industry
- CO 4** : Value the economic factors associated with mushroom cultivation
- CO 5** : Device new methods and strategies to contribute to mushroom production

Syllabus- OEC: Title: Mushroom Cultivation	Total Hrs: 42
Unit-I Introduction, Cultivation technology	14 hrs
Introduction, history. Nutritional and medicinal value of edible mushrooms; Nutrition and nutraceuticals – Proteins, amino acids, mineral elements nutrition, carbohydrates, crude fiber content, vitamins; Poisonous mushrooms. Cultivation Technology: Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low-cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, Sterilization, Preparation of spawn, Multiplication.	
Unit-II Cultivation	14 hrs
Cultivation practices of <i>Agaricus bisporus</i> , <i>Pleurotus</i> sp. and <i>Volvoriella volvacea</i> . Composting technology in mushroom production, Low-cost technology, Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation.	
Unit-III Storage and Food preparation, Food preparation	14 hrs
Short-term storage (Refrigeration - up to 24 hours) Long-term Storage (canning, pickles, papads), drying, storage in salt solutions. Food Preparation: Types of foods prepared from the mushroom. Research Centres - National level and Regional level. Cost-benefit ratio - Marketing in India and abroad, Export Value	

Books recommended.

1. Biswas, S., Datta, M. and Ngachan, S.V. 2012. Mushrooms: A Manual for Cultivation. PHI Learning Private Limited, New Delhi.
2. Kapoor, J.N. 2010. Mushroom Cultivation. ICAR, New Delhi.
3. Nita Bahl (2000) Handbook of Mushrooms. Oxford & IBH Publishing Co. Pvt. Ltd.
4. Singh, M., Vijay, B., Kamal, S., and Wakchaure (Eds.) 2011. Mushrooms: Cultivation, Marketing, and Consumption. Directorate of Mushroom Research (ICAR), Solan
5. Tewari, Pankaj, and Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.

B.Sc. Semester - I

Subject: Gardening and landscaping SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: Gardening and landscaping

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO):

After completion of the Skill Enhancement course, students will be able to:

CO 1: Apply the basic principles and components of gardening

CO 2: Conceptualize flower arrangement and bio-aesthetic planning

CO 3: Design various types of gardens according to the culture and art of bonsai

CO 4: Establish and maintain special types of gardens for outdoor and indoor landscaping

List of the Experiments for 52 hrs / Semesters

1. Tools, implements, and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding, and grafting.
3. Seed propagation - preparation of portable trays, seed treatments, sowing, and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage, and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti, and succulents.
5. Planning and designing of gardens, functional uses of plants in the landscape.
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds, and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing, and marketing of cut flowers.
11. Visit commercial nurseries and commercial tissue culture laboratories.

General instructions:

Theoretical Knowledge of the following is essential:

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs, and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses, and cacti succulents.

Flower arrangement: importance, production details, and cultural operations, constraints, postharvest practices. Bioaesthetic planning, definition, need round country planning, urban planning, and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, riverbanks, planting material for playgrounds.

Vertical gardens, roof gardens. Culture of bonsai, the art of making bonsai. Parks and public gardens. Landscape designs, Styles of the garden, formal, informal, and freestyle gardens, types of gardens, Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, dam sites, IT parks, corporate.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. Identify and describe the uses of tools **6 Marks**
2. Perform experiment – **Seed viability/Seed germination 6 Marks**
3. Identification of specimen **6 Marks**
4. **Study tour report 2 Marks**
5. **Viva 2 Marks**
6. **Journal 3Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
3. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.
4. Hartmann and Kester, 2010. Plant Propagation: Principles and Practices. Pearson Publisher.
5. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.
6. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
7. Thakur, A.K., Kashyap, B., Bassi, S.K. and Sharma, M. 2018. Floriculture. S. Dinesh & Co., Jalandhar.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

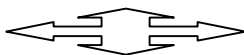
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight-age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Algae, Bryophytes, Pteridophytes and Gymnosperms
Discipline-Specific Course (DSC)

The course **Algae, Bryophytes, Pteridophytes, and Gymnosperms** in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): **Algae, Bryophytes, Pteridophytes, and Gymnosperms**

Course Outcome (CO):

After completion of the course (Theory), students will be able to:

CO 1: Demonstrate an understanding of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 2: Develop a critical understanding of morphology, anatomy, and reproduction of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 3: Understanding of plant evolution and their transition to land habitat.

CO 4: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Algae, Bryophytes, Pteridophytes, Gymnosperms

CO 5: Economic importance of Algae, Bryophytes, Pteridophytes, Gymnosperms

Syllabus- Course 2(Theory): Title- Algae, Bryophytes, Pteridophytes, Gymnosperms	Total Hrs: 56
Unit-I Algae: Cyanophyta, Xanthophyta, Chlorophyta and Phaeophyta and Rhodophyta	14 hrs
Algae, Cyanophyta and Xanthophyta: Life histories of algae, commonly found algae in India, Classification (by Fritsch), Algal cultivation methods, Phylogenetic systematics of red, brown and green algae, Dinoflagellates, Diatoms, Cryptomonads and other unicellular algae, Algal evolution, Algal bioprospecting. Ecology and occurrence; Range of thallus organization; Cell structure; Morphology and reproduction in <i>Nostoc</i> and <i>Vaucheria</i> .	

Chlorophyta and Phaeophyta and Rhodophyta: General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Volvox</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Ectocarpus</i> , and <i>Batrachospermum</i> Red tides and other algal adaptations. Commercial cultivation and economic importance of green algae, Brown and Red algae.	
Unit-II Bryophytes and type of bryophytes	14 hrs
Unifying features of and adaption of archegoniates; Transition to land habit; Alternation of generations. General characteristics; Classification (Smith/Fritsch); Range of thallus organization. Morphology, anatomy, reproduction and evolutionary trends in <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> , and <i>Funaria</i> ; Common mosses of India, Ecological and economic importance of bryophytes with special reference to <i>Sphagnum</i> .	
Unit-III Pteridophytes	14 hrs
Unifying features, morphology, anatomy, and reproduction of <i>Psilotum</i> , <i>Selaginella</i> , <i>Equisetum</i> , and <i>Pteris</i> (Developmental details not to be included). Apogamy and apospory, heterospory and seed habit, telome theory, stellar evolution; Common ferns of India, Ecological and economic importance.	
Unit-IV Gymnosperms	14 hrs
Unifying features, general characteristics, classification (Smith/Fritsch), morphology, anatomy, and reproduction of <i>Cycas</i> , <i>Pinus</i> , and <i>Gnetum</i> (excluding developmental details); <i>Cycas</i> and <i>Pinus</i> of India, Ecological and economic importance.	

Books recommended.

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Vashishta B.R., Sinha A.K. and Singh V. P. (2008). Botany for Degree Students. Algae. S Chand and Co, New Delhi.
3. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
4. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky P.V. and Jackson, R.B. (2008). Biology, 8th edition. Pearson Benjamin Cummings, USA.
5. Vashishta, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
6. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International Publishers, New Delhi, India.
7. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot, Allahabad.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, New Delhi.
9. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press, Cambridge

B.Sc. Semester – II

Subject: **Algae, Bryophytes, Pteridophytes and Gymnosperms** Discipline-Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **Algae, Bryophytes, Pteridophytes, and Gymnosperms**

Course Outcome (CO):

After completion of the course (Practical), students will be able to:

CO 1: Demonstrate an understanding of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 2: Develop a critical understanding of morphology, anatomy, and reproduction of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 3: Understanding of plant evolution and their transition to land habitat.

CO 4: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Algae, Bryophytes, Pteridophytes, Gymnosperms

CO 5: Economic importance of Algae, Bryophytes, Pteridophytes, Gymnosperms

List of the Experiments for 52 hrs / Semesters

1. Microscopic observation of vegetative and reproductive structures of *Nostoc*, *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Ectocarpus*, *Fucus*, and *Batrachospreum* through temporary preparations and permanent slides.
2. *Riccia* – Morphology of the thallus.
3. *Marchantia*- Morphology of thallus, whole-mount of rhizoids and Scales, vertical section of thallus through Gemma cup (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).
4. *Anthoceros*- Morphology of thallus, dissection of the sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of the thallus (permanent slide).

5. *Funaria*- Morphology, whole-mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of a capsule; whole mount of protonema.
6. *Psilotum*- Study of the specimen, transverse section of synangium (permanent slide).
7. *Selaginella*- Morphology, whole-mount of the leaf with a ligule, transverse section of stem, whole-mount of strobilus, whole-mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).
8. *Equisetum*- Morphology, transverse section of internode, longitudinal section of strobilus, whole-mount of sporangiophore, whole-mount of spores (temporary slide), transverse section of rhizome (permanent slide).
9. *Pteris*- Morphology, transverse section of rachis, vertical section of sporophyll, whole-mount of the sporangium, whole-mount of spores (temporary slides), transverse section of rhizome, whole-mount of prothallus with sex organs, and young sporophyte (permanent slide).
10. *Cycas*- Morphology (coralloid roots, leaf), the whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of the leaflet, vertical section of microsporophyll, whole-mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).
11. *Pinus*- Morphology (long and dwarf shoots, whole-mount of dwarf shoot, male and female cones), transverse section of the needle, transverse section of stem, longitudinal section of / transverse section of a male cone, whole-mount of microsporophyll, whole-mount of Microspores (temporary slides), longitudinal section of a female cone, tangential longitudinal section and radial longitudinal sections stem (permanent slide).
12. *Gnetum*- Morphology (stem, male and female cones), transverse section of stem, vertical section of the ovule (permanent slide).

General instructions:

- Q1. Give specimen from Algae, Bryophytes, Pteridophytes, and Gymnosperms (A, B, C, and D)**
- Q2. Preparation and analysis of material Algae/Bryophytes/Pteridophytes/ Gymnosperms (E and F)**
- Q3. Specimen or Slides from Algae/Bryophytes/Pteridophytes/Gymnosperms (H, I, and J)**
- Q4. Study Tour Report**
- Q5. Viva**
- Q6. Journal**

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

- 1. Identify, classify and describe features observed in specimen 8 Marks**
- 2. Describe the internal structures of the given specimen 4 Marks**
- 3. Identification of Specimen/slides 6 Marks**
- 4. Study Tour Report 2 Marks**
- 5. Viva 2 Marks**
- 6. Journal 3 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

- 1. Ashok Bendre and Ashok Kumar (2009) A textbook of practical botany, Rostakge Publications.
- 2. Sharma, O.P., and Sharma, K. D. (2017) Practical Botany-I, Pragathi Prakashan, Meerut.
- 3. Raghuram, M, and Rao, M. V. (2018) B. Sc. Practical Book of Botany First Year, Technical Publishers.
- 4. Verghese, N., Joy, P.P. Microbiology Laboratory Manual, Kerala Agricultural University.

B.Sc. Semester – II

Subject: **Biofertilizers** Open Elective Course (OEC-2) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: **Biofertilizers**

Course Outcome (CO):

After completion, of course, students will be able to:

CO 1: Develop their understanding of the concept of bio-fertilizer

CO 2: Identify the different forms of biofertilizers and their uses

CO 3: Compose the Green manuring and organic fertilizers

CO 4: Develop the integrated management for better crop production by using both nitrogenous and phosphate biofertilizers and vesicular-arbuscular mycorrhizal (VAM).

CO 5: Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

Syllabus- OEC: Title- Biofertilizers	Total Hrs: 42
Unit-I	14 hrs
The general account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier-based inoculants, Actinorrhizal symbiosis. <i>Azospirillum</i> : isolation and mass multiplication – carrier-based inoculant, the associative effect of different microorganisms. <i>Azotobacter</i> : classification, characteristics – crop response to <i>Azotobacter</i> inoculum, maintenance, and mass multiplication.	
Unit-II	14 hrs
Cyanobacteria (blue-green algae), <i>Azolla</i> and <i>Anabaena azollae</i> association, nitrogen fixation, factors affecting growth, blue-green algae, and <i>Azolla</i> in rice cultivation. Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	
Unit-III	14 hrs
Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural, and industrial wastes – bio compost making methods, types, and method of vermicomposting – field Application.	

Books recommended.

1. Dubey, R.C. (2005). A Textbook of Biotechnology S.Chand & Co, New Delhi.
2. John Jothi Prakash, E. (2004). Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
3. Kumaresan, V.(2005). Biotechnology, Saras Publications, New Delhi.
4. NIIR Board. (2012). The Complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.
5. Sathe, T.V. (2004) Vermiculture and Organic Farming. Daya publishers.
6. Subba Rao N.S. (2017). Biofertilizers in Agriculture and Forestry. Fourth Edition. Medtech.
7. Vayas, S.C, Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

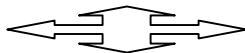
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight-age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
 'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್‌ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
 2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
 3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
 4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್‌ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
 5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
 6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
 7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
 8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
 9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
 10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
 11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
 12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರ್ಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

(Handwritten signature)
 ಕುಲಸಚಿವರು.

ಆಡಕ: ಮೇಲಿನಂತೆ
 ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಧಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Chemistry

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER NEP - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Chemistry for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

* Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected

Name of Course (Subject): Chemistry

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Chemistry students will be able to:

- PO 1** Demonstrate, solve and an understanding of major concepts in all the disciplines of chemistry.
- PO 2** Provide students with broad and balanced knowledge and understanding of key chemical concepts.
- PO 3** Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- PO 4** To apply standard methodology to the solutions of problems in chemistry.
- PO 5** Provide students with knowledge and skill towards employment or higher education in chemistry or multi-disciplinary areas involving chemistry.
- PO 6** Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- PO 7** Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- PO 8** Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.
- PO 9** To prepare students effectively for professional employment or research degrees in chemical sciences.
- PO 10** To cater to the demands of chemical industries of well-trained graduates.
- PO 11** To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- PO 12** To develop an independent and responsible work ethics.

B.Sc. Semester – I

Subject: Chemistry Discipline Specific Course (DSC)

The course Chemistry in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory) **CHEMISTRY: CHM T-1** **Course Outcome (CO):**

After completion of course (Theory), students will be able to:

- CO 1 Describe the dual nature of radiation and matter; dual behavior of matter and radiation, de Broglie's equations, Heisenberg uncertainty principle and their related problems. Quantum mechanics. Derivation of Schrodinger's wave equation. Orbital shapes of *s*, *p*, *d* and *f* atomic orbitals, nodal planes. Electronic configurations of the atoms.
- CO 2 Define periodicity, explain the cause of periodicity in properties, classify the elements into four categories according to their electronic configuration. Define atomic radii, ionisation energy, electron affinity and electronegativity, discuss the factors affecting atomic radii, describe the relationship of atomic radii with ionization energy and electron affinity, describe the periodicity in atomic radii, ionization energy, electron affinity and electronegativity.
- CO 3 Explain bond properties, electron displacement effects (inductive effect, electrometric effect, resonance effect and Hyper conjugation effect). steric effect and their applications in explaining acidic strength of carboxylic acids, basicity of amines. Understand basic concept of organic reaction mechanism, types of organic reactions, structure, stability and reactivity of reactive intermediates.
- CO 4 Describe important characteristics of configurational and conformational isomers. Practice and write conformational isomers of ethane, butane and cyclohexane. Understand the various concepts of geometrical isomerism and optical isomerism. Describe CIP rules to assign E,Z notations and R & S notations. Explain D and L configuration and *threo* and *erythro* nomenclature. Explain racemic mixture and racemisation, resolution of racemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality.
- CO 5 Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. Explain the laws governing behavior of ideal gases and real gases. Understand cooling effect of gas on adiabatic expansion. Describe the conditions required for liquefaction of gases. Realize that there is continuity in gaseous and liquid state. Explain properties of liquids in terms of intermolecular attractions.
- CO 6 Understand principles of titrimetric analysis. Understand principles of different type's titrations. Titration curves for all types of acids – base titrations. Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications.
- CO 7 Understand titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water.

Syllabus- Course 1(Theory): Title- Chemistry	Total Hrs: 56
Unit-I ATOMIC STRUCTURE & PERIODICITY OF ELEMENTS	14 hrs
<p>Atomic Structure: Review of Rutherford's atomic model, Bohr's theory, Hydrogen atomic spectra. Derivation of radius and energy of an electron in hydrogen atom, limitations of Bohr's theory, dual behavior of matter and radiation, de Broglie's equations, Heisenberg Uncertainty principle and their related problems. Quantum mechanics. Derivation of Schrodinger's wave equation for hydrogen atom and meanings of various terms in it. Significance of ψ and ψ^2. Radial and angular wave functions (atomic orbitals) and their distribution curves for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals (Only graphical representation). Radial and angular nodes and their significance. Quantum numbers and their significance. Orbital shapes of s, p, d and f atomic orbitals, nodal planes. Rules for filling electrons in various orbitals, Electronic configurations of the atoms (atomic number up to 54). Concept of exchange energy. Anomalous electronic configurations. IUPAC nomenclature of elements with atomic number greater than hundred. (10 Lectures)</p> <p>Periodicity of elements: Brief account on the following properties of elements with reference to s and p-block and trends in groups and periods. Effective nuclear charge, screening effect, Slater's rules, atomic and ionic radii, ionization enthalpy, electron gain enthalpy, electronegativity, Pauling/ Allred-Rochow scales. Numerical problems are to be solved wherever applicable. (04 Lectures)</p>	
Unit-II FUNDAMENTALS OF ORGANIC CHEMISTRY & STEREOCHEMISTRY	14 hrs
<p>Fundamentals of Organic Chemistry: Review of hybridization, <i>sigma</i> and <i>pi</i> bonds. IUPAC Nomenclature of poly functional organic compounds, comparative study of bond lengths, bond angles, bond energies and dihedral angles, bond polarity, dipole moment and illustration with examples of organic compounds, delocalization, electron displacement effects and their applications: inductive effect, electrometric effect, resonance effect, hyperconjugation, and steric effect.</p> <p>Organic reaction Mechanism: Definition, classification of organic reactions: substitution, addition, elimination, rearrangement, oxidation and reduction reactions with suitable examples. Use of curved arrows, types of bond fission, electrophiles, nucleophiles, nucleophilicity, nucleofugacity and basicity. Reactive intermediates: Energy profile diagrams, structure, formation and stability and reactions of carbocations, carbanions, free radicals and carbenes. (7 Lectures)</p> <p>Stereochemistry: Stereoisomersim: Definition of stereoisomerism, conformational isomers and configurational isomers (distinction between conformation and configuration). Newman, Sawhorse and Fischer projection formulae and their interconversions. Geometrical isomerism: Definition, reason for geometrical isomerism, E and Z notation -CIP rules and examples, determination of configuration of geometric isomers by dipole moment method and anhydride formation method, <i>syn</i> and <i>anti</i> isomers in compounds containing C=N. Optical isomerism: Chirality/asymmetry, enantiomerism, diastereomerism and meso compounds. R and S notations (compounds with two asymmetric centers), D and L configurations and <i>threo</i> and <i>erythro</i> nomenclature, racemic mixture and racemization, Resolution: Definition, Resolution of racemic mixture by: i) Mechanical separation ii) Formation of diastereomers iii) Biochemical methods. Biological significance of chirality. Problems are to be solved wherever applicable. (7 Lectures)</p>	
Unit-III GASES & LIQUIDS	14 hrs

<p>Gaseous state: Review of kinetic theory of gases, van der Waals equation of state Boyle temperature. Molecular velocity: Maxwell's Boltzmann distribution law of molecular velocities (most probable, average and root mean square velocities). Relation between RMS, average and most probable velocity and average kinetic energies (derivation not required), law of equipartition of energy. Collision frequency, collision diameter, Collision cross-section, collision number and mean free path and coefficient of viscosity, calculation of σ and η, variation of viscosity with temperature and pressure. Critical phenomena: Andrews isotherms of CO₂, critical constants and their determination Relation between critical constants and van der Waals equation (Derivation), continuity of states, law of corresponding states. Numerical problems are to be solved wherever applicable. (7 Lectures)</p> <p>Liquid state: Molecular forces and general properties of liquids. Surface tension: surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, determination of surface tension by capillary rise method, drop weight and drop number methods using stalagmometer. Effect of temperature on surface tension. Parachor, Additive and constitutive properties: atomic and structural parachor. Elucidation of structure of benzene and benzoquinone. Viscosity: Definition, viscosity coefficient, fluidity, molecular viscosity, relative viscosity and absolute viscosity, determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces. Refractive index: Definition, Specific and molar refraction. Determination of refractive index using Abbe's refractometer. Additive and constitutive properties: Elucidation of structure of molecules. Numerical problems are to be solved wherever applicable. (7 Lectures)</p>	
<p>Unit-IV ANALYTICAL CHEMISTRY</p>	<p>14 hrs</p>
<p>Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Accuracy, precision, selectivity and sensitivity. Method validation. Types and sources of errors in analytical measurements. Presentation of experimental data and results from the point of view of significant figures.</p> <p>Titrimetric analysis: Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials (salts).</p> <p>Acid-base titrimetry: Theory, titration curves for all types of acids – base titrations.</p> <p>Redox titrimetry: Theory, balancing redox equations, titration curves, theory of redox indicators and applications.</p> <p>Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.</p> <p>Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water.</p> <p>Numerical problems are to be solved wherever applicable. (14 Lectures)</p>	

Recommended Books/References

Inorganic Chemistry

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd Ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J. J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J. E., Keiter, E.A., Keiter, R.L. & Medhi, O. K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
6. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
7. Rodgers, G. E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008.
8. Mark Weller and Fraser Armstrong, 5th Edition, Oxford University Press (2011-2012) Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley & Sons, 1974.
9. G.L. Miessler & Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
10. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
11. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co., New York (1985).

Organic Chemistry

1. Organic Chemistry-P. Y. Bruice, 7th Edition, Pearson Education Pvt. Ltd., New Delhi (2013).
2. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
4. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
7. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
8. Graham Solomons, T. W., Fryhle, C. B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
9. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
10. Organic Chemistry-F. A. Carey, 4th Edition, McGraw Hill (2000).
11. Modern Organic Chemistry - R.O.C. Norman and D.J. Waddington, ELBS, 1983.
12. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
13. Organic Chemistry - L. Ferguson, Von Nostrand, 1985.
14. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
15. Organic Chemistry- Mehta and Mehta, 2005.

Physical Chemistry

1. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill, 2007.
2. Castellan, G.W. Physical Chemistry, 4th Ed. Narosa, 2004.
3. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.
4. P.W. Atkins: Physical Chemistry, 2002.
5. W.J. Moore: Physical Chemistry, 1972.
6. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
7. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
8. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
9. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
10. Physical Chemistry - G. M. Barrow, McGraw Hill, 1986.
11. Physical Chemistry (3rd Edition) - Gilbert W. Castilian, Narosa Publishing House, 1985.
12. Chemical Kinetics by K. J. Laidler, Tata McGraw Hill Publishing Co., New Delhi.
13. Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York, 1981.

Analytical Chemistry

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Willard, H. H., Merritt, L.L., Dean, J. & Settle, F.A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, G.D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Skoog, D. A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017.
6. Ditts, R.V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974.

B.Sc. Semester – I

Subject: Chemistry
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical) **CHEMISTRY LAB: CHM P -1:**

Inorganic and Organic chemistry practicals

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO1: Understand and practice the calibration of glasswares (burette, pipette, volumetric flask).

CO2: Basic concepts involved in titrimetric analysis, primary standard substances, preparation of standard solutions.

CO3: Explain the principles of acid-base, redox and iodometric titrations.

CO4: Work out the stoichiometric relations based on the reactions involved in the titrimetric analysis.

CO5: Based on principles of titrimetric analysis student can perform

CO6: Describe the significance of organic quantitative analysis.

CO7: Determine the amount of phenol, aniline, amide, ester and formaldehyde in a given solution by performing blank titration and main titrations.

CO8: Determine aspirin in the tablet by hydrolysis method.

List of the Experiments for 52 hrs / Semester

Inorganic chemistry experiments

Calibration of glasswares (burette, pipette, volumetric flask)

(Primary and Secondary standard solutions, normality, molarity, molality, equivalent mass).

1. Determination of sodium carbonate using standard HCl solution (Standardize HCl solution using standard sodium carbonate solution).
2. Determination of carbonate and hydroxide present together in a mixture.
3. Determination of Mohr's salt and oxalic acid using standardized KMnO_4 solution.
4. Determination of ferrous and ferric ions in a solution using standard solution of $\text{K}_2\text{Cr}_2\text{O}_7$ by internal indicator method (diphenylamine or N-phenylanthranilic acid).
5. Determination of Magnesium using standard EDTA solution (Standardize EDTA solution using standard zinc sulphate solution).
6. Determination of iodine using sodium thiosulphate (Standardize sodium thiosulphate solution using standard potassium dichromate solution).

Organic chemistry experiments

7. Determination of phenol by bromination method
8. Determination of aniline by bromination method.
9. Determination of acetamide by hydrolysis method.
10. Determination of ethyl benzoate by hydrolysis method.
11. Determination of aspirin in the tablet by hydrolysis method.
12. Determination of amount of formaldehyde in the given solution by sodium sulphite method.

General instructions:

Standard solution is to be prepared by the students for both in regular and in practical examination.

In the practical examination, in a batch of ten students, five students each will be performing inorganic and organic experiments. At least two experiments from inorganic and two experiments from organic may be given. Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. *Manual is not allowed in the examination.*

Scheme of Practical Examination (distribution of marks):

For Internal and Semester end examination

1. Accuracy:	12 Marks
2. Technique and presentation :	02Marks
3. Reactions and Calculations:	03 Marks
4. Viva:	05 Marks
5. Journal:	03 Marks
Total	25 marks

Deduction of marks for accuracy(Inorganic and Organic Practicles) : ± 0.2 CC -12 marks, ± 0.4 CC-09 marks, ± 0.6 CC- 06 marks, ± 0.8 CC- 03 marks, ± 0.9 CC or above - 01 marks.

Recommended Books/References

1. Vogel's Textbook of Qualitative Chemical Analysis – J Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, ELBS, 1986
2. Inorganic Semi-micro Qualitative Analysis V. V. Ramanujam, The National Pub. Co., 1974
3. Practical Inorganic Chemistry G. Marr and B. W. Rackett, Von Nostrand Reinhold, 1972
4. Laboratory manual of Organic Chemistry Day, Sitaraman and Govindachai 1998
5. Text book of Practical Organic Chemistry, A. I. Vogel, 1996
6. A Handbook of Organic Analysis, Clarke and Hayes, 1964
7. An introduction to practical Biochemistry, David Plummer, McGraw-Hill Publishing Co., 1992

B.Sc. Semester – I

Subject: Chemistry
Open Elective Course (OEC-1)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course **CHEMISTRY: CHM OEC-1 Chemistry in daily life**
Course Outcome (CO):

After completion of course, students will be able to:

CO1: Understand the chemical constituents in various day to day materials used by a common man like Tooth paste, Cosmetics, Soaps and detergents and Biomolecules .

CO2: Understand the chemical constituents and applications in Food additives, adulterants and contaminants, Artificial food colorants.

CO3: Understand the scientific reasons in various aspects and chemotherapy and its applications.

CO4: Understand the basic constituents and applications in polymers, surface coatings, fertilizers, insecticides and pesticides, chemical explosives etc.

Syllabus- OEC: Title- Chemistry in daily life	Total Hrs: 42
Unit-I	14 hrs
Household chemicals: Common chemicals used at home. Tooth paste – Contents of toothpaste, chemical name, ingredients, flavor and its role. Cosmetics – Contents and uses of Face powder, snow, lipsticks and perfumes. Toxic household chemicals and their effects (antifreeze, bleach, drain cleaners, carpet cleaners, ammonia, air fresheners). Soaps and detergents- Types of soaps, synthetic detergents (neutral, anionic and cationic), cleansing action of detergents. Advantages and disadvantages of detergents over soaps. Biomolecules: Composition and uses of Carbohydrates, proteins, oils and fats minerals and vitamins. Functions of enzymes and hormones in the human body.	
Unit-II	14 hrs
Food additives, adulterants and contaminants: Definition types and applications - Food preservatives like benzoates, propionates, sorbates, disulphites. Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose and sodium cyclamate. Flavours: Vanillin, alkyl esters (fruit flavours) and monosodium glutamate. Artificial food colorants: Coal tar dyes and non-permitted colours and metallic salts. Analysis of pesticide residues in food. Science behind emotions, sunscreen, rust formation, rainbow, motion sickness, salt harvesting, crystallization of sugar and kidney stones. Chemotherapy: Drugs and their classification. Therapeutic action of different classes of the drugs viz. analgesics, antibiotics, antacids, antihistamines, antimicrobials, contraceptives, antipyretics, antiseptics and neurologically active drugs.	

Unit-III	14 hrs
<p>Polymers: Examples of synthetic polymers and their uses (LDPE, HDPE, PVC, Polypropylene, nylon, teflon, polysiloxanes, polyphosphazenes and polybutadiene).</p> <p>Surface Coatings: Classification and brief introduction to surface coatings. Paints and pigments - formulation, composition and related properties. Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, Metallic coatings (electrolytic and electroless), metal spraying and anodizing.</p> <p>Fertilizers: Composition of fertilizers, uses of Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates, superphosphate of lime.</p> <p>Insecticides, weedicides and pesticides: Examples, content and uses.</p> <p>Chemical explosives: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.</p>	

Recommended Books/References

1. Hawley's Condensed Chemical Dictionary by Richard J. Lewis. Call Number: REF 540.3 H31.
2. Van Nostrand's Encyclopedia of Chemistry by Glenn D. Considine, Call Number: REF 540.3 V33C 2005.
3. Macmillan Encyclopedia of Chemistry by Joseph J. Lagowski.
4. NCERT 12th Standard Book and references therein.
5. Chemistry in Daily Life: Third Edition Paperback – 1 January 2012 by Singh K.

B.Sc. Semester - I

Subject: Chemistry
SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: CHM SEC-1 Soil Analysis

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO)

After completion of Skill Enhancement course, students will be able to:

CO1: Acquire skills for Laboratory management and routine analysis of Soil.

CO2: Improve working ability in analytical laboratory.

CO3: Helpful for obtaining jobs in various fields.

CO4: The student can start his own business /laboratory or can associate with any kind of laboratory or associated jobs with confidence.

List of the Experiments for 52 hrs / Semesters (Theory and Practical= 3Hours/Week) Theory

1. Introduction: Definition of soil, concept of lithosphere, soil as a natural body.
Soil Components: Air, Water, inorganic and organic solids. Formation of Soil, Types of soils & basic concepts.
2. Physical properties of Soil: Soil separates, texture, aggregation and structure, temperature and colour. Properties of soil mixture, pore space, bulk density, particle density, aeration and drainage, compaction, surface area, soil water relationships.
3. Chemical Properties of soil: Morphology of colloids, chemistry of clays, ionic exchange, acidity, alkalinity, pH, salinity, reactions in liming and acidification.
4. Biological Properties: Soil organic matter, C: N relationships, nitrogen-transformation, soil organisms, sulfur transformation.
5. Fertility of soil. Soil deficiency with respect to macro and micro nutrient components, brief study of micronutrient & macronutrient sources & importance

Practical

6. Visit to soil testing laboratory & report writing. Visit to farmers fields for collection of different types of soil samples.
7. Determination of pH and electrical conductivity of different types of soil samples
8. Determination of alkalinity and salinity of the soil sample and determination of total organic matter in the given soil Sample.
9. Determination of Ca (II) and Mg(II) ions from soil sample
10. Determination of Fe (II) and Fe (III) ions from soil sample.
11. Determination of Na and K from soil sample by flame photometry.

General instructions:

In the practical examination, in a batch of ten students, minimum three sets of experiments may be given. Selection of experiment may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. *Manual is not allowed in the examination*

Scheme of Practical Examination (distribution of marks)

For internal and Semester end examination

1. Three questions on the theory may be given.	
Student has to answer any two questions:	06 Marks
2. Accuracy in the practical :	08 Marks
3. Reactions and Calculations:	03 Marks
4. Viva:	05 Marks
5. Journal:	03 Marks
Total	25 marks

Deduction of marks for accuracy: : ± 0.2 CC -08 marks, ± 0.4 CC- 06 marks, ± 0.6 CC- 04 marks, ± 0.8 CC- 02 marks, ± 0.9 CC or above - 01 marks.

Recommended Books/References

1. Laboratory manual for Environmental Chemistry: Sunita Hooda and Sumanjeet Kaur by S. Chand & Company 1999.
2. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
3. Fundamentals of soil science, Foth, H.D. Wiley Books.
4. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
5. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.
6. Handbook of Agricultural Sciences, S.S. Singh, P. Gupta, A. K. Gupta, Kalyani Publication.
7. Introduction to soil laboratory manual - J. J. Harsett Stipes.
8. Introduction to soil science laboratory manual, Palmer and troch – Iowa State.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

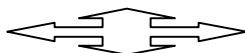
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Chemistry
Discipline Specific Course (DSC)

The course Chemistry in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory) **CHEMISTRY: CHM T-2**
Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO1: Explain ionic bond, Born Lande equation, Born Haber cycle and Fajan's rules. State VSEPR theory, hybridisation and shapes of various molecules. Understand the concept of resonance and write resonating structures of NO_3^- , CO_3^{2-} and SO_4^{2-} .

CO2: Explain MO Theory and draw the MO diagrams for homonuclear diatomic molecules and ions of 1st and 2nd periods and heteronuclear diatomic molecules such as CO, NO and NO^+ . Compare MO and VB theory.

CO3: Learn preparation and reactions of alkanes, alkenes and alkynes. Clear the concept learning mechanism of Free radical mechanism of halogenations of alkanes. Understand the mechanisms of addition reactions of alkenes and alkynes.

CO4: Learn the concept of polymerization, ozonolysis in alkenes and alkynes. Learn acidity of alkynes, formation of metal acetylides and their applications. Explain cycloalkanes and their relative stability. Explain conformational analysis of cyclohexane with Karplus energy diagram. Axial and equatorial bonds. Relative stability of mono substituted cycloalkanes.

CO5: Expected to learn symmetry elements, unit cells, crystal systems. Learn Bravais lattice, types and identification of lattice planes. Explain laws of crystallography - law of constancy of interfacial angles, law of rational indices.

CO6: Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Explain defects in crystals. Learn the applications of liquid crystals. Learn the concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates.

CO7: Understand the concept of order and molecularity of a reaction and their applications. Define half-life of a reaction. Explain methods for determination of order of a reaction by half life period and differential equation method. Understand the concept of activation energy and its calculation from Arrhenius equation. Explain theories of reaction rates: Collision theory and activated complex theory of bimolecular reactions.

CO8: Learn principles of gravimetric analysis. Learn the precipitation, mechanism of precipitation, factors influencing precipitation, co-precipitation and post-precipitation. Learn structure, specificity, conditions and applications of organic reagents. Advantages of organic reagents over inorganic reagents.

CO9: Learn about quality of surface water, ground water. Impurities in water, standards of water quality (color, pH, hardness, TDS, sulphate, fluoride, chloride) for potable, domestic, industrial and agricultural purpose. Learn Water treatment technologies – house hold water treatment, municipal water treatment, industrial treatment (primary and secondary treatment of industrial effluent), softening of water, and disinfection of water. Determinations of DO, BOD and COD, and their significance.

Syllabus- Course 2(Theory): Title- CHEMISTRY: CHM T-2	Total Hrs: 56
Unit-I CHEMICAL BONDING & MOLECULAR STRUCTURE	14 hrs
<p>Ionic Bonding: General characteristics of ionic compounds. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Landé equation and calculation of lattice energy. Born-Haber cycle and its applications.</p> <p>Polarizing power and polarizability: Fajan's rules, ionic character in covalent compounds and percentage of ionic character.</p> <p>Covalent bonding: General characteristics of covalent compounds. VB approach, shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures of NO_3^-, CO_3^{2-} and SO_4^{2-}.</p> <p>Molecular Orbital Theory: LCAO method, bonding and antibonding MOs and their characteristics for <i>s-s</i>, <i>s-p</i> and <i>p-p</i> combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules and ions of 1st and 2nd periods and heteronuclear diatomic molecules such as CO, NO and NO^+. Comparison of VB and MO approaches.</p> <p>Numerical problems are to be solved wherever applicable.</p>	
Unit-II ALIPHATIC HYDROCARBONS	14 hrs
<p>Alkanes: Methods of preparation by catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis and from Grignard reagent. Free radical mechanism of halogenations, relative reactivity and selectivity of halogenation. Conformational analysis of ethane and butane.</p> <p>Alkenes: Methods of preparation by dehydration of alcohols and dehydrohalogenation of alkyl halides. Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. <i>cis</i> Alkenes by partial catalytic hydrogenation and <i>trans</i> alkenes by Birch reduction. Reactions: Addition of HX (Markownikov's and anti-</p>	

<p>Markownikov's addition) Stereospecificity of halogen addition, regioselectivity and relative rates of addition reaction. Hydrogenation, hydration, hydroxylation and epoxidation of alkenes. Oxidative cleavage of alkenes with KMnO_4. Ozonolysis, mechanism of ozonolysis in propene and polymerization.</p> <p>Alkadienes: Classification, mechanism of addition of halogen and hydrogen halides in 1,3-diene, kinetically and thermodynamically controlled addition of HBr to 1,3-butadiene, polymerization and Diels-Alder reaction.</p> <p>Alkynes: Preparation: Acetylene from CaC_2 and conversion into higher alkynes by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: Acidity of 1-alkynes and formation of metal acetylides, addition of bromine and alkaline KMnO_4, ozonolysis and oxidation with hot alk. KMnO_4.</p> <p style="text-align: right;">(11 Lectures)</p> <p>Cycloalkanes: Types of cycloalkanes and their relative stability. Baeyer strain theory and theory of strainless rings. Conformational analysis of cyclohexane with Karplus energy diagram. Axial and equatorial bonds. Relative stability of mono substituted cyclohexanes.</p> <p style="text-align: right;">(3 Lectures)</p>	
<p>Unit-III SOLIDS & CHEMICAL KINETICS</p>	14 hrs
<p>Solids: Types of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl. Defects in crystals.</p> <p>Liquid Crystals: Explanation, classification with examples- Smetic, nematic, cholesteric, disc shaped and polymeric. Structures of nematic and cholesteric phases-molecular arrangements in nematic and cholesteric liquid crystals. Applications of liquid crystals in LCDs and thermal sensing. Numerical problems are to be solved wherever applicable.</p> <p style="text-align: right;">(7 Lectures)</p> <p>Chemical Kinetics: Review of reaction rates, order and molecularity. Factors affecting rates of reaction: concentration pressure, temperature, catalyst, etc. Examples for different orders of reactions. Derivation of integrated rate equations for zero and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction (numerical problems). Methods for determination of order of a reaction by half life period and differential equation method. Effect of temperature on reaction rates, temperature coefficient, Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Numerical problems are to be solved wherever required.</p> <p style="text-align: right;">(7 Lectures)</p>	
<p>Unit-IV ANALYTICAL CHEMISTRY</p>	14 hrs
<p>Gravimetric Analysis: Stages in gravimetric analysis, requisites of precipitation, theories of precipitation, factors influencing precipitation, co-precipitation and post-precipitation. Structure, specificity, conditions and applications of organic reagents such as salcylalldoxime, oxine, dimethyl glyoxime, cupron and cupferron in inorganic analysis. Advantages of organic reagents over inorganic reagents.</p> <p style="text-align: right;">(6 Lectures)</p> <p>Water analysis: Water availability, requirement of water. Quality of surface water and ground water. Impurities in water. Standards of water quality for potable, domestic, industrial and agricultural purpose (color, pH, alkalinity, hardness, TDS, sulphate, fluoride, chloride etc.)</p> <p>Water treatment technologies – house hold water treatment, municipal water treatment and industrial treatment (primary and secondary treatment of industrial effluent). Softening of water. Disinfection of water. Definition and determinations of DO, BOD and COD, and their significance.</p> <p>Numerical problems are to be solved wherever required.</p> <p style="text-align: right;">(8 Lectures)</p>	

Recommended Books/References

Inorganic Chemistry

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd Ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J. J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J. E., Keiter, E.A., Keiter, R.L. & Medhi, O. K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
6. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
7. Rodgers, G. E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008.
8. Mark Weller and Fraser Armstrong, 5th Edition, Oxford University Press (2011-2012) Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley & Sons, 1974.
9. G.L. Miessler & Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
10. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
11. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co., New York (1985).

Organic Chemistry

1. Organic Chemistry-P. Y. Bruice, 7th Edition, Pearson Education Pvt. Ltd., New Delhi (2013).
2. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
4. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
7. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
8. Graham Solomons, T. W., Fryhle, C. B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
9. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
10. Organic Chemistry-F. A. Carey, 4th Edition, McGraw Hill (2000).
11. Modern Organic Chemistry - R.O.C. Norman and D.J. Waddington, ELBS, 1983.
12. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
13. Organic Chemistry - L. Ferguson, Von Nostrand, 1985.
14. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
15. Organic Chemistry- Mehta and Mehta, 2005.

Physical Chemistry

1. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill, 2007.
2. Castellan, G.W. Physical Chemistry, 4th Ed. Narosa, 2004.
3. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.
4. P.W. Atkins: Physical Chemistry, 2002.
5. W.J. Moore: Physical Chemistry, 1972.
6. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
7. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
8. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
9. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
10. Physical Chemistry - G. M. Barrow, McGraw Hill, 1986.

11. Physical Chemistry (3rd Edition) - Gilbert W. Castilian, Narosa Publishing House, 1985.
12. Chemical Kinetics by K. J. Laidler, Tata McGraw Hill Publishing Co., New Delhi.
13. Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York, 1981.

Analytical Chemistry

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Environmental Chemistry-A K De
3. Christian, G.D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Skoog, D. A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017.

B.Sc. Semester – II

Subject: Chemistry
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical)

CHEMISTRY LAB CHM P- 2 :Analytical and Physical chemistry practicals

Course Outcome (CO)

After completion of course (Practical), students will be able to:

CO1: Learn regarding errors, types of errors, accuracy, precision, significant figures and standard deviation. To determine the total alkalinity in antacids, Vitamin C in lemon juice/formulations. To determine free alkali present in different soaps/detergents. Learn analysis of DO in waste water sample.

CO2: To determine Chemical Oxygen Demand (COD) in waste water sample.

CO3: To determine temporary, permanent and total hardness of water by collecting different samples of water.

CO4: Enable to understand the applications of experiments like methods of determination of viscosity, surface tension, refractive index.

List of the Experiments for 52 hrs / Semesters

Analytical chemistry experiments

Explanation regarding errors, types of errors, accuracy, precision, significant figures and standard deviation (students should write in the journal regarding the above).

1. Determination of total alkalinity in antacids.
2. Determination of Vitamin C in lemon juice/formulations.
3. Determination of free alkali present in different soaps/detergents.
4. Analysis of DO in waste water sample / pond water / river water etc.
5. Determination of Chemical Oxygen Demand (COD) in waste water sample.
6. Determination of temporary, permanent and total hardness of water using standard EDTA solution
7. Determination of Ni (II) using DMG by gravimetric method.

Physical chemistry experiments

1. Determination of surface tension and parachor of alcohol series.
2. Determination of surface tension of soap solutions for various concentrations.
3. Determination of the viscosity of liquids (ethylacetate & ethyl alcohol /toluene, & chlorobenzene or any other two non hazardous liquids) using Ostwald's viscometer.
4. Study of the variation of viscosity of sucrose solution with different concentrations.
5. Determination of specific and molar refraction by Abbes refractometer (ethyl acetate, methyl acetate, ethylene chloride)
6. Determination of the composition of liquid mixture by refractometry (toluene & alcohol, water & sucrose solution).

General instructions:

In the practical examination, in a batch of ten students, five students each will be performing analytical and physical experiments. At least two experiments from analytical and two experiments from physical may be given. Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. *Manual is not allowed in the examination.*

Scheme of Practical Examination (distribution of marks):

For Internal and Semester end examination

For Analytical chemistry practicals

1. Accuracy:	12 Marks
2. Technique and presentation :	02Marks
3. Reactions and Calculations:	03 Marks
4. Viva:	05 Marks
5. Journal:	03 Marks
Total	25 marks

Deduction of marks for accuracy: : ± 0.2 CC -12 marks, ± 0.4 CC- 09 marks, ± 0.6 CC- 06 marks, ± 0.8 CC- 03 marks, ± 0.9 CC or above - 01 marks.

For Physical chemistry practicals

1. Accuracy:	12 Marks
2. Graphs and Calculations:	05 Marks
3. Viva:	05 Marks
4. Journal:	03 Marks
Total	25 marks

Deduction of marks for accuracy: Error up to 5% - 12 marks, 6 - 10% 09 marks, 11-15% 6 marks, 16 or above 3 marks.

Recommended Books/References

1. Findlay 's practical physical chemistry revised by levitt, Longman's, London, 1968
2. Experiments in Physical Chemistry, Shoemaker and Garland, McGraw Hill International, 1996
3. Colorimetric Determination of Traces of metals B. Sandell
4. Analytical Chemistry G. D. Christian, 4th ed., Wiley, 1986

B.Sc. Semester – II

Subject: Chemistry
Open Elective Course (OEC-2)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: **CHEMISTRY: CHM OEC-2 Molecules of Life**

Course Outcome (CO)

After completion of course, students will be able to:

CO1: Acquire knowledge about different types of sugars and their chemical structures. Identify different types of amino acids and determine the structure of peptides.

CO2: Explain the actions of enzymes in our body and interpret enzyme inhibition. Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism. Differentiate RNA and DNA and their replication. Explain production of energy in our body.

Syllabus- OEC: Title- CHEMISTRY: CHM OEC-2 Molecules of Life	Total Hrs: 42
Unit-I	14 hrs
<p>Carbohydrates: Sugars, non sugars, reducing and non-reducing sugars. Occurrence and general properties of glucose and fructose. Open chain and Haworth ring structures of glucose and fructose. Epimers, mutarotation and anomers.</p> <p>Disaccharides: Occurrence of disaccharides (Sucrose, Maltose and Lactose). Glycosidic linkage in disaccharides. Ring structures of sucrose, maltose and lactose.</p> <p>Polysaccharides: Starch – monomer units, glycosidic linkage, components-difference in their structure (explanation only) and solubility in water. Cellulose and glycogen– monosaccharide, glycosidic linkage, structure (explanation only). Biological importance of carbohydrates. (8 Lecturers)</p> <p>Amino Acids, Peptides and Proteins : α- amino acids , general formula, zwitter ion form of α- amino acid, general formula. Isoelectric point and its importance. Classification of amino acids as essential and non-essential- examples. Configuration of optically active α-amino acids (found in proteins). Peptide bond. Proteins: classification based molecular shape –fibrous and globular, examples. Structure of protein – qualitative idea about primary, secondary, tertiary, and quaternary structures (diagrams not required). Denaturation of protein. (6 lectures)</p>	

Unit-II	14 hrs
<p>Enzymes and correlation with drug action: Mechanism of enzyme action, factors affecting enzyme action, Co-enzymes and cofactors and their role in biological reactions, Specificity of enzyme action (including stereospecificity), Enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and Noncompetitive inhibition including allosteric inhibition). (6 lectures)</p> <p>Drug action- Receptor theory. Structure–activity relationships of drug molecules, binding role of –OH group, -NH₂ group, double bond and aromatic ring. (3 lectures)</p> <p>Oils and fats Biological Importance of oils and fats. Fatty acids (saturated, unsaturated fatty acids, formation of triglycerides and general formula of triglycerides. Chemical nature of oils and fats-saponification, acid hydrolysis, rancidity and its prevention methods, refining of oils, hydrogenation of oils, drying of oils. Iodine value. Introduction to lipids, classification. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol). (5 lecturers)</p>	
Unit-III	14 hrs
<p>Nucleic Acids : Components of nucleic acids: Adenine, guanine, thymine and cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation. (8 lectures)</p> <p>Vitamins and Hormones: Classification and biological significance, source and structure of Vitamin A, B1 (thiamine), B2 (riboflavin), B6 (pyridoxine), α-tocopherol, K1 (phyloquinone), C (ascorbic acid). Deficiency diseases of vitamins.</p> <p>Hormones: definition, classification with examples, functions and deficiency diseases of hormones. (6 lectures)</p>	

Recommended Books/References

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed.,
5. W. H. Freeman. Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, 2002.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

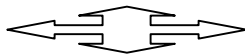
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
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No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಆಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಆಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

(Handwritten signature)
ಕುಲಸಚಿವರು.

ಆಡಕ: ಮೇಲಿನಂತೆ
ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಭಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Computer Science

[Effective from 2021-22]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,

OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM I

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Computer Science for B.Sc. (Hons.)
 Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Course Code	Subject Title	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	CS -T -1.1	Problem solving techniques and Algorithms	04hrs	56	02 hrs	40	60	100	04
		Practical	CS -P- 1.2	Algorithm Lab-I	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	CSOEC -1.3	Fundamentals of Computer Concepts	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	CSSEC. -1.4	Fundamentals of digital Logic	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	CS -2.1	Data Structures	04 hrs	56	02 hrs	40	60	100	04
		Practical	CS.-2.2	Data Structure Lab-II	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	CSOEC-2.4	Fundamentals of Computer Network and Mobile Communications	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later											

*** Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected**

Name of Course (Subject): Computer Science

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Computer Science students will be able to:

PSO 1 : Understand basic concepts involved in computing.

PSO 2 : Apply the knowledge in computer techniques to solve real world problems.

PSO 3 : Think of new approaches for solving problems in different domains.

PSO 4 : Follow ethics in designing software with team members.

PSO 5 : Develop research oriented skills

PSO 6 : Understand good lab practices

B.Sc. Semester – I

Subject: Computer Science
Discipline Specific Course (DSC)

The course Computer Science in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.1 (Theory): Title of the Course (Theory): Problem solving techniques and Algorithms

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1** : Familiarize with fundamental concepts and computer programming.
- CO 2** : Learn fundamental concepts of programming by developing and executing programs in C.
- CO 3** : Focuses on the structured program.
- CO 4** : Various constructs and their syntax.

Syllabus- Course 1(Theory): Title- Problem solving techniques and Algorithms	Total Hrs: 56
Unit-I	14 hrs
<p>Basics of Programming- Definition and Characteristics of Computer, Block diagram of Computer, Compiler, Interpreter, Linker, Loader, Algorithm, Flowchart, Testing and Execution. Examples of flow charts and algorithms Largest of three numbers, reversing the digits of an integer, GCD of two integers, generating prime numbers, computing nth Fibonacci numbers, finding Even and Odd numbers.</p> <p>Programming Tokens: Keywords, Identifiers, Constants, Variables, Data types, defining symbolic constants, Simple Programs.</p>	
Unit-II	14 hrs
<p>Programming Concepts: Operators & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, shorthand assignment operators, conditional operators and increment and decrement operators, Special operators, Type Conversion in expressions, Operator precedence, Mathematical functions.</p> <p>Input/output Functions: Unformatted & formatted I/O functions.</p>	

Branching and Looping: Simple 'if' statement, Nested if Statement, Ladder 'if-else' statement. The 'Switch' statement, GOTO statement. Looping: for, while, do-while loop, Nested loops and jumps in loops - break, continue statement.	
Unit-III	14 hrs
Arrays, Strings and Functions: Definition, types, initialization, processing an array, passing arrays to functions, Array of Strings. Strings: String constant and variables, Declaration and initialization of string, Input/output of string data, String Handling Functions: strlen, strcat, strcmp, strcpy, strcmp. Functions: Definition, types of user defined functions, prototype, Local and global variables, passing parameters, recursion.	
Unit-IV	14 hrs
Advanced Algorithms: Introduction, the problem solving aspects, Top-down design, Implementation of Algorithms. Exchanging the values of two variables, Counting, Summation of set of Numbers, Factorial Computation, Generation of Fibonacci Sequence, Array Order Reversal, Array Counting, Finding the Maximum Number in a Set, Removal of Duplicates from an Ordered Array, Partitioning an Array, Finding the k^{th} Smallest Element.	

Books recommended.

Text Books

1. Balaguruswamy: Programming in ANSI C, Tata Mc Graw-Hill.
2. Brain W.Karningham and Dennis Ritchie: The C Programming Language, PHI.
3. R.G.Dromey: How to Solve it by Computer, Pearson Education, ISBN 978-81-317-0562-9.

References

1. V. Rajaraman: Fundamentals of Computers, PHI (EEE).
2. Kamthane, Programming with ANSI and Turbo C, Pearson Education, Asia.
3. Herbert Schildt: C. The complete reference, 4th edition.
4. Yeshwant Kanetkar: Let us C, BPB.

B.Sc. Semester – I

Subject: Computer Science
Discipline Specific Course (DSC)

Course No.1 (Practical): Title of the Course (Practical): Algorithm Lab

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1 : Understand the basics of programming by executing the simple programming

CO 2 : Be able to design & execution of code.

CO 3 : Have practical knowledge of arrays, strings & functions

List of the Experiments for 52 hrs / Semesters

1. Find the area of a circle and area of a triangle given three sides.
2. Largest of three numbers.
3. Reversing the digits of an integer.
4. GCD of two integers.
5. Generating prime numbers.
6. Computing nth Fibonacci numbers.
7. Finding Even and Odd numbers.
8. Exchanging the values of two variables.
9. Counting: Print number from 100 to 200 which are divisible by 7 and display their sum and count using for loop.
10. Summation of set of Numbers.
11. Factorial Computation.
12. Generation of Fibonacci sequence.
13. Array Order Reversal.
14. Finding the Maximum Number in a Set.
15. Removal of Duplicates from an Ordered Array.
16. Partitioning an Array.
17. Finding the Smallest Element.
18. Read N (minimum 5) students marks and find number of students passed and fail depending on the marks.
19. Count the number of vowels, consonants and special characters in a given sentence.
20. To find the addition and subtraction of two matrices using function.

General instructions:

Implement all the programs using C Language

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. 7 Marks (Program 1 + Execution without error)**
- 2. 7 Marks (Program 2 + Execution without error)**
- 3. Viva 6 Marks**
- 4. Journal 5 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc. Semester – I

Subject: Computer Science
Open Elective Course (OEC-1)
(OEC for other students)

OEC-1: Title of the Course : **FUNDAMENTALS OF COMPUTER CONCEPTS**

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1** : Understanding the basic concepts Computer.
- CO 2** : Paperless environment.
- CO 3** : To develop word processor abilities of students.
- CO 4** : To develop numerical abilities of students using electronic spread sheet.
- CO 5** : To acquire practical skills related to Presentation Software.

Syllabus- OEC: Title- FUNDAMENTALS OF COMPUTER CONCEPTS	Total Hrs: 42
Unit-I	14 hrs
Introduction To Computer: Definition of Computer, History, Characteristics of Computer, Basic Applications of Computer, Components of Computer System: Central Processing Unit: Keyboard, mouse and VDU, Input devices, Output devices, Computer Memory, Concept of Hardware and Software, Application Software, Systems software, Programming Languages, Representation of Data/Information, Concept of Data processing, Multimedia and Entertainment, Introduction to Operating System: Definition, Basics of popular operating systems: Windows & Linux, User Interface: Task Bar, Icons, Start Menu, Running an Application, Changing System Date And Time, Changing Display Properties, To Add Or Remove A Windows Component, Changing Mouse Properties, Adding and removing Printers, File and Directory Management, Types of files.	
Unit-II	14 hrs
Word Processors: Definition of Word Processing, Examples of Word Processors, Opening Word Processing Package, Menu Bar, Using the Help, Using the Icons below Menu Bar, Opening and closing Documents, Save and Save As, Page Setup, Print Preview, Printing of Documents, Text Creation and manipulation, Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Font and Size selection, Alignment of Text, Formatting the Text, Paragraph, Indenting, Bullets and Numbering, Changing case, Table Manipulation, Draw Table, Changing cell width and height, Alignment of Text in cell, Delete / Insertion of row and column, Border and shading, Short-cut keys wherever applicable.	

Unit-III	14 hrs
<p>Electronic Spreadsheet: Elements of Electronic Spread Sheet, Examples of Electronic Spreadsheets, Workbook Vs Worksheet, Opening of Spread Sheet, Addressing of Cells, Printing of Spread Sheet, Saving Workbooks, Manipulation of Cells, Entering Text, Numbers and Dates, Creating Text, Number and Date Series, Editing worksheet Data, Inserting and Deleting Rows, Column, Changing Cell Height and Width, Using Formulas, Function, Charts, Short-cut keys wherever applicable.</p> <p>Presentation Software: Opening A PowerPoint Presentation, Saving A Presentation, Creation of Presentation, Creating a Presentation, Using a Template, Creating a Blank Presentation, Entering and Editing Text, Inserting And Deleting Slides in a Presentation, Preparation of Slides, Inserting Word Table or An Excel Worksheet, Adding Clip Art Pictures, Inserting Other Objects, Resizing and Scaling an Object, Enhancing Text Presentation:</p>	

Books recommended.

Text Books

1. Computer Fundamentals - P K Sinha, BPB Publications.

References

1. Fundamentals of Computers, M. Abid, M. Amjad, Willey
2. Computer Fundamentals, D.P. Nagpal, S.Chand.

B.Sc. Semester - I

Subject: Computer Science

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: FUNDAMENTALS OF DIGITAL LOGIC

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

CO 1 : To teach the basics involved in data representation and digital logic circuit.

CO 2 : It includes the general concept in digital logic design.

CO 3 : To make better understanding of logic used in combinational circuit design.

B.SC. -1.5 (SEC – 1): FUNDAMENTALS OF DIGITAL LOGIC	30 Hrs
Unit –1	10
Number Representation: Positional representation of numbers, decimal, binary, octal, Hexadecimal number systems, general radix system, numbers, conversions, complements, binary codes, Fixed point representation, floating point representation, representation for numeric data , arithmetic with signed unsigned numbers, addition, subtraction. Introduction to array correction and array detection. Introduction to logic circuits-variables and functions, truth tables, logic gates and networks, Boolean algebra, synthesis using AND, OR and NOT gates, NAND and NOR logic networks.	
Unit – 2	10
Optimized implementation of logic functions-karnaugh map, strategy for minimization, minimization of product of sums forms, incompletely specified functions, multiple output circuits, multilevel synthesis, a tabular method for minimization, cubical technique for minimization, practical considerations.	
Unit – 3	10
Combinational logic- design procedures, adders, subtractors, design of arithmetic circuits, multiplexers, demultiplexers, encoders, decoders, code converters, verilog for combinational circuits.	

List of the Experiments for 52 hrs / Semesters

1. Introduction to digital Electronics lab (Simulators)

i. Nomenclature of digital I/C's, Specifications

ii. Tools required-Simulators

Gates:

2. AND

3. NOT

4. OR

5. NAND

6. NOR

7. XOR

Implement of given Boolean function using logic gates

8. SOP: $A.B+A.B$

9. POS: $(A+B) (B+C) (A+C)$

Draw the logic circuit diagram & truth table, test the output in the simulator

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. 7 Marks (Program 1 + Execution without error)

2. 7 Marks (Program 2 + Execution without error)

3. Viva 6 Marks

4. Journal 5 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

Text Books

1. Fundamental of digital logic with Verilog Design by Stephen Brown & ZVONKO VRANESIC, Tata McGrawHill.
2. Digital Design by M. Morris Mano, Pearson.

References

1. Computer System Architecture, M. Morris Mano, Third edition, Pearson Education.
2. Computer Organization and Architecture, W. Stallings, Pearson Education.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

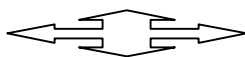
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Computer Science
Discipline Specific Course (DSC)

The course Computer Science in II semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.2 (Theory): Title of the Course (Theory): DATA STRUCTURES

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1** : To impart the basic concepts of data structures and algorithms.
- CO 2** : To familiar with data structural algorithms such as sorting & searching, stack & queue, linked list and trees.
- CO 3** : To be familiar with some graph algorithms such as binary tree representation of tree and operations on trees.
- CO 4** : To understand the basic concepts of tree traversal.
- CO 5** : How to use basic data structure for program implementation.

Syllabus- Course 2(Theory): Title- DATA STRUCTURES	Total Hrs: 56
Unit-I	14 hrs
Structure and Pointers: Structure Definition, Initialization, Array as structure, Array within structure, Union. Understanding pointers, Declaring and initializing pointers, accessing a variable through its pointer, static and dynamic memory allocation. Data Structures: Definition, Classification of Data Structure: Primitive and Non-Primitive, Operations on Data Structure, Review of Array.	
Unit-II	14 hrs
Searching and Sorting: Searching Definition, Searching Techniques: Sequential search, Binary search. Comparison Between sequential and binary searching. Sorting Definition, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort.	

Unit-III	14 hrs
Stack and Queue: Definition of stack, Array Representation of Stack, Linked List Representation of stack, Operation Performed on Stack, Infix, Prefix, Postfix notations, Conversion of arithmetic expressions, Application of stack. Definition of Queue, Array Representation of Queue, Types of Queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on all types of queue.	
Unit-IV	14 hrs
Linked List: Definition, Representation of linked lists in Memory, Types of linked list: Singly linked list, Doubly linked list and Circular linked list. Operations on linked list: Creation, Insertion, Deletion, Search, Display and Traversing. Advantages and disadvantages of linked list. Trees: Definitions, Tree terminology, Binary tree, Complete binary tree. Operations on Binary Trees, Representation of binary tree.	

Books recommended.

Text Books

1. Kamthane: Introduction to Data Structure in C. Pearson education 2005.
2. Fundamentals of Data structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson-Freed, Universities Press.

References

1. Data Structures using C, A.M.Tanenbaum, Y. Langsam, M.J.Augenstein, Pearson.
2. Data structures and Program Design in C, 2nd edition, R.Kruse, C.L.Tondo and B.Leung, Pearson.
3. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.
4. E. Balaguruswamy, Programming in ANSI C, Tata Mc Graw-Hill.

B.Sc. Semester – II

Subject: Computer Science
Discipline Specific Course (DSC)

Course No.2 (Practical): Title of the Course (Practical): Data Structures Lab

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1 : Be able to design & implement list data structure using

- i. Stack & Queue
- ii. Linked list
- iii. Singly & doubly linked list

CO 2 : Design & implement searching and sorting by applying various operations.

CO 3 : Design & implement basic operation on trees.

List of the Experiments for 52 hrs / Semesters

1. Write a Program to create, Initialize and access a pointer variable.
2. Write a Program to Calculate the length of the string using a pointer.
3. Write a Program to swap numbers using pointer.
4. Write a program in C to print all permutations of a given string using pointers.
5. Write a Program to store n student's information using structure.
6. Write Program to implement Push, Pop and Traverse operation on STACK.
7. Write Program to convert infix notation to postfix notation.
8. Write Program to convert Infix notation to prefix notation.
9. Write a program to convert Prefix notation to postfix notation.
10. Write Program to perform the operation Insert, Delete and Display on Queue.
11. Write Program to implement Circular queue.
12. Write Program to implement Double ended queue.
13. Write Program to implement Priority queue.
14. Write a Program to search an element using Linear search.
15. Write a Program to sort given Array using Insertion sort technique.
16. Write a Program to sort given Array using Bubble sort technique.
17. Write a Program to sort given Array using Quick sort technique.
18. Write a Program to sort given Array using selection sort technique.
19. Write Program to implement Singly Linked List.
20. Write Program to implement Double Linked List.

General instructions:

Implement using C Language

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. 7 Marks (Program 1 + Execution without error)**
- 2. 7 Marks (Program 2 + Execution without error)**
- 3. Viva 6 Marks**
- 4. Journal 5 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc. Semester – II

Subject: Computer Science
Open Elective Course (OEC-2)
(OEC for other students)

OEC-2: Title of the Course : **FUNDAMENTALS OF COMPUTER NETWORK AND MOBILE COMMUNICATIONS**

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1 : Understand broad range of computer networks and data communication technology.
- CO 2 : Introducing basic knowledge, basic communication fundamentals.
- CO 3 : Understand the network models such as OSI and TCP/IP.
- CO 4 : Understand cellular and satellite networks.

Syllabus- OEC: Title- FUNDAMENTALS OF COMPUTER NETWORK AND MOBILE COMMUNICATIONS	Total Hrs: 42
Unit-I	14 hrs
Data Communications: Components, Data Representation, Data Flow. Networks: Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks, Interconnection of Networks, Internetwork. The internet: A Brief History, The Internet Today. Protocols and standards: Protocols, Standards, Standards Organizations, Internet Standards.	
Unit-II	14 hrs
Network Models: layered tasks, Sender, Receiver and Carrier, Hierarchy, the OSI model: Layered Architecture, Peer-to-Peer Processes, Encapsulation. Layers in the OSI model: Physical Layer, Data Link Layer, Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer. TCP/IP protocol suite: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer. Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.	
Unit-III	14 hrs
Cellular Telephony: Frequency-Reuse Principle, Transmitting, Receiving, Roaming First Generation, Second Generation, Third Generation. Satellite Networks: Orbits, Footprint, Three Categories of Satellites, GEO Satellites, MEO Satellites, LEO Satellites.	

Books recommended.

Text Books

1. Introduction to Data Communications & Networking, Behrouz Ferouzan, 4th edition. TMH.

References

1. Communication Networks- Fundamental Concepts & Key Architecture, Alberto Leon-Garcia & Indra Widjaja, Mc.Graw Hill.
2. Data and Computer Communications, W. Stalling, 7th edition, Pearson Education.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

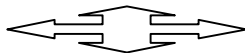
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಷಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24.25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಷಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ
ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

Haniff 29/10/21
ಕುಲಸಚಿವರು.



Practical Course

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: **ELECTRONICS**

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
 Four Years Under Graduate Program in **ELECTRONICS** for B.Sc. (Hons.)
 Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

* Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected

Name of Course (Subject): **ELECTRONICS**

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in **ELECTRONICS** students will be able to:

PSO 1: Provide students with learning experiences that provide broad knowledge and understanding of key concepts of Electronics and equip students with advanced scientific / technological capabilities for analysing and tackling then issues and problems in the field od Electronics.

PSO 2: Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in Electronics

PSO3: Develop abilities in students to design and develop innovative solutions for the benefit of society.

PSO4: Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as entrepreneurs.

B.Sc. Semester – I

Subject: **ELECTRONICS**
Discipline Specific Course (DSC)

The course **ELECTRONICS** in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory) **ELECTRONIC DEVICES AND CIRCUITS**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO1: Ability to apply knowledge of logical thinking and basic science for solving Electronic related issues.

CO2: Ability to perform Electronic experiments, as well as to analyse and interpret data.

CO3: Ability to design and manage electronic system or processes that conform to a given specification within ethical and economic constraints.

CO4: Ability to identify, formulate, solve and analyse the problems in various sub-disciplines of Electronics.

CO5: Ability to use modern tools / techniques.

Syllabus- Course 1(Theory): Title- ELECTRONIC DEVICES AND CIRCUITS	Total Hrs: 56
Unit-I	14 hrs
<p>Electronic Components: Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power. (Qualitative only)</p> <p>Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity Theorems. DC and AC analysis of RC and RL circuits, RLC series and parallel Resonant Circuits.</p> <p>PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.</p>	

<p>Rectifiers-Half wave and Full wave (center tap and bridge) rectifiers, expressions for output voltage, ripple factor and efficiency (mention only), Shunt capacitor filter. (Solve Numerical examples wherever applicable).</p>	
<p>Unit-II</p>	<p>14 hrs</p>
<p>Voltage regulator: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers (shunt type) and clampers(Qualitative analysis only), Voltage Multipliers.</p> <p>Bipolar Junction Transistor: Construction, types, C-E,C-B and C-C configurations (mention only), VI characteristics of a transistor in C-E mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains α , β and their inter-relations, dc load line and Q point. Applications of transistor as amplifier and switch - circuit and working. (Numerical examples wherever applicable).</p>	
<p>Unit-III</p>	<p>14 hrs</p>
<p>Transistor Biasing and Stabilization Circuits: Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameter equivalent circuit. Amplifier: Small signal analysis of single stage C-E amplifier using h-parameters. Input and Output impedances, Current and Voltage gains. Advantages of C-C amplifier. Class A, B and C Amplifiers (qualitative).Types of coupling, Two stage RC Coupled Amplifier – circuit, working and its Frequency Response, loading effect, GBW product, Darlington transistor, Current gain.</p> <p>Special Semiconductor Diodes: Varactor diode, Schottky diode, Tunnel diode, - construction, characteristics, working, symbol, and applications for each.LED, LCD and solar cell – construction, operation and applications, 7-segment display, concept of common anode and common cathode types.(Numerical problems, wherever applicable)</p>	
<p>Unit-IV</p>	<p>14 hrs</p>
<p>Number System: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, Binary arithmetic; addition, subtraction by 1's and 2's complement method, BCD code (8421, 2421, Excess-3), Gray code, error checking and correction codes (Only parity check). Boolean Algebra: Constants, variables, operators, basic logic gates-AND, OR, NOT, Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorem, simplification of Boolean expressions-SOP and POS. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. (Numerical examples wherever applicable).</p>	

Books recommended.

1. Robert L Boylestad, "Introductory circuit analysis", 5th edition., Universal Book 2003.
2. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
3. A.P. Malvino, "Principles of Electronics", 7th edition .TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
8. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
9. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001,PHI Learning.
11. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum's Outline SeriesTMGH2005
12. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill, 2004
13. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
14. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn., Oxford University Press, 2014
15. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series, TMG1991

B.Sc. Semester – I

Subject: ELECTRONICS
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **ELECTRONIC DEVICES AND CIRCUITS**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

- CO1.** Study and analyze basic networks using network theorems in a systematic manner.
- CO2.** Build simple electronic circuits used in various applications.
- CO3.** Describe the behaviour of basic semiconductor devices
- CO4.** Reproduce the VI characteristics of diode/BJT devices
- CO5.** Describe the frequency response of BJT amplifiers.
- CO6.** Explain the behaviour, characteristics and applications of Varactor diode, Schottky diode, Tunnel diode, LED, LCD and solar cells.
- CO7.** Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
- CO8.** Understand and represent numbers in powers of base and converting one from the other, carry out simple arithmetic operations.
- CO9.** Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra.

List of the Experiments for 52 hrs / Semesters

(Hardware implementation and Analysis of Circuit using Simulation Software)

Minimum Four Experiments to be performed in each Part excluding demonstration experiments

- 1. Demonstration Experiment: Familiarization with**
 - a) Electronic components
 - b) Resistance in series, parallel and series-parallel
 - c) Capacitors and inductors in series and parallel
 - d) Multimeter and LCR meter – checking of components / measurements.
 - e) Voltage sources in series, parallel and series-parallel
 - f) Voltage and current dividers
 - g) Measurement of Amplitude, Frequency & Phase difference using Oscilloscope

Part A (Any Four)

2. Verification of Thevenin's and Maximum Power Transfer Theorem.
3. Verification of Superposition Theorem.
4. Study of the VI Characteristics of (a) P-N junction diode (b) Zener diode.
5. Study of the I-V Characteristics of LEDs of two different colours and 7-segment display.
6. Study of Half wave rectifier without and with shunt capacitor filter– ripple factor for different values of filter capacitors.
7. Study of full wave bridge rectifier without and with shunt capacitor filter – ripple factor for different values of filter capacitors.
8. Study of Zener diode as a Voltage Regulator using bridge rectifier with shunt capacitor filter [Load and line regulation].
9. Study of Clipping, Clamping and Voltage Multiplier circuits.
10. Designing and testing of fixed positive and negative voltage regulators using 78xx and 79xx series ICs (Using bridge rectifier and shunt capacitor filter).
11. Designing and testing of variable voltage regulator using IC LM317 (Using bridge rectifier and shunt capacitor filter).

Part B (Any Four experiments including Experiment No 14)

12. Study of Transistor characteristics in CE configuration – determination of h-parameters.
13. Study of Fixed Bias and Voltage divider bias circuits – comparison for different values of β .
14. Study of single stage RC coupled C-E amplifier (frequency response, input and output impedances in mid-band)
15. Study of two-stage RC-coupled CE amplifier (AV1, AV2, AV) at mid-band frequency.
16. Study of Series and Parallel Resonance circuits – determination of its (a) Resonant frequency (b) Impedance at resonance (c) Bandwidth (d) Quality Factor.
17. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using corresponding ICs. Realization of XOR and XNOR using basic gates.
18. Universal property of NAND and NOR gates.
19. Binary to Gray and Gray to Binary code conversion and parity checker using XOR gates IC 7486

General instructions:

1. *Minimum of eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1 Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram	- 05 Marks
2 Tabular Column with quantities and unit mentioned, experimental skills.	- 05 Marks
3 Recording of observations, calculations and drawing graph, and accuracy of the result	- 11 Marks
4 Viva-voce	- 02 Marks
5 Completed & Certified Journal	- 02 Marks
Total 25 marks	

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc. Semester – I

Subject: ELECTRONICS Open Elective Course (OEC-1) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course **BASIC ELECTRONICS -I**

Syllabus- OEC: Title- BASIC ELECTRONICS -I	Total Hrs: 42
Unit-I	14 hrs
<p>Introduction to Electronics and Principles of Electricity: Introduction to Electronics: Electronics and its scope: Development of vacuum tube devices, semiconductor devices, integrated circuits, microprocessors and microcontrollers. Applications of electronics–entertainment, communication, defense, industrial, medical Impact of electronics on quality of life Principles of Electricity: Charge-positive and negative charges, properties of charges, charge of an electron, number of electrons in one Coulomb of charge, electric current-definition, its unit and direction of current - conventional current and the electronic current. Potential difference and its unit related to electric circuit, Ohm’s law-statement and limitations, application to circuits. Resistance and its unit, electric power, electric energy. Combinations of resistors, open and short circuit. Kirchhoff’s current law and Kirchhoff’s voltage law, current and voltage division. <i>Sufficient number of numerical problems must be solved.</i></p>	
Unit-II	14 hrs
<p>Passive Electronic components, Application of DC and AC to Passive components Passive Electronic components: Introduction, resistors, types of resistors, capacitors, principle of capacitor, energy stored in a capacitor, types of capacitors, and combination of capacitors. Inductors, self-inductance, mutual-inductance, combination of inductors, energy stored in an inductor, choke, transformer, types of transformer, transducers, loudspeaker, microphone Application of DC and AC to Passive components: RC time constant, charging of capacitor (growth voltage), discharging of capacitor through resistor (decay voltage), L/R time constant, growth and decay of current through R-L circuit. AC applied to passive component: LCR series, resonance circuit, quality factor, bandwidth, RC low pass and high pass filter. <i>Sufficient number of numerical problems must be solved</i></p>	

Unit-III	14 hrs
<p>Current and voltage sources and Network theorems:</p> <p>Current and voltage sources: Sources of electric power, internal impedance of a source, Concept of voltage source: ideal voltage source, practical voltage source. Concept of current source: ideal current source, practical current source, equivalence between voltage source and current source, conversion of voltage source into current source and vice versa.</p> <p>Network Theorems: Thevenin's, Norton's theorem statement and proof, Super position theorem, statement, analysis with two voltage sources and Maximum power transfer theorem- statement (derivation) all theorems with respect to DC circuit.</p> <p><i>Sufficient number of numerical problems must be solved.</i></p>	

Books recommended.

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

B.Sc. Semester - I

Subject: ELECTRONICS SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: Domestic Equipment Maintenance and measuring Instruments

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Unit-1

15 Hours

Basics of Electronics: concept of Voltage, Current, Power, AC and DC sources. Ohms law.

Electronic Components: Passive components, resistors, inductors, capacitors, and their types. Series and parallel combination, semiconductor diode- ideal and practical diode, VI characteristics, Zener diode- Construction, working and its VI characteristics. application of semiconductor diode as full wave rectifier, ripple factor and its efficiency. Zener diode as voltage regulator. Block diagram of regulated power supply

List of the Experiments for 52 hrs / Semesters

1. Charging of Capacitors (Parallel combination, Series combination etc.),
2. Measurement of Resistors using Ohm meter, Measurement of Capacity of a capacitor.
3. Semiconductor diode V-I Characteristics,
4. Half Wave Rectifiers/ Full Wave Rectifier
5. Zener diode Characteristics
6. Zener as voltage regulator using full wave rectifier
7. Using Resistive network study of star to delta network conversion or vice-versa.
Show that they are equivalent

Unit-2

15 Hours

Measuring Instruments: Analog and digital instruments, permanent magnet moving mechanism, converting basic meter into DC multirange voltmeter and multirange ammeter. Ohmmeter-series and shunt type (qualitative), multimeter. CRO: application of CRO for measurement of voltage, and frequency. Lissajous figures.

List of the Experiments for 52 hrs / Semesters

1. Measurement of voltage, current using multimeter, construction of multirange voltmeter, current meter.
2. Converting basic meter into D. C. Voltmeter/Ammeter
3. Measurement of voltage and frequency using CRO, Lissajous figures
4. Soldering and desoldering Technique: Students will acquire a skill of soldering discrete components of a given circuit on general PCB and check the working of the circuit.
5. Experimental study of KVL and KCL using DC source and resistive network.
6. Calibration of analog voltmeter and ammeter.
7. Basics and working of Battery Eliminators/ battery charger

General instructions:

1. *Minimum of eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. **Basic formula, Units & Nature of graph,
Circuit Diagram / Ray Diagram / Schematic diagram** - 05 Marks
2. **Tabular Column with quantities and unit mentioned,
experimental skills.** - 05 Marks
3. **Recording of observations, calculations and drawing graph,
and accuracy of the result** - 11 Marks
4. **Viva-voce** - 02 Marks
5. **Completed & Certified Journal** - 02 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Electronic instruments and systems: Principles, maintenance and troubleshooting by R. G. Gupta Tata McGraw Hill.
2. Modern electronic equipment: Troubleshooting, repair and maintenance by Khandpur, Tata McGraw Hill
3. Electronic fault diagnosis by G. C. Loveday, A. H. Wheeler publishing
Modern Electronics Instrumentation and measurement techniques- Helfrick Cooper
4. Basics of Electronics (Solid State) – BL

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

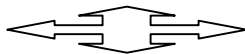
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: **ELECTRONICS**
Discipline Specific Course (DSC)

The course **ELECTRONICS** in II semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory) : **ANALOG AND DIGITAL ELECTRONICS**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO1.** Reproduce the VI characteristics of various MOSFET devices,
- CO2.** Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
- CO3.** Explain the behavior and characteristics of power devices such as UJT, SCR, Diac, Triac etc.
- CO4.** Perform experiments for studying the behavior of semiconductor devices.
- CO5.** Calculate various device parameter values from their VI characteristics.
- CO6.** Interpret the experimental data for better understanding the device behaviour.
- CO7.** Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- CO8.** Analyze combinatorial and sequential circuits

Syllabus- Course 2(Theory): Title- ANALOG AND DIGITAL ELECTRONICS	Total Hrs: 56
Unit-I	14 hrs
<p>JFET: Types - p-channel and n-channel, working and VI characteristics, n-channel JFET, parameters and their relationships, Comparison of BJT and JFET.</p> <p>MOSFET: Depletion and enhancement type MOSFET, n-channel and p-channel, Construction, working, symbols, biasing, drain and transfer characteristics, VMOS, UMOS Power MOSFETs, handling, MOS logic, symbols and switching action of MOS, NMOS inverter, CMOS logic, CMOS – inverter, circuit and working, CMOS characteristics, IGBT construction and working.</p> <p>UJT - construction, working, equivalent circuit and VI characteristics, intrinsic stand-off ratio, relaxation oscillator.</p> <p>SCR - Construction, VI characteristics, working, symbol, and applications – HWR and FWR.</p> <p>Diac and Triac-construction, working, characteristics, applications, (Numerical examples wherever applicable)</p>	

Unit-II	14 hrs
<p>Op-Amp: Differential Amplifier, Block diagram of Op-Amp, Characteristics of an Ideal and Practical Op-Amp, Open and closed loop configuration, Frequency Response, CMRR, Slew Rate and concept of Virtual Ground.</p> <p>Applications of op-amps: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative Study). Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector</p> <p>Filters: First and second order active low pass, high pass and band pass Butterworth filters.</p> <p>Oscillators: Barkhausen criterion for sustained oscillations, Collpitt's oscillator and crystal oscillators using transistor, Phase Shift oscillator, Wien-bridge oscillator – (no derivation for each)</p> <p>IC 555Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits. (Numerical Examples wherever applicable).</p>	
Unit-III	14 hrs
<p>Logic Families: Pulse characteristics, Logic Families-classification of digital ICs. Characteristics of logic families, circuit description of TTL NAND gate with totem pole and open collector. TTL IC terminology. CMOS NAND, comparison of TTL and CMOS families.</p> <p>Combinational Logic Circuits: Minimisation techniques using K-maps - SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, KMap for 3 and 4 variable.</p> <p>Digital to Analog converter: DAC with binary weighted resistor and R-2R resistor ladder network. Analog to Digital converter: Successive approximation method - performance characteristics.</p> <p>Design of Arithmetic logic circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-bit parallel binary adder, 2-bit and 4-bit magnitude comparator. Encoder, decimal to BCD priority encoder. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7-Segment decoder, Multiplexer - 4:1 and 8:1 multiplexer, Demultiplexer, 1:4 and 1:8 demultiplexer - logic diagram and truth table of each, Realization of Full adder and Full Subtractor using Mux and Decoder</p>	
Unit-IV	14 hrs
<p>Sequential Logic Circuits: Flip-Flops - SR Latch, RS, D and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Racearound conditions in JK Flip-Flop. Master- Slave JK and T Flip-Flops. Applications of Flip-Flops in semiconductor memories, RAM, ROM and types.</p> <p>Registers and Counters: Types of Shift Registers, Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits), applications. Ring counter, Johnson counter applications. Asynchronous Counters: Logic diagram, Truth table and timing diagrams of 4 bit ripple counter, modulo-n counters, 4bit Up-Down counter, Synchronous Counter, 4-bit counter, Design of Mod 3, Mod 5 and decade Counters using K-maps.</p>	

Books recommended.

1. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
2. Electronic Devices Conventional Current Version by Thomas L. Floyd
3. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015.
4. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall.
5. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.

6. R.S.Sedha, "A Text book of Applied Electronics", 7th edition.,S.Chand and Company Ltd. 2011.
7. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994))
8. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
9. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
10. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
11. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
12. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGrawHill (1994)
13. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

B.Sc. Semester – II

Subject: **ELECTRONICS**
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **ANALOG AND DIGITAL ELECTRONICS**

List of the Experiments for 52 hrs / Semesters

PART- A (Any Four)

1. Study of JFET/MOSFET characteristics – determination of parameters.
2. Study of single stage JFET amplifier.(frequency response and band width)
3. UJT characteristics and relaxation oscillator
4. SCR characteristics – determination of IH and firing voltage for different gate currents.
5. Design of inverting and non-inverting amplifier using Op-amp & study of frequency response.
6. Op-amp inverting and non-inverting adder,subtractorand averaging amplifier.
7. Study of the zero-crossing detector and comparator.
8. Design and study of differentiator and integrator using op-amp for different input waveforms.
9. Design and study of Wien bridgeand RC phase shift oscillator using op-amp.
10. Design and study of first order high-pass and low-pass filters using op-amp.
11. Study of Collpitt's and crystal oscillator using transistor.
12. Astable multivibrator using IC555 timer.
13. Monostable multivibrator using IC555 timer

PART- B (Any Four)

14. Half Adder and Full Adder using (a) logic gates (b) using only NAND gates.
15. Half Subtractor and Full Subtractor(a) logic gates (b) using only NAND gates.
16. 4 bit parallel binary adder and Subtractor using IC7485.
17. Study of BCD to decimal decoder using IC7447
18. Study of the Encoders and priority encoders.
19. Study of Multiplexer and Demultiplexer using ICs.
20. Study of 2-bit and 4-bit magnitude comparators.
21. Study of Clocked RS, D and JK Flip-Flops using NAND gates.
22. Study of 4-bit asynchronous counter using JK Flip-Flop IC7476, modify to decade counter and study their timing diagrams.
23. Study of 4-bit Shift Register – SISO, modification to ring counter using IC 7495.
24. Digital to Analog converter using binary weighted resistor method, determination of resolution, accuracy and linearity error

General instructions:

- 1. *Minimum Four Experiments to be performed in each Part***
- 2. *Any new experiment may be added to the list with the prior approval from the BOS.***

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram	- 05 Marks
2. Tabular Column with quantities and unit mentioned, experimental skills.	- 05 Marks
3 Recording of observations, calculations and drawing graph, and accuracy of the result	- 11 Marks
4. Viva-voce	- 02 Marks
5 Completed & Certified Journal	- 02 Marks
	Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

B.Sc. Semester – II

Subject: **ELECTRONICS**
 Open Elective Course (OEC-2)
 (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: **BASIC ELECTRONICS-II**

Syllabus- OEC: Title- BASIC ELECTRONICS-II	Total Hrs: 42
Unit-I	14 hrs
<p>Semiconductor Theory: Semiconductors: Semiconductor materials, structure of an atom, atomic structure of some elements, electron energies, energy bands in solids, metals, insulators, semiconductors, hole formation and its movement, types of semiconductors, intrinsic semiconductors, extrinsic semiconductors, electron current and hole current, N-type and P-type semiconductor, majority and minority charge carriers, effect of temperature on extrinsic semiconductors.</p> <p><i>Sufficient number of numerical problems must be solved.</i></p>	
Unit-II	14 hrs
<p>Semiconductor Diode and its application: P-N junction theory, effect of temperature on barrier potential, current components in an open circuited P-N junction, biasing P-N junction, forward bias P-N junction, reverse bias P-N junction. Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance. Half-wave rectifier, PIV, average value voltage and load current, rms value, ripple factor, efficiency of rectification. Full-wave rectifier, Peak Inverse Voltage, average values of output voltage and load current, rms value of load current, ripple factor, efficiency of rectification, Bridge rectifier working and comparison of rectifiers.</p> <p><i>Sufficient number of numerical problems must be solved.</i></p>	
Unit-III	14 hrs
<p>Power Supply: Block diagram of power supply, unregulated power supply, voltage regulation, load regulation, importance of filters in power supply, shunt capacitor filter, its ripple factor, LC-section filter, CLC filter, ripple factor, and comparison of these filters. Zener diode : construction working and its V-I characteristics, Zener diode as voltage regulator—circuit diagram, load and line regulation, disadvantages.</p> <p><i>Sufficient number of numerical problems must be solved.</i></p>	

Books recommended.

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

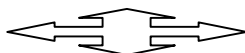
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
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'A' Grade 2014

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No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಷಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24.25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಷಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ
ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

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ಕುಲಸಚಿವರು.



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Mathematics

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER NEP - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Mathematics for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

* Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected

Name of Course (Subject): Mathematics

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Mathematics students will be able to:

- PSO 1 : Culminate in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of mathematics and also in other allied subjects.**
- PSO 2 : To communicate various mathematical concepts effectively using examples and their geometrical visualization which can be used for modeling and solving of real life problems.**
- PSO 3 : Acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.**
- PSO 4 : Develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions.**
- PSO 5 : Develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.**
- PSO 6 : Use appropriate softwares to solve system of algebraic equation and differential equations.**
- PSO 7 : Develop an ability of working independently and to make an in-depth study of various notions of Mathematics.**
- PSO 8 : Develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.**
- PSO 9 : Think independently and develop algorithms and computational skills for solving real word problems.**
- PSO 10 : Peruse advanced studies and research in Mathematical sciences.**

B.Sc. Semester – I

Subject: Mathematics Discipline Specific Course (DSC)

The course Mathematics in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2 hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): **Algebra - I and Calculus - I**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1:** Learn to solve the system of homogeneous and non homogeneous linear equations in m variables by using concept of rank of matrix, finding eigenvalues and eigenvectors.
- CO 2:** Sketch curves in Cartesian, polar and pedal equations.
- CO 3:** Learn geometrical representation and problem solving on MVT and Rolls theorems.
- CO 4:** Get familiar with the techniques of integration and differentiation of function with real variables.
- CO 5:** Identify and apply the intermediate value theorems and L'Hospital rule and Trace the curves.

Syllabus- Course 1(Theory): Title- Algebra - I and Calculus - I	Total Hrs: 56
Unit-I	14 hrs
Matrices: Elementary row and column transformations, Row reduction to Echelon form. Rank of a matrix; Reduction to normal form; Solution of system of linear equations by Gauss Elimination and Gauss-Jordan methods. Condition for existence of non-trivial solutions of homogeneous system of linear equations. Solution of non-homogeneous system of linear equations. Eigenvalues and Eigenvectors of square matrices, real symmetric matrices and their properties, reduction of such matrices to diagonal form, Cayley-Hamilton theorem (without proof), inverse of matrices by Cayley-Hamilton theorem.	
Unit-II	14 hrs
Differentiation in polar Co-ordinates: Polar coordinates, angle between the radius vector and tangent. Angle of intersection of curves (polar forms), Length of perpendicular from pole to the tangent, pedal equations. Derivative of an arc length in Cartesian, parametric and polar forms, curvature of plane curve-radius of curvature formula in Cartesian, parametric and polar and pedal forms. - center of curvature, Asymptotes, Evolutes and envelops of plane curves.	

Unit-III	14 hrs
Differential Calculus: Limits and Continuity, ε - δ from definition only. Differentiability: Definition and Problems, Properties of continuous functions, Intermediate value theorem, Rolles Theorem, Lagranges Mean Value Theorem, Cauchy's Mean Value Theorem. Taylor's theorem (without proof), Taylor's series, Maclaurin's expansions, Indeterminate forms: Evaluation of Limits using L-Hospital rule.	
Unit-IV	14 hrs
Successive Differentiation: nth Derivatives of Standard functions e^{ax+b} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$, Leibnitz theorem and its applications. Tracing of Curves (standard curves).	

Books recommended.

1. University Algebra - N.S. Gopala Krishnan, New Age International (P) Limited
2. Theory of Matrices - B S Vatsa, New Age International Publishers.
3. Matrices - A R Vasista, Krishna Prakashana Mandir.
4. Elements of Real Analysis - Shanti Narayan, S. Chand & Company, New Delhi.
5. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
6. Calculus – Lipman Bers, Holt, Rinehart & Winston.
7. Calculus - S Narayanan & T. K. Manicavachogam Pillay, S. Viswanathan Pvt. Ltd., vol. I & II.
8. Schaum's Outline of Calculus - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw.

B.Sc. Semester – I

Subject: Mathematics
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3 hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **Practicals on Algebra - I and Calculus – I**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1: Learn Free and Open Source Software (FOSS) tools for computer programming

CO 2: Solve problem on algebra and calculus using FOSS softwares.

CO 3: Acquire knowledge of applications of algebra and calculus through FOSS.

List of the Experiments for 52 hrs / Semesters

Introduction to the software and commands related to the topic.

1. Computation of addition and subtraction of matrices.
2. Computation of Multiplication of matrices.
3. Computation of Trace and Transpose of Matrix
4. Computation of Rank of matrix and Row reduced Echelon form.
5. Computation of Inverse of a Matrix using Cayley-Hamilton theorem.
6. Solving the system of homogeneous and non-homogeneous linear equations.
7. Finding the nth Derivative of e^{ax} , trigonometric and hyperbolic functions
8. Finding the nth Derivative of algebraic and logarithmic functions.
9. Finding the nth Derivative of $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$.
10. Finding the Taylor's and Maclaurin's expansions of the given functions.
11. Finding the angle between the radius vector and tangent.
12. Finding the curvatures of the given curves.
13. Tracing of standard curves.

General instructions: Suggested Softwares: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. Programme writing and problem solving: 10 Marks**
- 2. Programme Execution: 5 Marks**
- 3. Viva: 5 Marks**
- 4. Journal: 5 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company
3. Scilab for very beginners. - www.scilab-enterprises.com
4. University Algebra - N.S. Gopala Krishnan, New Age International (P) Limited
5. Theory of Matrices - B S Vatsa, New Age International Publishers.
6. Matrices - A R Vasista, Krishna Prakashana Mandir.
7. Elements of Real Analysis - Shanti Narayan, S. Chand & Company, New Delhi.
8. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
9. Calculus – Lipman Bers, Holt, Rinehart & Winston.
10. Calculus - S Narayanan & T. K. Manicavachogam Pillay, S. Viswanathan Pvt. Ltd., vol. I & II.
11. Schaum's Outline of Calculus - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw.

B.Sc. Semester – I

Subject: Mathematics Open Elective Course (OEC-1) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-1: Title of the Course: **Business Mathematics-I**

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1:** Apply sets, relations, functions in business.
- CO 2:** Use permutations and combinations.
- CO 3:** Use matrices in commercial field.
- CO 4:** Apply trigonometric function in real world.

Syllabus- OEC: Title- Business Mathematics-I	Total Hrs: 42
Unit-I	14 hrs
Algebra: Sets, relations, functions, indices, logarithms, permutations and combinations, Examples on commercial mathematics	
Unit-II	14 hrs
Matrices: Definition of a matrix; types of matrices; Algebra of matrices, Determinants, Properties of determinants; calculations of values of determinants up to third order. Adjoint of a matrix, elementary row and column operations; solution of a system of linear equations involving not more than three variables. Examples on commercial mathematics	
Unit-III	14 hrs
Trigonometric Functions: Recapitulation of basic Definitions of trigonometric functions. Signs of trigonometric functions and sketch of their graphs. Trigonometric functions of sum and difference of two angles. Trigonometric ratios of multiple angles (Simple problems).	

Books recommended.

1. Allel R.G.A: Basic Mathematics: Macmilan, New Delhi.
2. Dowling, E.T. Mathematics for Economics: Schaum Series, McGraw Hill, London.
3. Soni R.S.: Business Mathematics: Pitamber Publishing House, Delhi
4. N. Rudraiah and Others: College Mathematics for B.Sc Series I and II SBS Publication Co. Bangalore.

B.Sc. Semester - I

Subject: Mathematics
SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: Scilab

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03 hrs	30	Practical	2 hrs	25	25	50

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

- CO 1:** Understand the Scilab and apply commands in Scilab
- CO 2:** Use looping in Scilab
- CO 3:** Build Scilab functions
- CO 4:** Plot graphs
- CO 5:** Develop skills to write programme in Scilab

Syllabus- SEC: Title- Scilab	Total Hrs: 30
Unit-I	15 hrs
Introduction to Scilab, The general environment, The editor, Command Window, graphics window, window management and workspace customization, Variables assignments, display array in terms of matrices and vectors, Displaying output data, data file, Scilab functions.	
Unit-II	15 hrs
Relational and logical operators, Branching Statements and program design, Loops, the while loop, for loop, Tests, 2D and 3D plotting, developing the skills of writing a program Solving differential equations	

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Programme writing and problem solving: 10 Marks
2. Programme Execution: 5 Marks
3. Viva: 5 Marks
4. Journal: 5 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company
3. Scilab for very beginners. - www.scilab-enterprises.com

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Mathematics
Discipline Specific Course (DSC)

The course Mathematics in II semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2 hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): **Algebra - II and Calculus - II**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1:** Recognize the countable set and groups.
- CO 2:** Link the fundamental concepts of groups and symmetries of geometrical objects.
- CO 3:** Explain the significance of the notions of Cosets, normal subgroups and factor groups.
- CO 4:** Finding the extreme values of functions.
- CO 5:** Evaluate multiple integration.

Syllabus- Course 2 (Theory): Title- Algebra - II and Calculus - II	Total Hrs: 56
Unit-I	14 hrs
Real Number System: Countable and uncountable sets-standard theorems. Real line, Bounded sets, supremum and infimum of a set, completeness properties of \mathbb{R} , Archimedean property of \mathbb{R} . Intervals, neighbourhood of a point, open sets, closed sets, limit points and Bolzano-Weierstrass theorem (without proof).	
Unit-II	14 hrs
Groups: Definition of a group with examples and properties, congruence, problems. Subgroups, center of groups, definition of order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fermat's theorem and Euler's ϕ function.	
Unit-III	14 hrs
Multivariate Calculus: Functions of two or more variables, explicit and implicit functions, Partial derivatives of implicit and composite functions. Homogeneous functions- Euler's theorem and its extension. Total differentials, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables. Lagrange's method of undetermined multipliers.	

Unit-IV	14 hrs
Integral Calculus: <i>Line integral:</i> Definition of line integral and basic properties, examples on evaluation of line integrals. <i>Double integral:</i> Definition of Double integrals and its conversion to iterated integrals. Evaluation of double integrals by changing the order of integration and change of variables. Computation of plane surface areas, volume underneath a surface of revolution using double integral. <i>Triple integral:</i> Definition of triple integrals and evaluation-change of variables, volume as triple integral. Differentiation under the integral sign by Leibnitz rule.	

Books recommended.

1. Topics in Algebra- I N Herstein, Wiley Eastern Ltd., New Delhi.
2. Higher algebra - Bernard & Child, Arihant, ISBN: 9350943199/ 9789350943199.
3. Modern Algebra - Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P.
4. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
5. Integral Calculus - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.,
6. Schaum's Outline Series - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
7. Mathematical Analysis- S C Malik, Wiley Eastern.
8. A Course in Abstract Algebra- Vijay K Khanna and S K Bhambri, Vikas Publications.
9. Text Book of BSc Mathematics-G K Ranganath, S Chand Publications.

B.Sc. Semester – II

Subject: Mathematics
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3 hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **Practicals on Algebra -II and Calculus - II**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

- CO 1:** Learn Free and Open Source Software (FOSS) tools for computer programming
- CO 2:** Solve problem on algebra and calculus using FOSS softwares.
- CO 3:** Acquire knowledge of applications of algebra and calculus through FOSS.

List of the Experiments for 52 hrs / Semesters

1. Program for verification of binary operations.
2. Program to construct Cayley table and test abelian for given finite set.
3. Program to find all possible cosets of the given finite group.
4. Program to find generators and corresponding possible subgroups of a cyclic group.
5. Programs to verification of Lagrange's theorem with suitable examples.
6. Program to verify the Euler's ϕ function for a given finite group.
7. Program to check homogeneous function.
8. Program to verify the Euler's theorem and its extension.
9. Programs to construct series using Maclaurin's expansion for functions of two variables.
10. Program to evaluate the line integrals with constant and variable limits.
11. Program to evaluate the Double integrals with constant and variable limits.
12. Program to evaluate the Triple integrals with constant and variable limits.

General instructions: Suggested Softwares: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. Programme writing and problem solving: 10 Marks**
- 2. Programme Execution: 5 Marks**
- 3. Viva: 5 Marks**
- 4. Journal: 5 Marks**

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A.S.Nair.2011S.Chand and Company
3. Scilab for very beginners. - www.scilab-enterprises.com
4. Topics in Algebra- I N Herstein, Wiley Eastern Ltd., New Delhi.
5. Higher algebra - Bernard & Child, Arihant, ISBN: 9350943199/ 9789350943199.
6. Modern Algebra - Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P.
7. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
8. Integral Calculus - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.,
9. Schaum's Outline Series - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
10. Mathematical Analysis- S C Malik, Wiley Eastern.
11. A Course in Abstract Algebra- Vijay K Khanna and S K Bhambri, Vikas Publications.
12. Text Book of BSc Mathematics-G K Ranganath, S Chand Publications.

B.Sc. Semester – II

Subject: Mathematics Open Elective Course (OEC-2) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-2: Title of the Course: **Business Mathematics-II**

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1:** Integrate concept in business concept with functioning of global trade.
- CO 2:** Understand the commercial arithmetic.
- CO 3:** Apply decision-support tools to business decision making.
- CO 4:** Apply knowledge of business concepts and functions in an integrated manner.

Syllabus- OEC: Title- Business Mathematics-II	Total Hrs: 42
Unit-I	14 hrs
Commercial Arithmetic: <i>Interest:</i> Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems <i>Annuity:</i> Ordinary Annuity, Sinking Fund, Annuity due, Present Value and Future Value of Annuity, Equated Monthly Installments (EMI) by Interest of Reducing Balance and Flat Interest methods, Examples and Problems.	
Unit-II	14 hrs
Measures of central Tendency and Dispersion: Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram and ogive curves. Requisites of ideal measures of central tendency, Arithmetic Mean, Median and Mode for ungrouped and grouped data. Combined mean, Merits and demerits of measures of central tendency. Geometric mean: definition, merits and demerits, Harmonic mean: definition, merits and demerits, Choice of A.M., G.M. and H.M. Concept of dispersion, Measures of dispersion: Range, Variance, Standard deviation (SD) for grouped and ungrouped data, combined SD, Measures of relative dispersion: Coefficient of range, coefficient of variation. Examples and problems.	

Unit-III	14 hrs
Correlation and regression: Concept and types of correlation, Scatter diagram, Interpretation with respect to magnitude and direction of relationship. Karl Pearson's coefficient of correlation for ungrouped data. Spearman's rank correlation coefficient. (with tie and without tie) Concept of regression, Lines of regression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties (without proof). Examples and problems.	

Books recommended.

1. Practical Business Mathematics S. A. Bari New Literature Publishing Company New Delhi
2. Mathematics for Commerce K. Selvakumar Notion Press Chennai
3. Business Mathematics with Applications Dinesh Khattar & S. R. Arora S. Chand Publishing New Delhi
4. Business Mathematics and Statistics N.G. Das & Dr. J.K. Das McFraw Hill New Delhi
5. Fundamentals of Business Mathematics M. K. Bhowal Asian Books Pvt. Ltd New Delhi
6. Mathematics for Economics and Finance: Methods and Modelling, Martin Anthony and Norman Biggs Cambridge University Press Cambridge
7. Financial Mathematics and Its Applications Ahmad Nazri Wahidudin Ventus Publishing ApS Denmark
8. Fundamentals of Mathematical Statistics Gupta S. C. and Kapoor V. K.: Sultan Chand and Sons 23, Daryaganj, New Delhi 110002
9. Statistical Methods Gupta S. P.: Sultan Chand and Sons 23, Daryaganj, New Delhi 110002
10. Applied Statistics Mukhopadhyaya Parimal New Central Book Agency Pvt. Ltd. Calcutta.
11. Fundamentals of Statistics Goon A. M., Gupta, M. K. and Dasgupta, B. World Press Calcutta.
12. Fundamentals of Applied Statistics Gupta S. C. and Kapoor V. K.: Sultan Chand and Sons 23, Daryaganj, New Delhi 110002

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

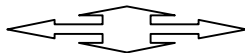
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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'A' Grade 2014

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No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಷಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24.25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಷಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ
ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

Haniff 29/10/21
ಕುಲಸಚಿವರು.



Practical Course

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: **PHYSICS**

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in **PHYSICS for B.Sc. (Hons.)**
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

* Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected

Name of Course (Subject): PHYSICS

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in **PHYSICS** students will be able to:

- PSO 1** :culminate in depth knowledge of almost all basic branches of physics such as mechanics, properties of matter, relativity, electricity and magnetism, wave motion, optics, thermal physics, electronics, classical mechanics, quantum mechanics, spectroscopy, nuclear physics, condensed matter physics and also advanced areas like Nanoscience, energy science, astrophysics, instrumentation.
- PSO 2** :communicate effectively physics concepts with examples related to day to day life. Acquire ability of recognizing and distinguishing various aspects of physics found in real life.
- PSO 3** : learn, perform and design experiments in the laboratory to demonstrate the concepts principles, laws of physics, theories learnt in the class rooms.
- PSO 4** : acquire ability of critical thinking and logical reasoning in physics problems and their solutions. Develop ability to analyze physics problem including simple to thought provoking problems and apply the acquired knowledge to solve.
- PSO 5** : appreciate the importance of physics subjects and its application for pursuing interdisciplinary and multidisciplinary higher education and research in these areas.
- PSO 6** : understand the vast scope of physics as theoretical and experimental science with application in finding solution of problems in nature spanning from smallest dimension 10^{-15} m to highest dimension 10^{26} m in space, covering energy ranges from 10^{-10} eV to 10^{25} eV.
- PSO 7** : think independently and develop algorithm and program using programming techniques for solving real world physics problems.
- PSO 8** : develop ability of working independently and to make in-depth study of various notions of physics.
- PSO 9** develop ability to apply the knowledge and skill acquired through experiments of physics in laboratories to solve real life problems.
- PSO 10**: Pursue advanced studies and research in varied areas of physical science.

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B.Sc. Semester – I

Subject: **PHYSICS**
Discipline Specific Course (DSC)

The course **PHYSICS** in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): **Mechanics and Properties of Matter**

Course Outcome (CO):

- CO 1** : Analyze data, (graphical and analytical), through estimation of errors and their sources in experimental determination of physical quantities. Also able to fit experimental data to straight line graph and calculate standard deviation, standard error and probable error.
- CO 2** : Distinguish inertial, non-inertial and rotational frames of reference. Also able understand and distinguish real, fictitious and Coriolis force and its importance in real life.
- CO 3** : Distinguish Galilean, Lorentz transformation and their applications .Understand special theory of relativity by studying variation of length, mass and time with relativistic velocity
- CO 4** : Analyze collision problems through laboratory and center of mass frame of reference, also able to relate these two frames.
- CO 5** : Understand concept of moment of inertia of regular/irregular bodies and its variation with axes through distribution of mass
- CO 6** : Find Young's modulus, rigidity modulus and their importance in understanding materials and applications.
- CO 7** : Understand concept of surface tension and viscosity of liquids and their experimental determination.
- CO 8** : Understand importance of surface tension and viscosity of liquids/fluids in real life situation (everyday life).

Syllabus- Course 1(Theory): Title- Mechanics and Properties of Matter	Total Hrs: 56
Unit-I	14 hrs
<p>Frames of Reference and Special Theory of Relativity:</p> <p>Frames of Reference: Inertial frames, Galilean transformation equations (derivation), invariance of Newton's laws under Galilean transformations, invariance of the laws of conservation of momentum and energy under Galilean transformations. Non-inertial frames and fictitious force, rotating frame of reference, concept of the Coriolis force and its importance with derivation.</p> <p>Special Theory of Relativity: The Michelson-Morley experiment, significance of negative result. Postulates of special theory of relativity. The Lorentz transformation equations (derivation), length contraction (derivation), time dilation (derivation), simultaneity, twin paradox, addition of velocities (derivation), variation of mass with velocity, mass-energy equivalence (derivation). Four vectors in relativity: space-time and energy-momentum vectors and their Lorentz transformation.</p> <p><i>Suggested Activities: please refer to foot note</i></p>	
Unit-II	14 hrs
<p>Collisions and Rotational Dynamics:</p> <p>Collisions: Two-dimensional elastic and inelastic collisions in center of mass and laboratory frames of reference: i) relation between velocities in center of mass system and laboratory system ii) relation between angle of recoil in laboratory system and angle of scattering in center of mass system. Conservation of linear momentum in case of variable mass. Double stage rocket (derivation for final velocity).</p> <p>Rotational Dynamics: Angular momentum of a particle and system of particles. Torque, principle of conservation of angular momentum. Rotation about a fixed axis, moment of inertia, theorem of parallel and perpendicular axes (derivation). M.I. of rectangular lamina, and circular disc, (derivations), hollow and solid cylinders (mention of expressions). Theory of flywheel and experimental determination of radius of gyration. Theory of gyroscope: effect of external torque on gyroscope.</p> <p><i>Suggested Activities: please refer to foot note</i></p>	
Unit-III	14 hrs
<p>Gravitation and Elasticity:</p> <p>Gravitation: Theory of compound pendulum, interchangeability of centers of suspension and oscillation, four points collinear with the C.G. about which the time period is same, conditions for maximum and minimum time periods. Bar pendulum, experimental determination of 'g' using bar pendulum. Bifilar suspension with parallel threads. Satellite in circular orbit and geosynchronous orbits. Global Positioning System (GPS): basic principle, working and its applications in various fields. Qualitative discussions on applications of artificial satellites.</p> <p>Elasticity: Review of basic concepts of elasticity: Relation between elastic constants (derivation), Poisson's ratio in terms of elastic constants (derivation). Twisting couple on a solid cylinder (wire), work done in twisting solid cylinder (wire). Determination of coefficient of rigidity by torsional pendulum and Maxwell needle method. Bending of beams- neutral surface, neutral axis, plane of bending, bending moment. Expression for bending moment (derivation), uniform bending (mention formula). Theory of light cantilever (derivation).</p> <p><i>Suggested Activities: please refer to foot note</i></p>	

Unit-IV	14 hrs
<p>Fluid Mechanics: Surface Tension: Review of basics of surface tension. Pressure difference across a liquid surface: excess pressure inside a spherical liquid drop and excess pressure inside a soap bubble. Derivation of relation between radius of curvature, pressure and surface tension. Angle of contact: case of two liquids in contact with each other and with air, case of solid, liquid and air in contact. Experimental determination of surface tension by Jaeger's method with relevant theory. Determination of surface tension and angle of contact of mercury by Quincke's method. Viscosity: Review of basics of viscosity. Expression for critical velocity, significance of Reynolds's number. Derivation of Poiseuille's equation. Experimental determination of co-efficient of viscosity for a liquid by Poiseuille's method. Motion of a spherical body in a viscous medium: expression for co-efficient of viscosity from Stokes law.</p>	

Suggested Activities I:

1. Considering the edges of a room as three axes of a RH/LH coordinates system, specify the position of objects in the room (say tip of the head of students seated there) describe their motion.
2. Perform an experiment with a freely falling body in the class room and explain equations of motion. Arrive at the fictitious force expression.

Suggested Activities II:

1. Students can try and understand conservation of energy in every day examples. For example: What happens in solar conservation panels, Pushing an object on the table it moves, Moving car hits a parked car causes parked car to move. In these cases, energy is conserved. How? Understand and verify if possible.
Reference : Weblink/Youtube/Book
2. Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body and it is proportional to the product of the square of radius, r of the body and its mass, m . Students by referring to websites, can construct and perform simple experiments to verify that $MI \propto mr^2$

Reference: www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edu

Suggested Activities III:

1. Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale along side. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material.
2. Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.
Reference: Weblink/Youtube/Book

Suggested Activities IV:

1. Measure surface tension of water and other common liquids and compare and learn Why water has high ST? Think of reasons, check whether ST is a function of temperature? You can do it by heating the water to different temperatures and measure ST. Plot ST versus T and learn how it behaves. Mix some quantity of kerosene or any oil to water and measure ST. Check whether ST for the mixture is more or less than pure water. Think of reasons.
2. Collect a set of different liquids and measure their viscosity. Find out whether sticky or non-sticky liquids are most viscous. Think of reasons. Mix non sticky liquid to the sticky liquid in defined quantities and measure viscosity. Find out viscosity is increasing or decreasing with increase of non-sticky liquid concentration. Find out change in viscosity with increase of concentration of sticky liquid. Think why this is so

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Books recommended.

1. Mechanics (VI-Edition) - J. C. Upadhyay –Ramprasad & Sons, Agra, 2005.
2. Mechanics (XX-Edition) – D. S. Mathur- S. Chand & Company Ltd., New-Delhi, 2007.
3. Mechanics & Electrodynamics (XVII-Edition, Course- 1 & 2) – Brijlal, Subramanyam & Jivan Seshan, S. Chand & Company Ltd., New-Delhi, 2008.
4. Properties of Matter (XIII-Edition) – Brijlal & Subramanyam, Eurasia Publishing House Pvt. Ltd., New-Delhi, 2001.
5. Elements of Properties of Matter (XXVIII-Edition), D. S. Mathur - S. Chand & Company Ltd., New-Delhi, 2005.
6. Physics, Vol. No. I (V-Edition)– Resnick, Halliday & Krane – John Wiley & Sons Inc., New-York, Singapore, 2005.
7. Berkeley Physics, Vol. No. I – ABC Publications, Bangalore & New-Delhi.
8. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004.
9. Introduction to Relativity- R. Resnik.
10. Relativistic Mechanics- Gupta and Kumar.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – I

Subject: **PHYSICS**
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **Mechanics and Properties of Matter**

List of the Experiments for 52 hrs / Semesters

1. Estimation of errors (Average deviation, Standard deviation, standard error and Probable error) in the experimental determination of physical quantities like length, diameter, thickness, time, mass, temperature and resistance from the given data. And also fit the given data to a straight-line graph and calculate from the given observation's Standard deviation, standard error and Probable error.
2. Y by bending/cantilever.
3. Parallel/perpendicular axes theorem.
4. Bar Pendulum /Kater's pendulum.
5. Fly-Wheel
6. Bifilar Suspension.
7. Koenig's method.
8. Co-efficient of viscosity of liquid by Poiseuille's method.
9. Surface Tension by Jaeger's Method / Quincke's method.
10. Modulus of Rigidity of a wire using disc/ Maxwell's needle.
11. To find Young's modulus, modulus of rigidity and Poisson's ratio for the material of a wire by Searle's method.
12. Problem based learning in physics: Problems on, gravitation (especially on satellite communication), special theory of relativity, rigid body dynamics and center of mass of different bodies.

General instructions:

1. *Minimum of eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1 Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram	- 05 Marks
2 Tabular Column with quantities and unit mentioned, experimental skills.	- 05 Marks
3 Recording of observations, calculations and drawing graph, and accuracy of the result	- 11 Marks
4 Viva-voce	- 02 Marks
5 Completed & Certified Journal	- 02 Marks
Total 25 marks	

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Physics For Degree Students B. Sc. First Year, S. Chand & Company.
2. Electronics Instrumentation by H. S. Kalasi.
3. B.Sc. practical Physics – C.L. Arora.
4. Advanced practical Physics – Samir Kumar Ghosh.
5. Advanced practical Physics – Worsnop and Flint.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – I

Subject: **PHYSICS**
Open Elective Course (OEC-1)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course: **Energy Sources**

Syllabus- OEC: Energy Sources	Total Hrs: 42
Unit-I	14 hrs
Introduction to Energy Sources: Energy concepts, sources in general, its significance and necessity. Classification of energy sources: primary and secondary sources. Energy consumption as a measure of prosperity. Need of renewable energy sources. Conventional (commercial) energy sources, Non- Conventional energy sources (Renewable energy). Advantages of renewable energy. Obstacles to the implementation of renewable energy systems. Prospects of renewable energy sources. Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges.	
Unit-II	14 hrs
Solar-Energy and its Applications: Potential of solar energy, solar radiation and measurements, different types of solar energy collectors, advantages and disadvantages of different collectors, solar energy storage. Solar hot water supply systems. Solar air heating and cooling systems. Solar thermal electric power generation. Solar pumping, distillation, furnace and green houses. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	
Unit-III	14 hrs
Wind energy harvesting and Ocean Energy and energy from Biomass: Fundamental of wind energy, wind turbines and different electrical machines in wind turbines, power electronic interfaces and grid interconnection topologies. Ocean Energy: Ocean energy potential against wind and solar, wave characteristics and statics wave energy devices. Tide characteristics and statistics, tide energy technologies ocean thermal energy, osmotic power, ocean bio-mass.	

Energy from Biomass: Biomass conversion technologies: wet process, dry process, photosynthesis. Biogas generation: Factors affecting bio-digestion. Classification of biogas plants: Floating drum plant, fixed dome plant, advantages and disadvantages of these plants.	
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Suggested Activities:

1. Demonstration of on Solar energy, wind energy, etc, using training modules at Labs.
2. Conversion of vibration to voltage using piezoelectric materials.
3. Conversion of thermal energy into voltage using thermoelectric (using thermocouples or heat sensors) modules.
4. Project report on Solar energy scenario in India
5. Project report on Hydro energy scenario in India
6. Project report on wind energy scenario in India
7. Field trip to nearby Hydroelectric stations.
8. Field trip to wind energy stations like Chitradurga, Hospet, Gadag, etc.
9. Field trip to solar energy parks like Yeramaras near Raichur.
10. Videos on solar energy, hydro energy and wind energy.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Books recommended.

1. Non-conventional energy sources by G. D. Rai Khanna Publishers New Delhi.
2. Solar energy by M. P. Agarwal S. Chand and Co. Ltd.
3. Solar energy by Suhas P. Sukhative Tata McGraw-Hill publishing Company Ltd.
4. Dr. P. Jayakumar, solar Energy: Resources Assesment Handbook, 2009.

Pedagogy: Seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester - I

Subject: **PHYSICS**
SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: **BASIC INSTRUMENTATION**

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

BASIC INSTRUMENTATION:

(30 Hours)

Basics of Measurement (02Hours): Instrument accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Analog Multimeter (02 Hours): Principle of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and its significance.

Digital Multimeter (02 Hours): Block diagram, principle and working of a digital multimeter.

Cathode Ray Oscilloscope (04 Hours): Introduction to CRO, Basic diagram of CRT: Brief introduction to Electron Beam, Operating voltage, Deflecting plates, Deflecting voltages, Phosphor Screen. Block diagram of CRO: Brief mention of functions of Vertical and Horizontal Amplifier, Delay Line, Time Base, Trigger Circuit, Power supply and brief explanation of waveform display. Mention of uses of CRO.

List of the Experiments for 52 hrs / Semesters

1. To observe the loading effect of i) Analog ii) Digital multimeters while measuring across a low resistance and high resistance and to observe the limitations of a multimeter for measuring high frequency voltage and currents.
2. Soldering and de-soldering technique (Solder given electronic circuit and check its working).
3. Use of CRO – Measurement of AC voltage and frequency for sine and square waves.
4. Use of CRO – Determination of phase shift using RC network and study of Lissajous figures.
5. Converting the range of a given measuring instrument (voltmeter, ammeter)
6. Basics of transformers. Winding a coil / transformer.
7. Using Resistive network study of star to delta network conversion or vice-versa. Show that they are equivalent.
8. Experimental study of KVL and KCL using DC source and resistive network.
9. Calibration of analog voltmeter and ammeter.
10. Conversion of galvanometer to ohm-meter for at least two ranges.
11. Basics of Relays, Fuses and disconnect switches, Circuit breakers and Overload devices.
12. Study of inductor: To check the health of the inductor using DMM and find self-inductance using AC and DC source.
13. Study of Capacitor: To check the health of the capacitor using DMM, find capacitor using RC network using step down transformer/ AFG and verify laws of combination of capacitor.
14. Basics and working of Battery Eliminators/ battery charger.

General instructions:

- 1. Minimum of Eight experiments to be performed.**
- 2. Any new experiment may be added to the list with the prior approval from the BOS.**

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

2 Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram	- 05 Marks
3 Tabular Column with quantities and unit mentioned, experimental skills.	- 05 Marks
3 Recording of observations, calculations and drawing graph, and accuracy of the result	- 11 Marks
5 Viva-voce	- 02 Marks
5 Completed & Certified Journal	- 02 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

- 1. Physics For Degree Students B. Sc. First Year, S. Chand & Company.**
- 2. Electronics Instrumentation by H. S. Kalasi.**
- 3. B.Sc. practical Physics – C.L. Arora.**
- 4. Advanced practical Physics – Samir Kumar Ghosh.**
- 5. Advanced practical Physics – Worsnop and Flint**

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

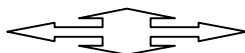
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: PHYSICS
Discipline Specific Course (DSC)

The course **PHYSICS** in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): **ELECTRICITY and MAGNETISM**

Course Outcome (CO):

CO1: understand and distinguish application of Gauss law in vacuum and dielectric medium.

CO2: determine dielectric constant of solid/liquid materials by experiments in laboratory.

CO3: apply the resonant circuits in the field of communication and signal oscillator building

CO4: apply concepts of AC and DC bridges to determine values of resistance, capacitance of capacitor and self- inductance of coil.

CO5: understand how to produce magnetic field from electric current. Understand magnetic field produced by current in toroid and solenoid.

CO6: distinguish Seebeck and Peltier effect and their applications to real life. Also able to distinguish different type of thermocouples as temperature sensors.

CO7: explain Maxwell's equations to articulate the relationship between varying electric and magnetic field. Also able to explain electromagnetic waves and their characteristics

Syllabus- Course 2(Theory): Title- ELECTRICITY and MAGNETISM	Total Hrs: 56
Unit-I	14 hrs
<p>Theory of Dielectrics and Electric Instruments, Measurements: Theory of Dielectrics: Introduction to dielectric materials. Polar and nonpolar molecules with examples. Gauss law in a dielectric medium. Dielectric in an electric field, electric polarization (P), electric displacement (D), electric susceptibility (χ) and atomic polarizability (α), relation between D, E and P. Mechanism of polarization. Boundary condition at a dielectric surface (derivation). Derivation of Clausius–Mosotti equation and its limitations. Langevin-Debye theory of polarization in polar dielectrics. Dielectric constant and its determination for liquids and solids by Hopkinson's method. Electrical Instruments, Measurements: Theory of moving coil galvanometer to be ballistic & dead beat. Charge and current sensitivity and their relationship, correction for damping. Measurement of capacitance of a capacitor by absolute method using B.G. Measurement of high resistance by leakage method using B.G. <i>Suggested Activities: please refer to foot note</i></p>	

<p>Unit-II</p> <p>Resonance Circuits, D. C. & AC Bridges: Resonance Circuits: Overview of AC circuits: Operator j, Argand diagram. LCR series circuit- Expression for current, impedance and phase (using j-operator method). Condition for resonance, resonant frequency, bandwidth, quality factor & their relation. LCR parallel circuit (Series L-R in parallel with C) - Expression for admittance & condition for resonance (using j-operator method). Comparison between series & parallel resonant circuits. D. C. & A.C. Bridges: D.C. Wheatstone Bridge and its demerits (qualitative discussion without derivation). Theory of low resistance measurement using Kelvin's double bridge method. Measurement of inductance, Theory of Maxwell's bridge and Anderson's bridge. Comparison of capacities of two condensers by de Sauty's method. <i>Suggested Activities: please refer to foot note</i></p>	<p>14 hrs</p>
<p>Unit-III</p> <p>Magnetostatics and Thermoelectricity: Magnetostatics: Overview of basics of Magnetostatics: Statement of Biot-Savart' law, derive the expression for magnetic field due to Straight conductor carrying current, mention the expression for the field along the axis of a circular coil & discuss the special cases. Tangent law, Helmholtz galvanometer-principle, construction & working. Ampere's circuital law-statement, proof & its applications (for D. C.) to derive the magnetic field due to Solenoid & Toroid. Thermoelectricity: Seebeck effect, Variation of thermo emf with temperature, neutral temperature & temperature of inversion. Thermoelectric series. Peltier effect, Thomson effect. Thermoelectric laws. Derivation of the relations $\pi = T (de/dT)$ and $\sigma_a - \sigma_b = T (d^2e/dT^2)$. Tait diagram and its uses. Thermoelectric generators (TEG), Peltier-cooling, Thermoelectric cooler (TEC). Qualitative discussion on different types of Thermocouples (J-type, K-type and RTD type). <i>Suggested Activities: please refer to foot note</i></p>	<p>14 hrs</p>
<p>Unit-IV</p> <p>Electromagnetic Induction and Electromagnetic Theory: Overview of basics of EMI, Determination of self-inductance (L) by Rayleigh's method and mutual inductance by direct method, with necessary theory. Electromagnetic Theory: Fields, types of fields, flux and circulation of a vector field, gradient of a scalar field and its significance, vector point function (electric field intensity) and scalar point function (electric potential) and relation between them for an electrostatic charge distribution. Divergence and curl of a vector field and their significance; Gauss divergence theorem (derivation), Stokes theorem (derivation) and Green's theorem (statement and explanation). Electromotive force (emf) as the circulation of electric field intensity (derivation); continuity equation (proof) and its significance. Inconsistency in Ampere's circuital law and the concept of displacement current. Integral form of Maxwell's equations of electromagnetic theory (mention and explanation); Setting up of the differential form of Maxwell's equations (derivations). Application of Maxwell's equations to dielectric and conducting media; electromagnetic potentials - their non-uniqueness and significance; Coulomb, Lorenz gauge and their significance; Poynting's theorem (statement and derivation). <i>Suggested Activities: please refer to foot notes</i></p>	<p>14 hrs</p>

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may kindly be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus

Books recommended.

1. Fundamentals of Electricity and Magnetism – Basudev Ghosh – Books & Allied New Central Book Agency, Calcutta, 2009.
2. Electricity and magnetism- D.N. Vasudev- S. Chand Publication, New Dehli.
3. Electricity and Magnetism- B.S.Agarwal- S. Chand Publication, New Dehli.
4. Electricity and magnetism- Brij lal & Subramasnyam.
5. Electricity and magnetism and Atomic physics vol-I – John Yarwood.
6. Electricity and magnetism – A. N. Matveer-Mir publisher,Moscow 1986.
7. Introduction to electrodynamics- D. J. Griffith (3rd ed)Prentice Hall of India, New Delhi.
8. Electricity and Magnetism by R. Murgeshan.
9. Vector Analysis-Hague
10. Electricity and Magnetism- D. Chattopadhyya & Rakshit.
11. Electricity and magnetism- K. K. Tiwari
12. Electricity and magnetism by B. S. Agarwal.
13. Fundamentals of electricity and magnetism- D. N. Vasudev.
14. Electricity and Magnetism- Segal and Chopra
15. Text book of Electrical Technology, Vol. 1 – B.L. Theraja and A.K Theraja.
16. Feynmenn Lectures in Physics Volume II
17. Electromagnetics by B. B. Laud.
18. Introduction to Electrodynamics Third Edition by David J. Griffiths.
19. Electrodynamics by Jacson

Pedagogy: Problem solving seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – II

Subject: **PHYSICS**
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical) - **ELECTRICITY and MAGNETISM**

List of the Experiments for 52 hrs / Semesters

1. Determination of dielectric constant of a liquid.
2. Determination of the constants of B.G.
3. Helmholtz galvanometer
4. Determination of magnetic field along the axis of a coil
5. Measurement of capacity by absolute method, using B.G.
6. Determination of high resistance by leakage method
7. Measurement of capacity by method of mixtures
8. Determination of coefficient of self-inductance (L) by Rayleigh's method/ Anderson's bridge method.
9. Low resistance measurement using Kelvin's double bridge method.
10. Measurement of thermo-emf and verification of laws of thermoelectricity using / ordinary potentiometer/Crompton potentiometer.
11. Thermoelectricity power Generator (TEG)
12. Study of Seeback / Peltier Effect (Thermoelectric Cooler-TEC).
13. Series /parallel resonance circuit.

General instructions:

1. *Minimum of Eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. **Basic formula, Units & Nature of graph, Circuit Diagram / Ray Diagram / Schematic diagram** - 05 Marks
2. **Tabular Column with quantities and unit mentioned, experimental skills.** - 05 Marks
3. **Recording of observations, calculations and drawing graph, and accuracy of the result** - 11 Marks
4. **Viva-voce** - 02 Marks
5. **Completed & Certified Journal** - 02 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Physics for Degree Students B. Sc. First Year, S. Chand & Company.
2. Electronics Instrumentation by H. S. Kalasi.
3. B.Sc. practical Physics – C.L. Arora.
4. Advanced practical Physics – Samir Kumar Ghosh.
5. Advanced practical Physics – Worsnop and Flint.

B.Sc. Semester – II

Subject: **PHYSICS**
Open Elective Course (OEC-2)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: **Climate Science**

Syllabus- OEC: Title- Climate Science	Total Hrs: 42
Unit-I	14 hrs
Atmosphere: Atmospheric Science (Meteorology) as a multidisciplinary science. Physical and dynamic meteorology, some terminology, difference between weather and climate, weather and climate variables, composition of the present atmosphere: fixed and variable gases, volume mixing ratio (VMR), sources and sinks of gases in the atmosphere. Greenhouse gases. Structure (layers) of the atmosphere. Temperature variation in the atmosphere, temperature lapse rate, mass, pressure and density variation in the atmosphere. Distribution of winds.	
Unit-II	14 hrs
Climate Science: Overview of meteorological observations, measurement of : temperature, humidity, wind speed and direction and pressure. Surface weather stations, upper air observational network, satellite observation. Overview of clouds and precipitation, aerosol size and concentration, nucleation, droplet growth and condensation (qualitative description). Cloud seeding, lightning and discharge. Formation of trade winds, cyclones. Modelling of the atmosphere: General principles, Overview of General Circulation Models (GCM) for weather forecasting and prediction. Limitations of the models. R and D institutions in India and abroad dedicated to climate Science, NARL, IITM, CSIR Centre for Mathematical Modeling and Computer Simulation, and many more.	
Unit-III	14 hrs
Global Climate Change: Greenhouse effect and global warming, enhancement in concentration of carbon dioxide and other greenhouse gases in the atmosphere, conventional and non-conventional energy sources and their usage. EL Nino/LA Nino Southern oscillations. Causes for global warming: Deforestation, fossil fuel burning, industrialization. Manifestations of global warming: Sea level rise, melting of glaciers, variation in monsoon patterns, increase in frequency and intensity of cyclones, hurricanes, tornadoes. Geo-engineering as a tool to mitigate global warming? Schemes of geo-engineering.	

Activities to be carried out on Climate Science:

1. Try to find answer to the following questions:

- (a) Imagine you are going in a aircraft at an altitude greater than 100 km. The air temperature at that altitude will be greater than 200°C. If you put your hands out of the window of the aircraft, you will not feel hot.
- (b) What would have happened if ozone is not present in the stratosphere.

2. Visit a nearby weather Station and learn about their activities.
3. Design your own rain gauge for rainfall measurement at your place.
4. Learn to determine atmospheric humidity using wet bulb and dry bulb thermometers.
5. Visit the website of Indian Institute of Tropical Meteorology (IITM), and keep track of occurrence and land fall of cyclone prediction.
6. Learn about ozone layer and its depletion and ozone hole
7. Keep track of melting of glaciers in the Arctic and Atlantic region through data base available over several decades.
8. Watch documentary films on global warming and related issues
9. (Produced by amateur film makers and promoted by British Council and BBC)

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take.

Books recommended.

1. Basics of Atmospheric Science: A Chndrashekar, PHI Learning Private Ltd. New Delhi, 2010.
2. Fundamentals of Atmospheric Modelling- Mark Z Jacobson, Cambridge University Press, 2000
3. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
4. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
5. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
6. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
7. Why the weather, Charles Franklin Brooks, 1924, Chpraman & Hall, London.
8. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

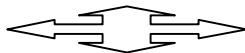
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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 'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್‌ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
 2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
 3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
 4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್‌ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
 5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
 6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
 7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
 8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
 9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
 10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
 11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
 12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P/ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರ್ಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ
 ಗೆ.

(Handwritten Signature)
 ಕುಲಸಚಿವರು.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: ZOOLOGY

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Zoology for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

* Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected

Name of Course (Subject): ZOOLOGY

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Zoology students will be able to:

PSO 1:

- 1.The structure and functions of animal cell, cell organelles, cell- cell interactions, process of reproduction leading to new organisms.
- 2.The principles of inheritance, Mendel's laws and the deviations. Inheritance of chromosomal aberrations in humans by pedigree analysis in families.
- 3.Acquaint the knowledge about basic procedure and methodology of integrated animal rearing. Students can start their own business i.e. self employments.
- 4.To get employment in different sectors of Applied Zoology.

PSO 2: .

1. In depth understanding of structure of biomolecules like proteins, lipids and carbohydrates.
2. The thermodynamics of enzyme catalyzed reactions.
- 3.To know various physiological processes of animals.

B.Sc. Semester – I

Subject: ZOOLOGY Discipline Specific Course (DSC)

The course Zoology in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): **Cytology, Genetics and Infectious Diseases**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1 :The structure and function of the cell organelles.
- CO 2 : The chromatin structure and its location.
- CO 3 :The basic principle of life, how a cell divides leading to the growth of an Organism and also reproduces to form a new organisms.
- CO 4: How a cell communicates with its neighboring cells.
- CO 5: The principles of inheritance, Mendel's laws and the deviations.
- CO 6: How environment plays an important role by interacting with genetic factors.
- CO 7: Detect chromosomal aberrations in humans and study of pedigree analysis.

Syllabus- Course 1(Theory): Title- Cytology, Genetics and Infectious Diseases	Total Hrs: 56
Unit-I Structure and Function of Cell Organelles I in Animal cell	14 hrs
Plasma membrane: chemical structure—lipids and proteins Endomembrane system: protein targeting and sorting, transport, endocytosis and exocytosis Cytoskeleton: microtubules, microfilaments, intermediate filaments, Mitochondria: Structure, oxidative phosphorylation; electron transport system, Peroxisome and Ribosome: structure and function.	
Unit-II Nucleus, Chromatin Structure, Cell cycle, Cell Division and Cell Signaling	14 hrs
Structure and function of nucleus in eukaryotes, Chemical structure and base composition of DNA and RNA DNA supercoiling, chromatin organization, structure of chromosomes, Types of DNA and RNA , Cell division: mitosis and meiosis Introduction to Cell cycle and its regulation, apoptosis, Signal Transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors Cell-cell interaction: cell adhesion molecules, cellular junctions.	

Unit-III Mendelism, Sex Determination, Extensions of Mendelism, Genes and Environment	14 hrs
Basic principles of heredity: Mendel's laws- monohybrid cross and hybrid cross, Complete and Incomplete Dominance, Penetrance and expressivity, Genetic Sex-Determining Systems, Environmental Sex Determination, Sex Determination and mechanism in <i>Drosophila melanogaster</i> . Sex-linked characteristics in humans and dosage compensation Extensions of Mendelism: Multiple Alleles, Gene Interaction. The Interaction Between Sex and Heredity: Sex-Influenced and Sex-Limited Characteristics Cytoplasmic Inheritance, Genetic Maternal Effects. Interaction between Genes and Environment: Environmental Effects on Gene Expression, Inheritance of Continuous Characteristics.	
Unit IV Human Chromosomes, Patterns of Inheritance and Infectious Diseases	14 hrs
Patterns of inheritance: autosomal dominance, autosomal recessive, X-linked recessive, X-linked dominant. Chromosomal anomalies: Structural and numerical aberrations with examples. Human karyotyping and Pedigree analysis Introduction to pathogenic organisms: viruses, bacteria, fungi, protozoa and Worms. Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of common parasites: <i>Trypanosoma</i> , <i>Giardia</i> and <i>Wuchereria</i> .	

Books recommended.

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA(2004).
2. Alberts et al: Molecular Biology of the Cell: Garland(2002).
3. Cooper: Cell: A Molecular Approach: ASM Press(2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman(2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson(2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby Immunology. W H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell(2017).
9. Principles of Genetics by B. D. Singh
10. Cell-Biology by C. B. Pawar, Kalyani Publications
11. Economic Zoology by Shukla and Upadhyaya

B.Sc. Semester – I

Subject: ZOOLOGY
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **Cytology, Genetics and Infectious Diseases**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

- CO 1: To use simple and compound microscopes.
- CO 2: To prepare stained slides to observe the cell organelles.
- CO 3: To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- CO 4: The chromosomal aberrations by preparing karyotypes.
- CO 5: How chromosomal aberrations are inherited in humans by pedigree analysis in families. The antigen-antibody reaction.

List of the Experiments for 52 hrs / Semesters

1. Understanding of simple and compound microscopes.
 2. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using 3. Methylene blue/any suitable stain (virtual/ slaughtered tissue).
 3. To study the different stages of Mitosis in root tip of *Allium cepa*.
 4. To study the different stages of Meiosis in grasshopper testis (virtual).
 5. To check the permeability of cells using salt solution of different concentrations.
 6. Study of parasites in humans (e.g. Protozoans, Helminthes in compliance with examples being studied in theory) permanent microslides.
 7. To learn the procedures of preparation of temporary and permanent stained slides, with available mounting material.
 8. Study of mutant phenotypes of *Drosophila* sp. (from Cultures or Photographs).
 9. Preparation of polytene chromosomes (Chironomus larva or *Drosophila* larva).
 10. Preparation of human karyotype and study the chromosomal structural and numerical aberrations from the pictures provided. (Virtual/optional).
 11. To prepare family pedigrees.
 12. <https://www.vlab.co.in>
 13. <https://zoologysan.blogspot.com>
 14. www.vlab.iitb.ac.in/vlab
 15. www.onlinelabs.in
 16. www.powershow.com
- <https://vlab.amrita.edu><https://sites.dartmouth.edu/>

General instructions:

1. Perform all the experiments as per the instructions in each questions.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Experiments	08 Marks
2. Minor Experiments	05 Marks
3. Identifications (A-C)	06 Marks
4. Viva	03 Marks
5. Journal	03 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

B.Sc. Semester – I

Subject: ZOOLOGY Open Elective Course (OEC-1) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course: Economic Zoology

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1: Gain knowledge about silkworms rearing and their products.
- CO 2 :Gain knowledge in Bee keeping equipment and apiary management.
- CO 3: Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
- CO 4:Acquaint knowledge about the culture techniques of fish and poultry.
- CO 5:Acquaint the knowledge about basic procedure and methodology of vermiculture.
- CO 6:Learn various concepts of lac cultivation.
- CO 7:Students can start their own business i.e. self-employments.
- CO 8:Get employment in different applied sectors

Syllabus- OEC: Title- Economic Zoology	Total Hrs: 42
Unit-I Sericulture, Apiculture and Aquaculture	14 hrs
<p>History and present status of sericulture in India,Mulberry and non-mulberry species in Karnataka and India,Mulberry cultivation,Morphology and life cycle of <i>Bombyxmori</i>,Silkworm rearing techniques: Processing of cocoon, reeling,Silkworm diseases and pest control</p> <p>Introduction and present status of apiculture,Species of honey bees in India, life cycle of <i>Apisindica</i>,Colony organization, division of labour and communication, Bee keeping as an agro based industry; methods and equipments: indigenous methods, extraction appliances, extraction of honey from the comb and processing,Bee pasturage, honey and bees wax and their uses,Pests and diseases of bees and their management</p> <p>Aquaculture in India: An overview and present status and scope of aquaculture, Types of</p>	

<p>aquaculture: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture</p>	
<p>Unit-II Live Stock Management: Dairy, Poultry. And Vermiculture</p>	<p>14 hrs</p>
<p>Introduction to common dairy animals and techniques of dairy management, Types, loose housing system and conventional barn system; advantages and limitations of dairy farming, Establishment of dairy farm and choosing suitable dairy animals- cattle, Cattle feeds, milk and milk products, Cattle diseases Types of breeds and their rearing methods, Feed formulations for chicks, Nutritive value of egg and meat, Disease of poultry and control measures Scope of vermiculture. Types of earthworms. Habit categories - epigeic, endogeic and anecic; indigenous and exotic species. Methodology of vermicomposting: containers for culturing, raw materials, required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost, Advantages of vermicomposting., Diseases and pests of earthworms.</p>	
<p>Unit-III Fish culture, Prawn culture and Lac Culture</p>	<p>14 hrs</p>
<p>Common fishes used for culture. Fishing crafts and gears. Ornamental fish culture: Fresh water ornamental fishes- biology, breeding techniques, Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality. control of snail and algal growth. Modern techniques of fish seed production. Culture of fresh and marine water prawns. Preparation of farm. Preservation and processing of prawn, export of prawn. History of lac and its organization, lac production in India. Life cycle, host plants and strains of lac insect. Lac cultivation: Local practice, improved practice,</p>	

<p>propagation of lac insect, inoculation period, harvesting of lac.Lac composition, processing, products, uses and their pests.</p>	
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Books recommended.

1. Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). Mulberry Silk Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition.
5. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
6. YadavManju (2003). Economic Zoology, Discovery Publishing House.
7. JabdePradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
8. Cherian & Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
9. Sathe, T.V. Vermiculture and Organic farming.
10. Bard. J (1986). Handbook of Tropical Aquaculture.
11. Santhanam, R. A. Manual of Aquaculture.
12. Zuka. R.1 and Hamiyn (1971). Aquarium fishes and plants
13. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture.
14. Animal Disease- Bairagi K. N. Anmol Publications Pvt.Ltd 2014
15. Economics Of Aquaculture - Singh(R.K.P) - Danika Publishing Company 2003
16. Applied and Economic Zoology (SWAYAM) web https://swayam.gov.in/nd2_cec20_ge23/preview

B.Sc. Semester - I

Subject: ZOOLOGY SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper : VERMICULTURE

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

- CO 1 :Understands the importance of earthworms in maintaining soil quality.
- CO 2:Learns that the vermicomposting is an effective organic solid waste management method.
- CO 3:Gets acquainted with the importance of earthworms in agro-based economic activity.
- CO 4:Vermicomposting leads to organic farming and healthy food production.
- CO 5:Vermicomposting may be taken up as a small scale industry by the farmers and unemployed youth.
- CO 6:Get jobs in teaching institutions or vermiculture units as technicians.
- CO 7:Learn the concept of vermicomposting as bio fertilizers thus student can become an entrepreneur after completion of the course.
- CO 8:Best opportunity for self-employment and lifelong learning with farmers.

List of the Experiments for 52 hrs / Semesters

1. **INSTRUCTIONS FOR ALL THE EXPERIMENTS** : Biology and life cycle of earthworm, Types of earthworms. Establishment of vermiculture unit, Preparation of bed, inoculation , composting process, harvesting of vermicompost and worms, Economic importance of vermicompost, vermiwash, vermi-protein. Natural enemies of earthworms and their control measures
- 2.Visit to vermiculture farm to acquaint latest field techniques
- 3.Collection of native earthworm species to study habit and habitat.
- 4.Keys to identify different species of earthworms
- 5.Study of vermicomposting equipment and devices.
- 6.Preparation of vermibeds and their maintenance
7. Study of different vermicomposting methods.
- 8.Harvesting of compost and separation of worms,
9. Establishment of vermiwash unit,
- 10.Packaging, transport and storage of varmicompost.
11. Worm meal preparation, preservation and packing
12. Physico-chemical and estimation of vermicompost , vermiwash and vermi protein

General instructions:Perform all the experiments as per the instructions in each questions.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- | | |
|--------------------------|----------|
| 1. Major Experiments | 08 Marks |
| 2. Minor Experiments | 05 Marks |
| 3. Identifications (A-C) | 06 Marks |
| 4. Viva | 03 Marks |
| 5. Journal | 03 Marks |

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Bhatt J.V. &S.R. Khambata (1959)-Role ofEarthworms in Agriculture □Indian Council of Agricultural Research, New Delhi
2. Edwards, C.A. and J.R. Lofty(1977) -BiologyofEarthworms□ Chapmanand Hall Ltd., London.
3. Lee, K.E. (1985) -Earthworms:Their ecologyand Relationship with Soilsand Land Use□Academic Press, Sydney.
4. Dash, M.C., B.K. Senapati, P.C. Mishra(1980) –VermsandVermicomposting□ Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, JyotiVihar, Orissa.
5. Kevin, A and K.E. Lee(1989) –EarthwormforGardenersandFisherman□ (CSIRO, Australia, Division ofSoils)
6. Satchel, J.E. (1983)-Earthworm Ecology□Chapman Hall, London.
7. Wallwork, J.A. (1983)-EarthwormBiology□Edward Arnold(Publishers)Ltd. London

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22
GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

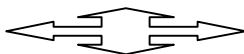
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: ZOOLOGY
Discipline Specific Course (DSC)

The course Zoology in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory) : Biochemistry and Physiology

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1:To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.
- CO 2:How simple molecules together form complex macromolecules.
- CO 3:To understand the thermodynamics of enzyme catalyzed reactions.
- CO 4:Mechanisms of energy production at cellular and molecular levels.
- CO 5:To understand various functional components of an organism.
- CO 6:To explore the complex network of these functional components.
- CO 7:To comprehend the regulatory mechanisms for maintenance of function in the body.

Syllabus- Course 2(Theory): Title- Biochemistry and Physiology	Total Hrs: 56
Unit-I Structure, Function of Biomolecules,Enzyme Action and Regulation	14 hrs
Nomenclature and classification of enzymes; Cofactors; pecificity of enzyme action.Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). Lipids (saturated and unsaturated Fatty acids, Tri-acylglycerols, Phospho lipids, Glycolipids and Steroids)Structure, Classification and General Properties of a-amino acids; Essential and non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins. Isozymes; Mechanism of enzyme action,Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions ; Equation of Michaela’s – Mendon, Concept of Km and V max, Enzyme inhibition,Allosteric enzymes and their kinetics; Regulation of enzyme action.	

<p>Unit-II Metabolism of Carbohydrates, Lipids Metabolism, Proteins and Nucleotides</p>	<p>14 hrs</p>
<p>Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis</p> <p>Lipids- Biosynthesis of palmitic acid; Ketogenesis, β-oxidation and ω-oxidation of saturated fatty acids with even and odd number of carbon atoms</p> <p>Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides and vitamins, Peptide linkages.</p>	
<p>Unit-III Digestion, Respiration, Circulation and Excretion in humans</p>	<p>14 hrs</p>
<p>Structural organization and functions of gastrointestinal tract and associated glands. Mechanical and chemical digestion of food; Absorption of carbohydrates, lipids, proteins, water, minerals and vitamins; Physiology of trachea and Lung.</p> <p>Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it; Control of respiration.</p> <p>Components of blood and their functions; hemopoiesis, Blood clotting: Blood clotting system, Blood groups: Rh-factor, ABO and MN, Structure of mammalian heart, Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation, Structure of kidney and its functional unit; Mechanism of urine formation.</p>	
<p>Unit-IV Nervous System, Endocrinology and Muscular System in humans</p>	<p>14 hrs</p>
<p>Structure of neuron, resting membrane potential (RMP), Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse</p> <p>Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them. Classification of hormones; Mechanism of Hormone action.</p> <p>Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus</p>	

Books recommended.

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols I & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume I & 2, 11th edition, CBS Publishers (2016).

B.Sc. Semester – II

Subject: ZOOLOGY Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical) : Biochemistry and Physiology

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1:At the end of the course the student should be able to understand Basic structure of biomolecules through model making.

CO 2:Develop the skills to identify different types of blood cells.

CO 3:Enhance basic laboratory skill like keen observation, analysis and discussion. Learn the functional attributes of biomolecules in animal body.

CO 4:Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

List of the Experiments for 52 hrs / Semesters

1. Preparation of models of nitrogenous bases- nucleosides and nucleotides.
2. Preparation of models of amino acids and dipeptides.
3. Preparation of models of DNA and RNA.
4. Qualitative analysis of Carbohydrates, Proteins and Lipids.
5. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid.
6. Separation of amino acids or proteins by paper chromatography.
7. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of Km and Vmax.
8. Determination of the activity of enzyme (Urease) - Effect of temperature and time.
9. Action of salivary amylase under optimum conditions.
10. Quantitative estimation of Oxygen consumption by fresh water Crab.
11. Quantitative estimation of salt gain and salt loss by fresh water.
12. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer.
13. Counting of RBC in blood using Hemocytometer.
14. Counting of WBC in blood using Hemocytometer.
15. Differential staining of human blood corpuscles using Leishman stain.
16. Recording of blood glucose level by using glucometer.

Virtual Labs (Suggestive sites)

<https://www.vlab.co.in>

<https://zoologysan.blogspot.com> www.vlab.iitb.ac.in/vlab

www.onlinelabs.in www.powershow.com <https://vlab.amrita.edu>

<https://sites.dartmouth.edu>

General instructions:

1. Perform all the experiments as per the instructions in each questions.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination.

1. Major Experiments	08 Marks
2. Minor Experiments	05 Marks
3. Identifications (A-C)	06 Marks
4. Viva	03 Marks
5. Journal	03 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols I & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003)
Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima I physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume I & 2, 11th edition, CBS Publishers (2016).

B.Sc. Semester – II

Subject: ZOOLOGY Open Elective Course (OEC-2) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: Parasitology

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1: Know the stages of the life cycles of the parasites and infective stages.
- CO 2: Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.
- CO 3: Develop skills and realize significance of diagnosis of parasitic infection and treatment.
- CO 4: Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
- CO 5: Develop their future career in medical sciences and related administrative services.

Syllabus- OEC: Title- Parasitology	Total Hrs: 42
Unit-I General Concepts Parasitic Platyhelminthes and Parasitic Protists	14 hrs
Introduction, Parasites, parasitoids, host, zoonosis, Origin and evolution of parasites, Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism, Host-parasite interactions and adaptations, Life cycle of human parasites, Occurrence, mode of infection and prophylaxis Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of <i>Fasciolopsis buski</i> , <i>Schistosoma haematobium</i> , <i>Taenia solium</i> , <i>Hymenolepis nana</i> Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of, <i>Entamoeba histolytica</i> , <i>Giardia intestinalis</i> , <i>Trypanosoma gambiense</i> , <i>Plasmodium vivax</i> .	
Unit-II Parasitic Nematodes, Arthropods and Vertebrates	14 hrs
Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> , <i>Wuchereria bancrofti</i> , <i>Trichinella spiralis</i> , Nematode plant interaction ; Gall formation Biology, importance and control of Ticks (Soft tick <i>Ornithodoros</i> , Hard tick <i>Ixodes</i>), Mites (<i>Sarcoptes</i>), Lice (<i>Pediculus</i>), Flea (<i>Xenopsylla</i>), Bug (<i>Cimex</i>), Parasitoid (Beetles) Cookicutter Shark, Hood Mocking bird and Vampire bat and their parasitic behavior and effect on host.	

Unit-III Molecular diagnosis and clinical parasitology	14 hrs
General concept of molecular diagnosis for parasitic infection, Advantages and disadvantages of molecular diagnosis Fundamental techniques used in molecular diagnosis of endoparasites Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like <i>G.intestinalis</i> , <i>B. coli</i> , <i>E. histolytica</i> , <i>L.donovani</i> , Malaria parasite using ELISA, RIA, Counter Current Immunoelectrophoresis (CCI), Complement Fixation Test (CFT) PCR, DNA, RNA probe.	

Books recommended.

1. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors.
2. E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea &Febiger.
3. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
4. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
5. Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers.
6. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
7. Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. Wiley Blackwell.
8. Noble, E. R. and G.A.Noble (1982) Parasitology: The biology of animal parasites. V th Edition, Lea &Febiger.
9. Paniker, C.K.J., Ghosh, S. [Ed] (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
10. Parija, S.C. Textbook of medical parasitology, protozoology & helminthology (Text and color Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
11. Roberts, L.S and Janovy, J. (2009). Smith & Robert's Foundation of Parasitology. 8th. Edn. McGraw Hill.
12. Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
13. Chandler, A. C. and Read. C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley and Sons Inc.
14. Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando. U.S.A.
15. Schmidt, G. D. and Roberts, L. S. (2001). Foundation of Parasitology. 3rd ed. McGraw Hill Publishers.
16. Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers (Indian print 1990, Universal Book Stall).
17. John Hyde (1996) Molecular Parasitology Open University Press.
18. J Joseph Marr and Miklos Muller (1995) Biochemistry and Molecular Biology of Parasites 2nd Edn Academic Press.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

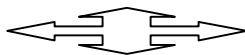
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ
ಗೆ.

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

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ಕುಲಸಚಿವರು.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: MICROBIOLOGY

[Effective from 2021-22]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,
OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and
SKILL ENHANCEMENT COURSE (SEC) FOR SEM I**

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Microbiology for B.Sc. (Hons.)
Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

*** Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected**

Name of Course (Subject): Microbiology

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Microbiology students will be able to:

- PSO 1:** Gain Knowledge and understanding of concepts of microbiology and its application in **pharma, food, agriculture, beverages, nutraceutical industries**. Knowledge on history, general characters and classification of Microorganisms, Understanding the microbiological techniques, cultivation and detection of microorganisms. Comprehend evolutionary importance and economic significance of microorganisms and microbiology. Understand the distribution, morphology and physiology of microorganisms and demonstrate the skills in aseptic handling of microbes including isolation, identification and maintenance.
- PSO 2:** To develop understanding about Biochemistry, enzymes, microbial metabolism, growth and bioenergetics. Students will become efficient in managerial skills, able to employ analytical reasoning, problems solving and interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry-level position in Microbiology.
- PSO 3:** Competent to apply the knowledge gained for conserving the environment and resolving the environmental related issues.
- PSO 4:** Learning and practicing professional skills in handling microbes and contaminants in laboratories and production sectors.
- PSO 5:** Exploring the microbial world and analyzing the specific benefits and challenges.
- PSO 6:** Applying the knowledge acquired to undertake studies and identify specific remedial measures for the challenges in health, agriculture, and food sectors.
- PSO 7:** Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.
- PSO 8:** Understanding biochemical and physiological aspects of microbes and developing broader perspective to identify innovative solutions for present and future challenges posed by microbes.
- PSO 9:** Understanding and application of microbial principles in forensic and working, knowledge about clinical microbiology. Enhance and demonstrate analytical skills and apply basic computational and statistical techniques in the field of microbiology.
- PSO 10:** Demonstrate the ability to identify ethical issues related to recombinant DNA technology, GMOs, intellectual property rights, bio-safety and biohazards. Demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyze outcomes by adopting scientific methods, thereby improving the employability.

B.Sc. Semester – I

Subject: Microbiology Discipline Specific Course (DSC)

The course Microbiology in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): DSC-1T MBL 101: General Microbiology

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1** : At the end of the course the student will have broad and balanced knowledge of Microbiology, history, general characters and classification of Microorganisms, Viz-Bacteria, Fungi, algae, protozoa and virus,
- CO 2** : Understanding the microbiological techniques, cultivation and detection of microorganisms.
- CO 3** : Comprehend evolutionary importance and economic significance of microorganisms and microbiology.
- CO 4** : Learning and practicing professional skills in handling microbes. Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control..

Syllabus- Course 1(Theory): Title- DSC-1T, MBL 101, General Microbiology	Total Hrs: 56
Unit-I Introduction to Microbiology and Microscopy	14 hrs
Chapter No.1: History of Microbiology Microbes and origin of life. History, scope and relevance of microbiology as a modern science. Branches of Microbiology, Contribution of Scientists in the field of microbiology- Antonie von Leuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch and others.	5 Hrs
Chapter No. 2 Taxonomy Haeckel's Three Kingdom system, Whittaker's Five kingdoms classifications - Monera. Protista, Fungi, Plantae and Animalia. Principles and methods of classification. Different trends in classification of microorganisms	4 Hrs

Unit 4: Microbial Diversity	14 Hrs
Chapter No. 10: Microbial Interactions. Basic principles and types of interactions among microorganisms. Inter and Intraspecific interactions. Merits and demerits of microbial interactions.	4 Hrs
Chapter No. 11: Microbial Ecology Ecology of Microbial cells and population ecology. Distribution and Significance of Microorganisms in air, water and soil	4 Hrs
Chapter No. 12 Bio-productivity Concepts and scope Methods used in the study of microbial diversity. Different levels of assessment and measure of microbial diversity, Factors influencing microbial diversity. Diversity as a source of innovation. Various approaches to improve microbial diversity and bio-productivity	5 Hrs

Books recommended.

1. Aneja K R 2017: Experimental in Microbiology Plant Pathology and Biotechnology. 5th Edition, New age International. New Delhi
2. Pelczar, Jr. Michael J. (2018). "Microbiology" 6thedn., Tata MaGraw HillBook Co. New York.
3. Ronald M Atlas, Richard Bartha, and David Atlas 1998: Microbial Ecology: Fundamentals and application 2nd Edition McMillan publishing Co. New York
4. Josephine A. Morello Paul A. Granato Helen Eckel Mizer (2003)."Laboratory Manual and Workbook in Microbiology". The McGraw–Hill Companies.
5. Atlas, R. M. (1997). "Principles of Microbiology". 2nd edition. WM.T. Brown Publishers Cappuccino, J.G and Shermani, N - 1999 "Microbiology" - a laboratory Manual Adeliason Wesley.
6. Bhattacharya. (1986)."Experiments with microorganisms" - Emkay Publishers.
7. Cappuccino. J. and Sherman, N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
8. Carter, J. and Saunders, V. (2007). "Virology: Principles and Applications". John Wiley and Sons
9. Vos, P., Goodfellow, M., Brenner, D. J., Castenholz, R. W. (2001). Bergey's Manual@of Systematic Bacteriology: Volume Two: The Proteobacteria (PartC). Germany: Springer.
10. Kumar, H. D and Swati Kumar 2004: Modern concepts of Microbiology. 2nd Edition, Vikas Publishing House Pvt. Ltd. New Delhi
11. Dubey, R. C. and Maheshawari, D.K, (2013). "Text book of Microbiology" S Chand and company limited, Ramnagar, New Delhi.
12. Edward Alcamo T. (1997)."Fundamental of Microbiology - 5th edn., Adlison Wesley Longman Inc. New York.
13. Gunashekar, P. (2009)."Laboratory Manual in Microbiology"New Age Intl Ltd.
14. Madigan, M.T. Martinko, J.M and Parker, J.(1997)."Biology of Microorganisms-8th edn., McGraw Hill Inc. New York.
15. Nelson David, L and Cox Michael, M., Lehninger. (2008). "Principles of Biochemistry" Macmillan Press, Worth Publishers, New Delhi.
16. Powar and Daginwala (1994)"Microbiology" - Vol I and II. Himalaya Publication, New York.
17. Salle, A.J. (2007)."Fundamental Principles of Bacteriology" Tata McGraw Hill Publishing Company Ltd., New Delhi.
18. Srivastava, S. and Srivastava, P. S. (2003). "Understanding Bacteria". Kluwer Academic Publishers, Dordrecht.
19. Stanier, R. Y., Ingraham, J. L., Wheelis, M. L. and Painter, P. R. (2005). "General Microbiology". 5th edition McMillan.
20. Sullia S. Band Shantaram. S. (1998)"General Microbiology" Oxford and IBH Publishing Co PvtLtd. New Delhi.
21. Sundara R. Rajan. (2013)."Tools and Techniques of Microbiology" - Anmol Publications.
22. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition. Pearson Education.
23. Peleczar, M.J.. Chan. E.C.S and Krieg, N.R. (2020)"Microbiology"7th Edition. Tata MaGraw HillBook.
24. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. (2021). "Brock Biology of Microorganisms", 14th Edition.Pearson.
25. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
26. Stuart Hogg. (2013). "Essential Microbiology" 2nd Edition. Wiley-Blackwel

B.Sc. Semester – I

Subject: Microbiology Discipline Specific Course (DSCI)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **PAPER MB DSC-1P – General Microbiology (4 hrs/week)**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1: Learning and practicing professional skills in handling microbes.

CO 2: Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.

CO 3: To develop in students a range of practical skills so that they can understand and assess risks and work safely

List of the Experiments for 52 hrs / Semesters

1. Laboratory safety: General rules and regulations.
2. Study of Microscope - Structure and working principles of Light microscope
3. Demonstrations of laboratory instruments: Autoclave, hot air oven, incubator, Laminar Air Flow, Centrifuge, pH meter, Colorimeter and Spectrophotometer..
4. Cleaning and sterilization of glassware.
5. Preparation of culture media - Broth, Semisolid and solid media. Isolation and Enumeration of microorganisms using serial dilution, Pour plate. Streak plate and spread plate techniques..
6. Isolation of microorganisms from air, water and soil and studying their characteristics.
7. Staining methods - Simple staining, Grams staining, Acid fast staining and structural staining.
8. Microscopic observations of Prokaryotes and Eukaryotes: Bacteria. Cyanobacteria, Protozoa, Fungi and Algae.
9. Study of Bacterial Motility by Hanging drop method
10. Micrometry and Camera lucida.
11. Counting of yeast cells and fungal spores by Haemocytometer.
12. Demonstration of slide culture technique of fungi
13. Demonstration of Chromatographic techniques (Paper Chromatography)

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 10 Marks
2. Minor Question ----- 06 Marks
3. Identify and comment ----- 3X1 = 03 Marks
4. Viva-----03Marks
5. Journal----- 03Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment examination) OE 1T MBL Human Microbial Diseases

Books recommended.

1. Aneja K R 2017: Experimental in Microbiology Plant Pathology and Biotechnology. 5th Edition, New age International. New Delhi
2. Pelczar, Jr. Michael J. (2018). "Microbiology" 6thedn., Tata MaGraw HillBook Co. New York.
3. Ronald M Atlas, Richard Bartha, and David Atlas 1998: Microbial Ecology: Fundamentals and application 2nd Edition McMillan publishing Co. New York
4. Josephine A. Morello Paul A. Granato Helen Eckel Mizer (2003)."Laboratory Manual and Workbook in Microbiology". The McGraw–Hill Companies.
5. Atlas, R. M. (1997). "Principles of Microbiology". 2nd edition. WM.T. Brown Publishers Cappuccino, J.G and Shermani, N - 1999 "Microbiology" - a laboratory Manual Adelson Wesley.
6. Bhattacharya. (1986)."Experiments with microorganisms" - Emkay Publishers

B.Sc. Semester – I

Subject: Microbiology Open Elective Course (OEC-1) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course **OE 1T MBL Human Microbial Diseases**

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1** : Knowledge and understanding of the disease causing microorganisms.
- CO 2** : Learning and practicing professional skills in handling microbes and diagnosing disease.
- CO 3** : Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality and disease control

Syllabus- OEC: Title- OE 1T MBL Human Microbial Diseases	Total Hrs: 42
Unit-I	11 hrs
Introduction to medical microbiology: History and Development of Medical Microbiology. Normal flora of human body-skin, oral cavity, respiratory tract and urogenital tract. Infection-types of infection, modes of disease transmission, portal of entry of pathogen. Pathogenesis, virulence, attenuation and exaltation with an example each. Collection, transport and culturing of clinical samples.	
Unit-II	10 hrs
Bacterial diseases: Cultural and biochemical characteristics, pathogenesis, symptoms, mode of transmission, prophylaxis and control of Respiratory diseases (<i>Streptococcus pyogenes</i> , <i>Mycobacterium tuberculosis</i>). Gastrointestinal diseases: <i>Salmonella typhi</i> , <i>Helicobacter pylori</i> Others: <i>Bacillus anthracis</i> , <i>Treponema pallidum</i> .	
Unit-III	10 hrs
Fungal and Protozoan disease Pathogenesis, clinical symptoms, laboratory diagnosis, epidemiology, prophylaxis and treatment of Viral diseases (Dengue, AIDS and Rabies). A brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis. Fungal diseases-transmission, symptoms and prevention of cutaneous mycoses (Athlete's foot), systemic mycoses (Histoplasmosis) and opportunistic mycoses (Candidiasis). Protozoan diseases (Malaria, Kala-azar).	

Unit-IV	11 hrs
Anti microbial agents: General characteristics, and of types antibacterial agents. Mode of action of Antibacterial (Penicillin, Streptomycin) Antifungal (polyenes, flucytosine, the imidazoles, and triazoles), antiviral-Acycloguanosine. Antibiotic resistance, MDR, XDR, MRSA, NDM-1.	

Books recommended.

1. Ananthanarayan, R. and Paniker, C.K.J. (2018). "Textbook of Microbiology". 8th edition, University Press Publication.
2. Goering, R., Dockrell Richard A., Kindt Thomas J. and Osborne Barbara A., Kuby, (2005) Immunology, W. H. Freeman and Company, H., Zuckerman, M. and Wakelin D. (2007).
3. Richard V Goering, Cedric A Mims. (2008). Mims' "Medical Microbiology". 4th edition. Elsevier.
4. Gupte, S.M.D.(1986)."The short text book of Medical Microbiology"⁷ Jaypee Brothers Medical Publishers New Delhi..
5. Jagadish Chandra, (1996). "Text Book of Medical Mycology". Orient Longman.
6. Jayaram Panicker, C.K. (1993). "Text Book of Medical Parasitology" Jaypee Brothers, Medical Publishers, New Delhi.
7. Kenneth Jr. (2001) "Medical Microbiology-Introduction to Infection Diseases" Prentice Hall International.
8. Madigan, M. T., Martinko, J. M., Dunlap, P. V. and Clark, D. P. (2014). "Brock Biology of Microorganisms". 14th edition. Pearson International Edition.
9. Peakman, M. and Vergani, D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg..
10. Richard, C. and Geiffrey, S. (2009). "Immunology". 6th edition. Wiley Blackwell Publication.
11. Roitt, I.M., (2016) "Essentials of Immunology", ELBS, Blackwell Scientific Publishers, London.
12. Sengupta, J. (1988)."Synopsis of Clinical Pathology and Microbiology" Hilton and Co. Culcatta.
13. Topley and Wilson (2001) "Principles of Bacteriology. Virology and Immunity" Edward Arnold. Greenwood. David, Richards. C and Slack B. "Medical Microbiology".
14. Prescott's Microbiology (2020).Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition. New York, NY : McGraw-Hill Education
15. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition.Pearson Education.
16. Arun K. Bhunia. (2018). "Foodborne Microbial Pathogens" 2nd Edition. Springer New York
17. Patricia Tille. (2015). "Baileys and scott's diagnostic microbiology" 14th Edition. Elsevier.
18. Kenneth Ryan and Nafees Ahmad and J. Andrew Alspaugh and W. Lawrence Drew and Megan Reller. (2018)."Sherris Medical Microbiology" MC Graw Hill education.
19. Stefan Riedel, Jeffery A. Hobden, Steve Miller, Stephen A. Morse, Timothy A. Mietzner, Barbara Detrick, Thomas G. Mitchell, Judy A. Sakanari, Peter Hotez, Rojelio Mejia. (2019). "Jawetz, Melnick, & Adelberg's Medical Microbiology" 28th E. MC Graw Hill education.

B.Sc. Semester - I

Subject: Microbiology SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: SEC 1T, MBL Microbial Analytical Techniques and quality control

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

CO 1 : Learning and practicing professional skills in handling microbes.

CO 2 : Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control..

CO 3 : To develop in students a range of practical skills so that they can understand and assess risks and work safely

CO 4 To provide students with industrial problem based knowledge and skill towards employment or higher education in Biotechnology or multi-disciplinary areas involving different branches of sciences

Theory Units

Syllabus- Title of : SEC 1T, MBL Microbial Analytical Techniques and quality control	Total Hrs: 30 1hour Theory followed by 2 hours practical
Unit-I Biosafety:	08 hrs
Good laboratory practices, Good microbiological practices Biosafety cabinets; Working of biosafety cabinets, using protective clothing, specification for BSL1, BSL-2, BSL-3. Discarding biohazardous waste-Methodology of Disinfection, Autoclaving & Incineration.	
Unit-II Determining Microbes in Samples	08 hrs
Culture and microscopic methods- Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products. Molecular methods - Nucleic acid probes, PCR based detection, biosensors.	
Unit-III Viral, Microbiological quality analysis of Food and Water:	07 hrs
Enrichment culture technique, Detection of specific microorganisms- on XLD agar, Salmonella Shigella Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Dextrose Agar. Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).	

Unit-IV Food safety and Standard:	07 hrs
HACCP for Food Safety and Microbial Standards. Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations Microbial Standards for Different Foods and Water-BIS standards for common foods and drinking water.	

List of the Experiments for the Semester

SEC-1P

Practicals: Microbiological analytical techniques and quality control

1. Isolation and enumeration of microorganisms from food utensils.
2. Isolation and enumeration of bacteria/fungi from spoiled vegetables/fruits.
3. Quantitative examination of bacteria in raw and pasteurized milk by SPC method.
4. Turbidity test to detect efficiency of sterilization.
5. Methylene blue reductase test and Resazurin test to determine the quality of milk.
6. Determination of efficiency of Pasteurization by Phosphatase test.
7. Casien hydrolysis test.
8. Litmus milk test.
9. Estimation of % of lactic acid present in given fermented dairy products.
10. Visit to food industries/ food research laboratories, dairy industries and distilleries.

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 10 Marks
2. Minor Question ----- 06 Marks
3. Identify and comment ----- 3X1 = 03 Marks
4. Viva-----03Marks
5. Journal----- 03Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Baird, R. M., Hodges, N. A. and Denyer, S. P. (2005). Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
2. Garg, N., Garg, K. L. and Mukerji, K. G. (2010). Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Harrigan, W. F. (1998). Laboratory Methods in Food Microbiology, 3rd ed. Academic Press.
4. Jay, J. M., Loessner, M. J., Golden, D. A. (2005). Modern Food Microbiology, 7th edition. Springer.
5. TimSandle.(2015). "Pharmaceutical Microbiology: essentials for quality assurance and quality control".Woodhead Publishing.
6. Frederick Kavanagh (Herausgeber).(2014).Analytical Microbiology. Elsevier Science .
7. David Roesti, Marcel Goverde. (2019). Pharmaceutical Microbiological Quality Assurance and Control: Practical Guide for Non Sterile Manufacturing. Willey.
8. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
9. Dubey, R. C. and Maheshawari, D.K, (2013). Text book of Microbiology, S Chand and company limited, Ramnagar, New Delhi.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

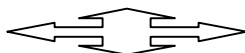
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – II

Subject: Microbiology Discipline Specific Course (DSC)

The course Microbiology in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): Microbiology

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1 : Develop thorough knowledge and understanding of concepts of Biochemistry, enzymes, microbial metabolism, growth, bioenergetics and physiology ...

CO 2 : Students will become efficient in managerial skills,

CO 3 able to employ analytical reasoning, problems solving, interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry- level position in Microbiology

Syllabus- Course 2(Theory): Title- MB DSC-2T - Microbial Biochemistry and Enzymology	Total Hrs: 56
Unit – I Biomolecules	18 hrs
Chapter No.1: Carbohydrates Chemical and molecular basis of life- Monomer, multimer and polymeric units. A brief account of the properties, classification, characteristics and importance of Carbohydrates	5 Hrs
Chapter No. 2: Proteins Classification, general characteristics and properties of amino acid and proteins. Structural organization and significance of proteins.	5 Hrs
Chapter No. 3: Lipids Classification, General characteristics and properties of Lipids	4 Hrs
Chapter No. 4: Nucleic acids: General characteristics, Structure, types and significance of nucleic acids.	4 Hrs
Unit - II: Enzymology	10 Hrs
Chapter No. 5: Enzymes Nomenclature, classification, Characteristics and properties of enzymes. Enzyme kinetics-Michaeli's and Menten equation. Factors affecting enzyme activity-Competitive and non competitive inhibition and allosteric enzymes, cofactors, coenzymes, Ribozymes and their importance, clinical importance of enzymes.	6 Hrs
Chapter No. 6: Enzyme Regulation Types, modes and mechanism of enzyme action, factors affecting enzyme action, enzyme regulation.	4 Hrs

Unit III: Bioenergetics	14 Hrs
Chapter No. 7: Thermodynamics Laws of thermodynamics, Free energy, ATP and its production, other high-energy compounds, Oxidation and reduction reactions.	4 Hrs
Chapter No. 8: Energy yielding process Glycolysis, Outline of TCA cycle, Electron transport chain, Oxidative phosphorylation, Oxidation (alpha, beta and Omega oxidation pathway). Amino acid degradation (Transamination. Deamination and Decarboxylation). Anaerobic respiration Alcoholic, Lactic and acetic acid fermentation.	6 Hrs
Chapter No. 9: Bacterial Photosynthesis of bacterial photosynthesis, Photosynthetic pigments. Light reactions. Dark reaction, Comparison of photosynthesis in green plants and bacteria, Oxygenic and Anoxygenic Photosynthesis. Mechanism of photosynthetic bacteria.	4 Hrs
Unit IV: Microbial Metabolism	14 Hrs
Chapter No. 10: Chemoheterotrophic Metabolism Concept and types of aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle, Electron transport chain- uncouplers and inhibitors. Pasteur effect.	4 Hrs
Chapter No. 11: Nitrogen and Lipids metabolism Biological nitrogen fixation-symbiotic and asymbiotic nitrogen fixation, nodule formation, mechanism and biochemistry of N ₂ fixation, nitrification and denitrification. A brief account on lipid metabolism-biosynthesis of triglycerides, β -oxidation.	4 Hrs
Chapter No. 12: Microbial Nutrition and Growth Nutritional requirements, modes of nutrition – Autotrophs, Heterotrophs, Phototrophs. chemotrophs, methanotrophs, organotrophs and saprotrophs. Microbial Growth: Growth Rate, generation time and growth curve - phases of growth and their significance physical and chemical factors affecting growth - Temperature, Light. pH, Oxygen and saline requirements. Measurement of growth by cell number, cell mass and cell viability.	6 Hrs

Books recommended.

1. Nelson David, L and Cox Michael, M., Lehninger, (2008). "Principles of Biochemistry". Macmillan Press, Worth Publishers, New Delhi.
2. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
3. Hrudayanath Thatoi, Pradeep K. Das Mohapatra, Sonali Mohapatra Keshab C. Mondal.. (2020). "Microbial Fermentation and Enzyme Technology" CRC press Taylor and Francis group.
4. Atlas, R. M. (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers Cappuccino, J.G and Shermani, N. (1999). "Microbiology - a laboratory Manual Adelioston Wesley.
5. G. N. Cohen. (2014). "Microbial Biochemistry" 3rd Edition. Springer Nature.
6. Goutam Brahmachari. (2016). "Biotechnology of Microbial Enzymes" 1st Edition. London, UK : Academic Press
7. Jose Luis Barredo. (2005). "Microbial Enzymes and Biotransformations" (Methods in Biotechnology) Humana Press.
8. Dubey, R. C. and Maheshwari, D.K, (2013). "Text book of Microbiology", S Chand and company limited, Ramnagar, New Delhi.
9. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition. Pearson Education.
10. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. (2021). "Brock Biology of Microorganisms", 14th Edition. Pearson.
11. Cooper T.G. (1997). "The tools of Biochemistry" John Wiley and sons.
12. Peleczar, M.J.. Chan. E.C.S and Krieg, N.R. (2020) "Microbiology" 7th Edition. Tata MaGraw HillBook

B.Sc. Semester – II

Subject: Microbiology
Discipline Specific Course (DSC)
Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **PRACTICAL II**
PAPER DSC-2P Microbial Biochemistry and Enzymology (4 hrs / week)

Course Outcome (CO):

After completion of course (Practical), students will be able to

- CO 1** Develop thorough knowledge and understanding of concepts of Biochemistry, enzymes, microbial metabolism, growth, bioenergetics and physiology ...
- CO 2** : Students will become efficient in managerial skills,
- CO 3** : able to employ analytical reasoning, problems solving, interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry- level position in Microbiology

List of the Experiments for 52 hrs / Semesters

PRACTICAL II

PAPER DSC-2P Microbial Biochemistry and Enzymology

1. Qualitative tests for the detection of Carbohydrates
Glucose - Benedict's test, Molisch's test, Fehling's test and Picric acid test.
2. Qualitative tests for Proteins and Amino acids
Protein -Biurette test. Ninhydrin test. Millons test and Xantho protein test.
3. Qualitative tests for Lipids
Lipids - Acrolein test. Sudan III test, emulsification test and solubility test.
4. Colorimetric estimation of sugar by DNS method.
5. Colorimetric estimation of protein by burette method.
6. Study of Bacterial Growth curve and Measurement of growth by cell mass using turbidometer/ photocolourimeter/ spectrophotometer.
7. Estimation of Saponification value of oils.
8. Biochemical tests for the identification of bacteria
 - a) IMViC
 - b) Fermentation of glucose, sucrose and lactose - Acid and gas production.
 - c) Starch hydrolysis
 - d) Gelatin hydrolysis
 - e) Catalase test
9. Effect of pH and temperature on bacterial growth.
10. Assay of salivary amylase by DNS method, determination of specific activity.
11. Effect of pH on enzyme activity
12. Effect of temperature on enzyme activity

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 10 Marks
2. Minor Question ----- 06 Marks
3. Identify and comment ----- 3X1 = 03 Marks
4. Viva-----03Marks
5. Journal----- 03Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. G. N. Cohen. (2014). "Microbial Biochemistry" 3rd Edition. Springer Nature.
2. Goutam Brahmachari. (2016). "Biotechnology of Microbial Enzymes"1st Edition.London, UK : Academic Press
3. Jose Luis Barredo. (2005). "Microbial Enzymes and Biotransformations" (Methods in Biotechnology) Humana Press.
4. Dubey, R. C. and Maheshawari, D.K, (2013). "Text book of Microbiology", S Chand and company limited, Ramnagar, New Delhi.
5. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition.Pearson Education.
6. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. (2021). "Brock Biology of Microorganisms", 14th Edition.Pearson.
7. Cooper T.G. (1997). "The tools of Biochemistry" John Wiley and sons.

B.Sc. Semester – II

Subject: Microbiology Open Elective Course (OEC-2) (OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course **OE-2T MBL Food borne microbial infections**

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1** : Thorough knowledge and understanding of concepts of Food microbiology, principles of food preservation and spoilage of foods
- CO 2** : Dairy Microbiological techniques and its application in different microbiological industries.
- CO 3** : They will be well aware of the food borne outbreaks and handle them accordingly

Syllabus- OEC: Title- OE-2T MBL Food borne microbial infections	Total Hrs: 42
Unit –I	11 Hrs
Spoilage of food: Food as a substrate for growth of microorganisms. Intrinsic and extrinsic factors that affect growth and survival of microbes in foods. Sources of contamination. Groups of bacteria important in food bacteriology. Microbial spoilage and preservation of fruits, vegetables, meat, poultry, fish and canned foods.	
Unit –II	10 Hrs
Principles and methods of food preservation: Physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids (propionates, benzoates, sorbates), SO ₂ , nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.	
Unit –III	10 Hrs
Microbiology of milk: Sources of contamination of milk. Methods to detect microbial quality by SPC, Reductase test, Phosphatase test, clot on boiling test. Biochemical changes of milk-souring, gassy fermentation, proteolysis, lipolysis, ropiness. Starter culture and its role. Therapeutic value of Yoghurt, Butter milk. Cheese (preparation and types). Preservation of milk and milk products-Pasteurization.	
Unit -IV	11 Hrs
Food infection and safety: Food infection (Salmonellosis, Shigellosis, <i>Yersinia enterocolitica</i> & <i>Listeria monocytogenes</i>) Food intoxication- (Aflatoxin, Staphylococcal Intoxication & Botulism). Food safety and quality control- brief account of HACCP, FSSAI and Food safety and standard act 2006.	

Books recommended.

1. Baird, R. M., Hodges, N. A. and Denyer, S. P. (2005). Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
2. Garg, N., Garg, K. L. and Mukerji, K. G. (2010). Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Harrigan, W. F. (1998). Laboratory Methods in Food Microbiology, 3rd ed. Academic Press.
4. Jay, J. M., Loessner, M. J., Golden, D. A. (2005). Modern Food Microbiology, 7th edition. Springer.
5. Arun K. Bhunia. (2018). "Foodborne Microbial Pathogens" 2nd Edition. Springer New York
6. Patricia Tille. (2015). "Baileys and scott's diagnostic microbiology" 14th Edition. Elsevier.
7. Kenneth Ryan and Nafees Ahmad and J. Andrew Alspaugh and W. Lawrence Drew and Megan Reller. (2018). "Sherris Medical Microbiology" MC Graw Hill education.
8. Stefan Riedel, Jeffery A. Hobden, Steve Miller, Stephen A. Morse, Timothy A. Mietzner, Barbara Detrick, Thomas G. Mitchell, Judy A. Sakanari, Peter Hotez, Rojelio Mejia. (2019). "Jawetz, Melnick, & Adelberg's Medical Microbiology" 28th E. MC Graw Hill education.
9. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2021). Microbiology: An Introduction, 13th Edition. Pearson Education.
10. Joanne Willey and Kathleen Sandman and Dorothy Wood Eleventh edition.(2020). "Prescott's Microbiology". New York, NY : McGraw-Hill Education.
11. Arun K. Bhunia. (2018). "Food borne Microbial Pathogens" 2nd Edition. Springer New York
12. Patricia Tille. (2015). "Baileys and Scott's diagnostic microbiology" 14th Edition. Elsevier.
13. Kenneth Ryan and Nafees Ahmad and J. Andrew Alspaugh and W. Lawrence Drew and Megan Reller. (2018). "Sherris Medical Microbiology" MC Graw Hill education.
14. Stefan Riedel, Jeffery A. Hobden, Steve Miller, Stephen A. Morse, Timothy A. Mietzner, Barbara Detrick, Thomas G. Mitchell, Judy A. Sakanari, Peter Hotez, Rojelio Mejia. (2019). "Jawetz, Melnick, & Adelberg's Medical Microbiology" 28th E. MC Graw Hill education.
15. Aneja K. R. (2018) Modern Food Microbiology. Medtech; 1st edition

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

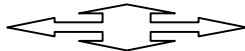
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ - 580003

NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮಿಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಆಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತಿಗಳು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಮಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

B.Sc. (Hons) Programme

DRAFT SYLLABUS FOR

BIOTECHNOLOGY

DISCIPLINE SPECIFIC COURSE (DSCC), OPEN ELECTIVE COURSE

(OEC) FOR SEM III & IV

UNDER

NATIONAL EDUCATION POLICY (NEP)

Effective from 2022-23

Karnatak University, Dharwad

B.Sc. Semester-III

Subject: Biotechnology

Discipline Specific Course (DSCC)

Course No.BIT103T

Title of the Course: Biomolecules (Theory)

The course Biomolecules in III semester has two papers(TheoryPaper-I for 04 credits & Practical Paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Detail of the courses are as under.

Course No./ Course code	Type of Course	Theory/Practical	Credits	Instruction Hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
BIT103T/033BIT011	DSCC	Theory	04	04	56hrs.	2hrs	40	60	100

Course Outcome (CO):

After completion of course(Theory), students will be able to:

CO1: Describe the structure and function of biomolecules

CO 2: Appreciate and illustrate the chemical composition of the genetic material and its multiplication

CO 3: Describe the process of gene expression in prokaryotes and eukaryotes

CO 4: Explain the concept of transposition, mutation and DNA repair mechanism

GEN103T: Biomolecules	Total Hrs:56
Unit-I	14hrs
<p>Carbohydrates: Introduction, sources, classification of carbohydrates. Structure, function and properties of carbohydrates. Monosaccharides – Isomerism and ring structure, Sugar derivatives – amino sugars and ascorbic acid</p> <p>Oligosaccharides – Sucrose and Fructose</p> <p>Polysaccharides – Classification as homo and heteropolysaccharides, Homopolysaccharides - storage polysaccharides (starch and glycogen- structure, reaction, properties), structural polysaccharides (cellulose and chitin-structure, properties), Heteropolysaccharides - glycoproteins and proteoglycans (Brief study). Metabolism: Glycolysis and gluconeogenesis, Kreb's cycle, oxidative phosphorylation.</p> <p>Amino Acids, Peptides and Proteins: Introduction, classification and structure of amino acids. Concept of – Zwitterion, isoelectric point, pKa values. Essential and nonessential amino acids. Peptide bond and peptide, classification of proteins based on structure and function, Structural organization of proteins [primary, secondary (α, β, tertiary and quaternary)]. Fibrous and globular</p>	

proteins, Denaturation and renaturation of proteins General aspects of amino acid metabolism: Transamination, deamination, decarboxylation and urea cycle.	
Unit-II	14hrs
<p>Lipids: Classification and function of lipids, properties (saponification value, acid value, iodine number, rancidity), Hydrogenation of fats and oils Saturated and unsaturated fatty acids. General structure and biological functions of - phospholipids, sphingolipids, glycolipids, lipoproteins, prostaglandins, cholesterol, ergosterol. Metabolism: Beta oxidation of fatty acids. Biosynthesis of cholesterol.</p> <p>Enzymes: Introduction, nomenclature and classification, enzyme kinetics, factors influencing enzyme activity, metalloenzymes, activation energy and transition state, enzyme activity, specific activity. Coenzymes and their functions (one reaction involving FMN, FAD, NAD). Enzyme inhibition- Irreversible and reversible (competitive, non-competitive and uncompetitive inhibition with an example each) Zymogens (trypsinogen, chymotrypsinogen and pepsinogen), Isozymes (LDH, Creatine kinase, Alkaline phosphatase and their clinical significance).</p>	
Unit-III	14hrs
<p>Vitamins: Water and fat-soluble vitamins, dietary source and biological role of vitamins Deficiency manifestation of vitamin A, B, C, D, E and K</p> <p>Nucleic acids: Structures of purines and pyrimidines, nucleosides, nucleotides in DNA de novo and salvage pathway of purine and pyrimidine synthesis.</p> <p>Hormones: Classification of hormones based on chemical nature and mechanism of action. Chemical structure and functions of the following hormones: Glucagon, Cortisone, Epinephrine, Testosterone and Estradiol.</p>	
Unit-IV	14hrs
<p>Bioanalytical tools :</p> <p>Chromatography: Principle, procedure and applications of - paper chromatography, thin layer chromatography, adsorption chromatography, ion exchange chromatography, gel filtration chromatography, affinity chromatography, gas liquid chromatography and high-performance liquid chromatography.</p> <p>Electrophoresis: Principle, procedure and applications of electrophoresis (paper electrophoresis, gel electrophoresis -PAGE, SDS- PAGE & agarose electrophoresis) and isoelectric focusing.</p> <p>Spectroscopy: UV-Visible spectrophotometry; mass spectroscopy, atomic absorption spectroscopy.</p>	

Books recommended :

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). *Lehninger principles of biochemistry*. Macmillan.
2. Voet, D., Voet, J. G., & Pratt, C. W. (2016). *Fundamentals of biochemistry: life at the molecular level*. John Wiley & Sons.
3. Satyanarayana, U. (2021). *Biochemistry, 6e-E-book*. Elsevier Health Sciences.
4. Campbell, M. K., Farrell, S. O., & McDougal, O. M. (2016). *Biochemistry*. Cengage Learning.
5. Walker, J. M. (2000). *Principles and techniques of practical biochemistry*. Cambridge University Press.

B.Sc. Semester-III

Subject: Biotechnology

Discipline Specific Course (DSCC)

Course No.-BIT1033P

Title of the Course: Biomolecules (Practical)

Course No.	Type of Course/ course code	Theory /Practical	Credits	Instruction Hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
GEN1033P / 033BIT012	DSCC	Practical	02	04	52hrs	3hrs	25	25	50

Course Outcome(CO):

After completion of course(Practical), students will be able to:

CO1: Acquire knowledge about biomolecules, structure, and their functions

CO2: Will be able to demonstrate the skills to perform bioanalytical techniques

CO3: Apply comprehensive innovation and skills of biomolecules to biotechnology field

List of the Experiments for 52hrs/Semesters

1. Introduction to basic instruments (Principle, standard operating procedure) with demonstration.
2. Definitions and calculations: Molarity, Molality, Normality, Mass percent % (w/w), Percent by volume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions. Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions.
3. Preparation of standard buffers by Henderson-Hasselbalch equation – Acetate, Phosphate, Tris and determination of pH of solution using pH meter.
4. Estimation of reducing sugars/ maltose by DNS method
5. Determination of α -amylase activity by DNS method
6. Estimation of proteins by Bradford method/ Biuret method
7. Estimation of amino acid by Ninhydrin method
8. Extraction of protein from soaked/sprouted green gram by salting out method
9. Separation of plant pigments by circular paper chromatography
10. Separation of amino acids by thin layer chromatography
11. Native PAGE
12. Determination of iodine number of lipids

**Other practical may be added according to requirement and feasibility*

Books recommended :

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt. Ltd. New Delhi, India
2. Biochemical Methods, 1st Edition, (1995), S. Sadashivam, A. Manickam; New Age International Publishers, India
3. Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing. House, New Delhi, ISBN 81-7319-302-9
4. Experimental Biochemistry: A Student Companion, Beedu Sasidhar Rao & Vijay Deshpande (ed). I. K. International Pvt. LTD, New Delhi. ISBN 81-88237-41-8
5. Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana ISBN 81-7663-067

General instructions:

Scheme of Practical Examination (distribution of marks):25 marks for Semester end examination

1. Major Question ----- 6Marks
2. Minor Question -----4Marks
3. Identification(A-E)-----8Marks
4. Viva -----2Marks
5. Journal-----5Marks

Total25marks

Note: Same Scheme may be used for IA(Formative Assessment)examination

B.Sc. Semester–III

Subject: Biotechnology

Open Elective Course (OEC)

(OEC for other students)

Course No.: BIT103E

Title of the Course: Nutrition and Health (Elective Theory)

Course No. / Course code	Type of Course	Theory /Practical	Credits	Instruction Hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
BIT103E 003BIT051	OEC	Theory	03	03	42hrs	2hrs	40	60	100

Course Outcome(CO):

After completion of course, students will be able to:

CO1: Study the concepts of food, nutrition, diet and health

CO2: To apply the best practices of food intake and dietary requirements

CO3: Acquire knowledge about various sources of nutrients and good Cooking practices

GEN103E: Nutrition and Health	Total Hrs:42
Unit-I	14hrs
Introduction: Concepts of nutrition and health. Definition of Food, Diet and nutrition, Food groups. Food pyramids. Functions of food. Balanced diet. Meal planning. Eat right concept. Functional foods, nutraceuticals, Prebiotics, Probiotics, and antioxidants	
Unit-II	14hrs
Nutrients: Macro and Micronutrients - Sources, functions and deficiency. Carbohydrates, Proteins, Fats – Sources and calories. Minerals –Calcium, Iron, Iodine. Vitamins – Fat soluble vitamins –A, D, E & K. Water soluble vitamins – vitamin C Thiamine, Riboflavin, Niacin. Water–Functions and water balance. Fiber –Functions and sources. Recommended Dietary Allowance, Body Mass Index and Basal Metabolic Rate	
Unit-III	14hrs
Nutrition and Health: Methods of cooking affecting nutritional value. Advantages and disadvantages. Boiling, steaming, pressure cooking. Oil/Fat – Shallow frying, deep frying. Baking. Nutrition through lifecycle. Nutritional requirement, dietary guidelines: Adulthood, Pregnancy, Lactation, Infancy- Complementary feeding, Pre-school, Adolescence, geriatric. Nutrition related metabolic disorders- diabetes and cardiovascular disease	

Books recommended :

1. Sri Lakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2. Sri Lakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan. C., Rama Sastry B.V., and S. C. Balasubramanian (2009), Nutritive value of Indian Foods. NIN.ICMR. Hyderabad.
5. Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi College Publishers

Details of Formative assessment (IA) for DSCC theory/OEC:40%weightage for total marks

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation &Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

Faculty of Science
04-Year UG Honors programme:2021-22

**GENERAL PATTERN OF THE THEORY QUESTION PAPER FOR DSCC/
 OEC
 (60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions :10 marks

Part-B

2. Question number 07-11 carries 05 Mark each. Answer any 04 questions :20 marks

Part-C

3. Question number 12-15 carries 10 Mark each. Answer any 03 questions :30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

B.Sc. Semester-IV

Subject: Biotechnology

Discipline Specific Course (DSCC)

Course No.: BIT104T

Title of the Course: Molecular Biology (Theory)

The course Human Genetics and Genetic Counselling in IVsemester has two papers (Theory Paper -I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are asunder.

Course No. / Course code	Type of Course / course code	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
BIT104T / 034BIT011	DSCC	Theory	04	04	56hrs	2hrs	40	60	100

Course Outcome(CO):

After completion of course(Theory), students will be able to:

- CO1:** Study the advancements in molecular biology with latest trends
- CO2:** Will acquire the knowledge of structure, functional relationship of proteins and nucleic acids
- CO3:** Aware about the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms.

Syllabus-Course4(Theory):Molecular Biology	Total Hrs:56
Unit-I	14hrs
Molecular basis of life and Nucleic Acids: An introduction RNA and experimental proof of DNA as genetic material and types of DNA. Structure and functions of DNA and RNA, Watson and Crick model of DNA and other forms of DNA (A and Z) functions of DNA and RNA including ribozymes. Recombination mechanisms - transformation, conjugation and transduction.	
Unit-II	14hrs
DNA Replication and Repair: Replication of DNA in prokaryotes and eukaryote- Enzymes and proteins involved in replication, Theta model, linear and rolling circle model. Polymerases and all enzyme components. The replication complex: Pre priming proteins, primosome, replisome, unique aspects of eukaryotic chromosome replication, Fidelity of replication DNA damage and Repair mechanism: photo reactivation, excision repair, mismatch repair and SOS repair.	

Unit-III	14hrs
<p>Transcription and RNA processing: Central dogma, RNA structure and types of RNA, Transcription in prokaryotes RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains.</p> <p>Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing</p>	
Unit-IV	14hrs
<p>Regulation of gene expression and translation: Genetic code and its characteristics, Wobble hypothesis Translation- in prokaryotes and eukaryotes- ribosome, enzymes and factors involved in translation. Mechanism of translation- activation of amino acid, aminoacyl tRNA synthesis, Mechanism- initiation, elongation and termination of polypeptide chain. Fidelity of translation, Inhibitors of translation. Protein folding and modifications, Post translational modifications of proteins.</p> <p>Gene regulation in prokaryotes - operon concept (lac and trp).</p> <p>Gene regulation in eukaryotes - transcriptional activation, galactose metabolism in yeast.</p>	

Books recommended :

1. Glick, B.R and Pasternak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press
2. Howe. C. (1995) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press
4. Rigby, P.W.J. (1987) Genetic Engineering Academic Press Inc. Florida, USA
5. Sambrook et al (2000) Molecular cloning Volumes I, II & III, Cold spring Harbor Laboratory Press New York, USA
6. Walker J. M. and Ging old, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry UK
7. Karp. G (2002) Cell & Molecular Biology, 3rdEdition, John Wiley & Sons; I

B.Sc. Semester – IV
Subject: Genetics Discipline Specific Course (DSCC)
Course No: BIT104P
Course Name: Molecular Biology (Practical)

Course No. / Course code	Type of Course	Theory /Practical	Credits	Instruction Hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
BIT104P /034BIT012	DSCC	Practical	02	04	52hrs.	3hrs	25	25	50

Course Outcome(CO):

After completion of course (Practical), students will be able to:

- CO 1** :Understand the techniques of nucleic acid estimation techniques
- CO 2** :Perform extraction, purification of proteins and its molecular weight detection
- CO 3** :Learn the process of reproduction in bacteria
- CO 4** : Understand nucleic acid replication and its types

List of the Experiments for 52hrs./Semesters

1. Preparation of DNA model
2. Estimation of DNA by DPA method
3. Estimation of RNA by Orcinol method
4. Column chromatography – gel filtration (Demo)
5. Extraction and partial purification of protein from plant source by Ammonium sulphate precipitation.
6. Extraction and partial purification of protein from animal source by organic solvents.
7. Protein separation by SDS-Polyacrylamide Gel Electrophoresis (PAGE)
8. Charts on- Conjugation, Transformation and Transduction, DNA replication, Types of RNA

Books recommended :

1. Glick, B.R and Pasternak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press
2. Howe. C. (1995) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press
4. Rigby, P.W.J. (1987) Genetic Engineering Academic Press Inc. Florida, USA
5. Sambrook et al (2000) Molecular cloning Volumes I, II & III, Cold spring Harbor Laboratory Press New York, USA
6. Walker J. M. and Ging old, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry UK
7. Karp. G (2002) Cell & Molecular Biology, 3rdEdition, John Wiley & Sons.

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 6Marks
2. Minor Question -----4Marks
3. Identification(A-E)-----8Marks
4. Viva -----2Marks
5. Journal-----5Marks

Total25marks

Note: Same Scheme may be used for IA(Formative Assessment)examination

B.Sc. Semester-IV

Subject: Biotechnology

Open Elective Course (OEC for other students)

Course No.:BIT104E

Title of the Course: Intellectual Property Rights

Course No. /Course code	Type of Course /Course code	Theory /Practical	Credits	Instruction Hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
BIT104E / 004BIT051	OEC	Theory	03	03	42hrs.	2hrs	40	60	100

Course Outcome(CO):

After completion of course, students will be having basic knowledge of:

CO 1 :Knowledge about need and scope of Intellectual property rights

CO 2 :Acquire knowledge about filing patents, process, and infringement

CO 3 :Knowledge about trademarks, industrial designs, and copyright

Syllabus-OEC4:Title-H Intellectual Property Rights	Total Hrs:42
Unit-I	14hrs
Introduction to Intellectual property rights (IPR): Genesis and scope. Types of Intellectual property rights - Patent, Trademarks, Copyright, Design, Trade secret, Geographical indicators, Plant variety protection. National and International agencies – WIPO, World Trade Organization (WTO), Trade-Related Aspects of Intellectual Property Rights (TRIPS), General Agreement on Tariffs and Trade (GATT)	
Unit-II	14hrs
Basics of patents - Types of patents; Patentable and Non-Patentable inventions, Process and Product patent. Indian Patent Act 1970; Recent amendments; Patent Cooperation Treaty (PCT) and implications. Process of patenting. Types of patent applications: Provisional and complete specifications; Concept of “prior art”, patent databases (USPTO, EPO, India). Financial assistance, schemes, and grants for patenting. Patent infringement- Case studies on patents (Basmati rice, Turmeric, Neem)	
Unit-III	14hrs
Trademarks- types, Purpose and function of trademarks, trademark registration, Protection of trademark. Copy right- Fundamentals of copyright law, Originality of material, rights of reproduction, industrial Designs: Protection, Kind of protection provided by industrial design	

Books recommended :

1. Manish Arora. 2007. Universal's Guide to Patents Law (English) 4th Edition) - Publisher: Universal Law Publishing House
2. Kalyan C. Kankanala. 2012. Fundamentals of Intellectual Property. Asia Law House
3. Ganguli, P. 2001. Intellectual Property Rights: Unleashing the knowledge economy. New Delhi: Tata McGraw-Hill Pub
4. World trade organization - <http://www.wto.org>
5. World Intellectual Property organization – www.wipo.intOffice of the comptroller general of Patents, Design & Trademarks - www.ipindia.nic.in

**Details of Formative assessment (IA) for DSCC
theory/OEC:40%weightagefortotalmarks**

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation &Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/ Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

**Faculty of Science
04-Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THE THEORY QUESTION PAPER FOR DSCC/
OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions :10m
arks

Part-B

2. Question number 07-11 carries 05 Mark each. Answer any 04 questions :20m
arks

Part-C

3. Question number 12-15 carries 10 Mark each. Answer any 03 questions :30marks
(Minimum 1 question from each unit and 10 marks question may have subque
stions for 7+3 or 6+4 or 5+5 if necessary)

Total:60Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ - 580003

NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಮಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 – Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Botany

[Effective from 2022-2023]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM III AND IV AND
OPEN ELECTIVE COURSE (OEC) FOR SEM III AND IV.**

AS PER NEP- 2020

KARNATAK UNIVERSITY, DHARWAD

**Four Years Under Graduate Program in Botany for B.Sc. (Hons.)
Effective from 2022-23**

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration Of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-3	Theory	03 hrs	42	02 hrs	40	60	100	03
IV	DSCC	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-4	Theory	03 hrs	42	02 hrs	40	60	100	03

B.Sc.: Semester – III
Subject: Botany
Theory: Discipline Specific Core Course (DSCC)

The Course Botany in III semester has two papers (Theory paper- 033 BOT 011 for 04 credits and Practical paper- 033 BOT 012 for 02 credits) for 06 credits: Both the papers are compulsory, Details of the courses are as

Course No.: 05
Course code (Theory): 033 BOT 011

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033 BOT 011	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Title of the Course and Code:
DSSC 033 BOT 011: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Course Outcomes:

On completion of this course, the students will be able to:

1. Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.
2. Skill development for the proper description of internal structure using botanical terms, their identification and further classification.
3. Induction of the enthusiasm on internal structure of locally available plants.
4. Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.
5. Observation and classification of the floral variations from the premises of college and house.
6. Understanding the various reproductive methods sub-stages in the life cycle of plants
7. Observation and classification of the embryological variations in angiosperms.
8. Enthusiasm to understand evolution based on the variations in reproduction among plants.

PLANT ANATOMY

Unit 1: ANGIOSPERM ANATOMY, PLANT CELL STRUCTURE AND TISSUES

14 Hrs

Introduction, objectives and scope of Plant Anatomy, Plant cell structure – nature of plant cell wall.

Tissue and tissue systems - meristematic tissue, permanent tissue and secretory cells.

Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem.

Apical meristem: Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.

Evolution and concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory continuing meristematic residue, cytohistological zonation).

Unit II: MORPHOGENESIS AND DIFFERENTIATION

14 Hrs.

Morphogenesis in plants - Differentiation of root, stem and leaf.

Types of vascular bundles and Vascular cambium, Origin, development, arrangement and diversity in size and shape of leaves.

Structure of Dicot root: primary and secondary structures (Tridax/Sunflower), Structure of monocot root (Maize).

Structure of Dicot stem: Primary and secondary structures (Tridax/Sunflower), Structure of Monocot stem (Maize), Nodal anatomy.

Structure of Dicot leaf: primary structure (Tridax/Sunflower), primary structure of Monocot leaf (Maize), Stomatal types. Anomalous secondary growth: Aristolochia, Boerhaavia (dicot stem) Dracaena (monocot stem)

Applications in systematics, forensics and Pharmacognosy.

DEVELOPMENT BIOLOGY

Unit III: Morphogenesis and Differentiation

14 Hrs.

Differentiation and cell polarity in acellular (*Dictyostelium*), Unicellular (*Acetabularia*) and multicellular system (root hair and stomata formation) Shoot Apical meristem (SAM): Origin, structure and function, Cytohistological zonation and Ultrastructure of meristems.

Organogenesis: Differentiation of root, stem, leaf and axillary buds, bud dormancy

Mechanism of leaf primordium initiation, development and Phyllotaxis (Diversity in size and shape of leaves)

Structure and function of root apical meristem (RAM): Root cap, quiescent centre and origin of lateral roots.

Transition from vegetative apex into reproductive apex

Developmental patterns at flowering apex: ABC model specification of floral organs.

Modification of gene action by growth hormones and cellular differences between floral organs. Senescence – a general account.

Unit IV: Reproductive Biology

14 Hrs.

Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, P.Maheshwari, M.S. Swaminathan and K.C. Mehta.

Microsporangium: Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions and sporogenous tissue.

Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.

Microgametogenesis – Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon).

Megasporangium – Structure of typical Angiosperm ovule. Types of ovule - Anatropous, Orthotropous, Amphitropous, Circinotropous. **Megagametogenesis** – Types of development of Female gametophyte/embryosac- monosporic- *Polygonum* type, bisporic – *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosac.

Pollination and fertilization: Structural and functional aspects of pollen, stigma and style. Post pollination events; Current aspects of fertilization and Significance of double fertilization, Post fertilization changes.

Endosperm – Types and its biological importance. Free nuclear (*Cocos nucifera*) cellular (*Cucumis*), helobial types. Ruminant endosperm.

Embryogenesis – Structure and composition of zygote, Dicot (*Capsella bursa-pastoris*) and Monocot (*Najas*) embryo development. A general account of seed development.

B.Sc. BOTANY: Semester - 3
Practical: Discipline Specific Core Course (DSCC)
Title of the Course and Code:

DSCC 033 BOT 012: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033 BOT 012	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

LIST OF EXPERIMENTS TO BE CONDUCTED

Practical No.1

- i) Study of meristem (Permanent slides/ Photographs).
- ii) Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma) and Complex Tissues (xylem and phloem).

Practical No.2

Maceration technique to study elements of xylem and phloem, Study of primary structure of dicot root, stem and leaf (Sunflower) and monocot root, stem and leaf (Maize).

Practical No.3

Study of Normal secondary growth structure in dicot stem and root (Sunflower) and Anomalous secondary growth: *Aristolochia*, *Boerhaavia* (dicot stem) *Dracaena* (monocot stem).

Practical No. 4

Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials.

Practical No. 5

Permanent slides of Microsporogenesis and male gametophyte Mounting of Pollen grains of Grass and Hibiscus and Pollinia of Calotropis.

Practical No. 6

Pollen germination (hanging drop method) and Effect of Boron and Calcium on pollen germination.

Practical No. 7

Permanent slides of types of ovules, Megasporogenesis & embryosac development and types of placentation: Axile, Marginal and Parietal types. Sectioning of ovary, for the studied types of placentation.

Practical No. 8

Mounting of embryo: Tridax and Cyamopsis, Mounting of endosperm: Cucumis.

Practical No. 09

Histochemical localization of proteins/ carbohydrates.

Practical No. 10 and 11

Mini project work in groups of 3-5 students, from the following list

- a) Study of pollen morphology of different flowers with respect to shape, colour, aperture etc.
- b) Pollen germination of different pollen grains and calculates percentage of germination.
- c) Calculating percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions.
- d) Study of placentation of different flowers.
- e) Any other relevant study related to Anatomy / Embryology.

Pedagogy

Scheme of Practical Examination (Distribution of Marks): 25 Marks for semester end Examination.

1. Practical: 15 (3X5 to cover all the Practicals) Marks/ Based on Nature of Practical/ Optional/Availability of specimen/ Infrastructure/ Sectioning and staining/ Mounting (may be modified).
 2. Viva: 05 Marks.
 3. Journal: 05 Marks.
- Total 25 Marks.

Note: The same scheme may be used for IA (Formative assessment) Examination.

Text Books for Reference:

1. Bhojwani and Bhatnagar, Introduction to Embryology of Angiosperms –Oxford & IBH, Delhi
2. Bhojwani Sant Saran, 2014.Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands,
3. Coutler E. G. , 1969. Plant Anatomy – Part I Cells and Tissues – Edward Arnold, London.
4. Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA
5. Eames A. J. - Morphology of Angiosperms - Mc Graw Hill, New York.
6. Esau, K. 1990. Plant Anatomy, Wiley Eastern Pvt Ltd New Delhi
7. Evert, R.F. (2006) Esau's Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc
8. Fahn, A.1992. Plant Anatomy, Pergamon Press, USA
9. Johri, B.M. I., 1984.Embryology of Angiosperms, Springer-Verlag, Netherlands.
10. Karp G., 1985. Cell Biology; Mc.Graw Hill Company
11. Maheshwari,P 1950. An introduction to the embryology of angiosperms. New York: McGraw-Hill
12. Mauseth, J.D. (1988). Plant Anatomy, the Benjamin/Cummings Publisher, USA.
13. Nair P .K .K - Pollen Morphology of Angiosperms - Scholar Publishing House, Lucknow
14. Pandey S.N. 1997, Plant Anatomy and Embryology. A. Chadha, Vikas Publication House Pvt Ltd;
15. Pandey, B. P., 1997. Plant Anatomy, S.Chand and Co. New Delhi

16. Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.
17. Saxena M. R. – Palynology – A treatise - Oxford & I. B .H., New Delhi.
18. Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.
19. Vashishta .P.C .,1984. Plant Anatomy – Pradeep Publications – Jalandhar
20. Vashishta, P.C. 1997. Plant Anatomy, Pradeep Publications.
21. N. N. Bhandari The Microsporangium.
22. F. Bouman The Ovule.
23. M. T. M. Willemsse, J. L. van Went: The Female Gametophyte.
24. R. B. Knox :The Pollen Grain.
25. J. L. van Went, M. T. M. Willems :Fertilization.

B.Sc. – III Semester
Subject: Botany
Open Elective Course (OEC - 3)
(OEC for other students)
Code: OEC-003 BOT 051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
003 BOT 051	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-3 (OEC for other students): 003 BOT 051
Title of the Paper: BOTANICAL GARDEN AND LANDSCAPING

Learning outcomes:

After the completion of this course the learner will be able to:

- Apply the basic principles and components of gardening
- Conceptualize flower arrangement and bio-aesthetic planning
- Design various types of gardens according to the culture and art of bonsai
- Distinguish between formal, informal and free style gardens
- Establish and maintain special types of gardens for outdoor and indoor landscaping

Keywords:

Gardening, Landscaping, Flower arrangement, Vertical gardens, Roof gardens, Computer aided designing

Unit I

14 lectures

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Green house, Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, planting, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit II

14 lectures

Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit III

14 lectures

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Land scape designs, Styles of garden, formal, informal and freestyle gardens, types of gardens, Urban land scaping, Land scaping for specific situations, institutions, industries, residents, hospitals, road sides, traffic islands, dam sites, IT parks, corporate. Establishment and maintenance, special types of gardens, Bio-aesthetic planning, eco- tourism, indoor gardening, therapeutic gardening, non-plant components, water-scaping, xeri-scaping, hardscaping; Computer Aided Designing (CAD) for outdoor and indoor scaping Exposure to CAD (Computer Aided Designing) components of a nursery, sowing, pricking, use of greenhouse for nursery production, propagation through cuttings, layering, grafting and budding.

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethno-botany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.

Suggested Readings

1. Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide. SmithsonianBooks
2. Butts, E. and Stensson, K. (2012). Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.
3. Russell, T.(2012). Nature Guide: Trees: The world in your hands (Nature Guides).

Details of Formative Assessment (IA) For DSCC theory/OEC: 40% weightage for Total Marks

Type of Assessment	Weightage	Duration	Comment
Written Test- 1	10%	1 hrs	8 th Week
Written Test- 2	10%	1 hrs	12 th Week
Seminar	10%	10 minutes	-----
Case study/ Assignment/ Field work/ Project work/ Activity	10%	-----	-----
Total	40% of the Maximum marks allotted for the Paper		

**Faculty of Science
04- Year UG Honors Programme: 2022-23**

**General Pattern of Theory Question paper for DSCC/ OEC
(60 Marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-6 carries 2 marks each. Answer any 5 questions. :10 marks

Part- B

2. Question number 7-11 carries 5 marks each. Answer any 4 questions. :20 marks

Part- C

3. Question number 12- 15 carries 10 marks each. Answer any 3 question. : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Format for Model Question paper Unit wise
DSCC 033 BOT 012: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----1 Unit III ----1 Unit IV ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----1 Unit IV ----1 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----1 Unit II ----1 Unit III ----1 Unit IV ----1 Total- 4	3	10	30

OEC-003 BOT 051
BOTANICAL GARDEN AND LANDSCAPING

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----2 Unit III ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----2 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----2 Unit II ----1 Unit III ----1 Total- 4	3	10	30

B.Sc.: Semester – IV**Subject: Botany****Discipline Specific Core Course (DSCC)**

The Course Botany in III semester has two papers (Theory paper- 033 BOT 011 for 04 credits and Practical paper- 033 BOT 012 for 02 credits) for 06 credits: Both the papers are compulsory, Details of the courses are as

Course no: 7

Course Code: 034 BOT 011

Number of Theory Credits	Total Lecture Hours/Semester	Number of Practical Credits	Total Practical hours/Semester
04	56	02	56

Title of the course (theory): DSSC ECOLOGY AND CONSERVATION BIOLOGY

Course outcome**Students will be able to**

- Know the principles and concept of ecosystems- Components, productions, Energy and limiting factors.
- Know the concepts of productivity, measurements of productivity, food chain, food webs and trophic levels
- Understand the diversity and characters of major ecosystems – Aquatic (Marine and Freshwater), Terrestrial and Agricultural ecosystems
- Know the Concept of biotic community with their Size and structure of biotic community- Physiognomy, Life-forms, stratification, ecotones and concept of edge-effect.
- Understand the causes and patterns of ecological succession, concept of climax.
- Know the Concept of ecological niches, species coexistence, overlapping and niche segregation.
- Know the concept of Eutrophication, Heavy metal pollution, Ozone depletion, greenhouse effect, Global warming and its effect, Acid rains. Pesticide, particulate and nuclear radiation.
- Understand the Solid wastes. Noise Pollution. Pest population and its biological control, invasive species and their effects on native species in aquatic and terrestrial ecosystems.
- Know the Patterns of diversity in a community, Diversity measurement and indices.
- Understand the Global distribution of organisms, concept of islands, biodiversity hotspots. Methods of conservation of biodiversity. Centers for origin of cultivator plants.
- Know the population density, Natality and mortality. Life table, population growth curves, carrying capacity.
- Know the positive and negative interactions among the organisms.

Contents of Theory Course		
Unit	Topics	Teaching Hours
I	<p>Introduction to Ecology and Conservation Biology: Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation.</p> <p>Ecological factors: Climatic factors: light, temperature, precipitation and humidity. Edaphic factors: Soil and its types, soil texture, soil profile, soil formation; physico-chemical properties of soil - mineral particle, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. Topographic Factors: Altitude</p>	14 hrs

	<p>Ecological groups of plants and their adaptations: Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.</p>	
II	<p>Ecosystem Ecology: Introduction, types of ecosystems with examples -terrestrial and aquatic, natural and artificial.</p> <p>Structure of ecosystem: Biotic and Abiotic components, detailed structure of a pond ecosystem.</p> <p>Ecosystem functions and processes: Food chain-grazing and detritus; Food web.</p> <p>Ecological pyramids -Pyramids of energy, biomass and number. Principles of Energy flow in ecosystem.</p> <p>Bio-geo chemical cycles: Gaseous cycles -carbon and nitrogen, Sedimentary cycle- Phosphorus.</p> <p>Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere.</p> <p>Community Ecology: Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes.</p> <p>Intra-specific and Inter-specific interactions with examples.</p> <p>Ecological methods and techniques: Methods of sampling plant communities – transects and quadrates. Remote sensing as a tool for vegetation analysis, land use – land cover mapping.</p> <p>Population Ecology: Population and its characteristics – Population density, natality, mortality, age distribution, population growth curves and dispersal.</p>	14 hrs
III	<p>Phytogeography and Environmental issues:</p> <p>Theory of land bridge, theory of continental drift, polar oscillations and glaciations.</p> <p>Centre of origin of plant – Vavilov’s concept, types. Phytogeographical regions – concept, phytogeographical regions of India.</p> <p>Vegetation types of Karnataka – Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shoal forests and grasslands. An account of the vegetation of the Western Ghats.</p> <p>Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment).</p> <p>Water pollution disasters – National mission on clean Ganga , Minimata, Pacific gyre garbage patch, Exxon valdez oil spill.</p> <p>Air pollution: Causes, effect, air quality standards, acid rain, control.</p> <p>Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.</p>	14hrs
IV	<p>Biodiversity and its conservation:</p> <p>Biodiversity: Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity, Global and Indian species diversity. SDG’s in biodiversity conservation.</p> <p>Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity.</p> <p>Concept of Biodiversity Hotspots, Biodiversity hot spots of India.</p> <p>Concept of endemism and endemic species.</p> <p>ICUN plant categories with special reference to Karnataka/ Western Ghats.</p> <p>Biodiversity Conservation- Indian forest conservation act, Biodiversity bill (2002).</p> <p>Conservation methods – <i>In-situ</i> and <i>ex-situ</i> methods</p>	14 hrs

	<i>In-situ</i> methods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves. <i>Ex-situ</i> methods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.	
Total		56 Hours

SUGGESTED REFERENCE BOOKS:

1. Sharma, P.D. 2018. Fundamentals of Ecology. Rastogi Publications.
2. Odum E.P. (1975): Ecology By Holt, Rinert& Winston.
3. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
4. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
5. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
6. Kumar H.D. (2000): Biodiversity & Sustainable Conservation. Oxford & IBH Publishing Co Ltd. New Delhi.
7. Newman, E.I. (2000): Applied Ecology, Blackwell Scientific Publisher, U.K.
8. Chapman, J.L&M.J. Reiss (1992): Ecology (Principles & Applications). Cambridge University Press, U.K.
9. Malcolm L. Hunter Jr., James P. Gibbs, Viorel D. Popescu, 2020. Fundamentals of Conservation Biology, 4th Edition. Wiley-Blackwel.
10. Saha T. K., 2017. Ecology and Environmental Biology. Books and Allied Publishers.

B.Sc. BOTANY: Semester - 4
Theory: Discipline Specific Core Course (DSCC)
Title of the Course and Code:
DSSC 034 BOT 012: ECOLOGY AND CONSERVATION BIOLOGY

LIST OF PRACTICALS TO BE CONDUCTED

Practical No.	Experiments
1	Determination of pH of different types of Soils, Estimation of salinity of soil/water samples.
2	Study of Ecological instruments – Wet and Dry thermometer, Altimeter, Hygrometer, Soil thermometer, Rain Gauge, Barometer, etc
3	Hydrophytes: Morphological adaptations in <i>Pistia</i> , <i>Eichhornia</i> , <i>Hydrilla</i> , <i>Nymphaea</i> . Anatomical adaptations in <i>Hydrilla</i> (stem) and <i>Nymphaea</i> (petiole).
4	Xerophytes: Morphological adaptations in <i>Asparagus</i> , <i>Casuarina</i> , <i>Acacia</i> , <i>Aloe vera</i> , <i>Euphorbia tirucalli</i> . Anatomical adaptations in phylloclade of <i>Casuarina</i> .
5	Epiphytes: Morphological adaptations in <i>Acampe</i> , <i>Bulbophyllum</i> , <i>Drynaria</i> . Anatomical adaptations in epiphytic root of <i>Acampe</i> / <i>Vanda</i> . Halophytes: study of Viviparyin mangroves, Morphology and anatomy of Pneumatophores.
6	Study of a pond/forest ecosystem and recording the different biotic and abiotic components
7	Demonstration of different types of vegetation sampling methods – transects and quadrats. Determination of Density and frequency.
8	Application of remote sensing to vegetation analysis using satellite imageries
9	Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.
10	Determination of water holding capacity of soil samples
11	Determination of Biological oxygen demand (BOD)
12	Determination of Chemical oxygen demand (COD)
13	Determination of soil texture of different soil samples.

Pedagogy

Scheme of Practical Examination (Distribution of Marks): 25 Marks for semester end Examination.

1. Practical: 15 (3X5 to cover all the Practicals) Marks/ Based on Nature of Practical/ Optional/Availability of specimen/ Infrastructure/ Sectioning and staining/ Mounting (may be modified).
 2. Viva: 05 Marks.
 3. Journal: 05 Marks.
- Total 25 Marks.

Note: The same scheme may be used for IA (Formative assessment) Examination.

B.Sc. BOTANY – IV Semester
Open Elective Course (OEC - 4)
(OEC for other students)
Paper: MEDICINAL PLANTS IN HEALTH CARE
Code: OEC-004 BOT 051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-004 BOT 051	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

On completion of this course, the students will be able to:

- Recognize the basic medicinal plants
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India

Keywords:

Medicinal plants, Traditional systems, endangered medicinal plants, Ethnobotany, Folk medicines, Ethnic communities

Unit I: History and Traditional System of Medicine **14 lectures**

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine; Definition and Scope.

Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments,

Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.

Unani: History, concept: Umoor-e-tabiya, tumors treatments / therapy, polyherbal formulations.

Unit II: Conservation, Augmentation and Ethnobotany and Folk Medicine 14 lectures

Conservation of Endemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethnomedicinal plant Gardens.

Propagation of Medicinal Plants: Objectives of the nursery, its classification, important

Unit III Medicinal Plants

14 lectures

Brief description of selected plants and derived drugs, namely Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia* for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardioprotection, turmeric (*Curcuma longa*) for wound healing, antioxidant and anticancer properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, *Salix* for analgesic, *Cincona* and *Artemisia* for Malaria, *Rauwolfia* as tranquilizer, Belladonna as anticholinergic, *Digitalis* as cardiotoxic, *Podophyllum* as antitumor.

Suggested Readings:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.
2. AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). *Aush Gyanya: Handbook of Medicinal and Aromatic Plant Cultivation*.
4. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. *Current Science* 73:909–928.
5. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16th edn. Philadelphia, PA: Elsevier Saunders Ltd.
6. Jain, S.K. and Jain, Vartika. (eds.) (2017). Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects. Deep Publications, Delhi
7. Kapoor, L.D. (2001). Handbook of Ayurvedic medicinal plants. Boca Raton, FL: CRC Press.
8. Saroya, A.S. (2017). Ethnobotany. ICAR publication.
9. Sharma, R. (2003). Medicinal Plants of India-An Encyclopaedia. Delhi: Daya Publishing House.
10. Sharma, R. (2013) Agro Techniques of Medicinal Plants. Daya Publishing House, Delhi.
11. Thakur, R.S., H.S. Puri, and Husain, A. (1989). Major medicinal plants of India. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

Details of Formative Assessment (IA) For DSCC theory/OEC: 40% weightage for Total Marks

Type of Assessment	Weightage	Duration	Comment
Written Test- 1	10%	1 hrs	8 th Week
Written Test- 2	10%	1 hrs	12 th Week
Seminar	10%	10 minutes	-----
Case study/ Assignment/ Field work/ Project work/ Activity	10%	-----	-----
Total	40% of the Maximum marks allotted for the Paper		

**Faculty of Science
04- Year UG Honors Programme: 2022-23**

**General Pattern of Theory Question paper for DSCC/ OEC
(60 Marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-6 carries 2 marks each. Answer any 5 questions. :10 marks

Part- B

2. Question number 7-11 carries 5 marks each. Answer any 4 questions. :20 marks

Part- C

3. Question number 12- 15 carries 10 marks each. Answer any 3 question. : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Format for Model Question paper Unit wise
DSCC 034 BOT 011: DSCC ECOLOGY AND CONSERVATION BIOLOGY

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----1 Unit III ----1 Unit IV ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----1 Unit IV ----1 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----1 Unit II ----1 Unit III ----1 Unit IV ----1 Total- 4	3	10	30

OEC-004 BOT 051
MEDICINAL PLANTS IN HEALTH CARE

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----2 Unit III ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----2 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----2 Unit II ----1 Unit III ----1 Total- 4	3	10	30



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

(Handwritten signature)
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರಿಶಿಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

Four - Year B.Sc. (Hons.) Program

SYLLABUS FOR SEM III & IV

Course: CHEMISTRY

SEMESTER - III:

DISCIPLINE SPECIFIC CORE COURSE(DSCC)

DSCC – 5 : Chemistry (Theory) - I (Code:033CHE011)

DSCC – 6 : Chemistry (Practical) - II (Code:033CHE012)

OEC- 3 : Chemistry in daily life (Code: 003CHE051)

SEMESTER - IV:

DSCC – 7 : Chemistry (Theory) - III (Code:034CHE011)

DSCC - 8 : Chemistry (Practical) - IV (Code:034CHE012)

OEC- 4 : Molecules of life (Code:004CHE051)

Effective from 2022-23

AS PER N E P - 2020

Karnatak University, Dharwad

Sem	Type of Course	Course Code	Instruction hour per week (hrs)	Total hours of Syllabus / Sem	Duration of Exam (hrs)	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC -5 Chemistry (Theory) - V	033CHE011	04	56	02	40	60	100	04
	DSCC -6 Chemistry (Practical) - VI	033CHE012	04	52	03	25	25	50	02
	OEC- 3 Industrial & Environmental Chemistry	003CHE051	03	42	02	40	60	100	03
IV	DSCC -7 Chemistry (Theory) - VII	034CHE011	04	56	02	40	60	100	04
	DSCC -8 Chemistry (Practical) - VIII	034CHE012	04	52	03	25	25	50	02
	OEC- 4 Analytical Chemistry	004CHE051	03	42	02	40	60	100	03
Details of the other Semesters will be given later									

Programme Specific Outcome (PSO):

After the completion of 03/ 04 years Degree in Chemistry , students will be able to:

- PO 13** : Demonstrate, solve and an understanding of major concepts in all the disciplines of chemistry.
- PO 14** : Provide students with broad and balanced knowledge and understanding of key chemical concepts.
- PO 15** : Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- PO 16** : Apply standard methodology to the solutions of problems in chemistry.
- PO 17** : Provide students with knowledge and skill towards employment or higher education in chemistry or multi-disciplinary areas involving chemistry.
- PO 18** : Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- PO 19** : Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- PO 20** : Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.
- PO 21** : To prepare students effectively for professional employment or research degrees in chemical sciences.
- PO 22** : To cater to the demands of chemical industries of well-trained graduates.
- PO 23** : To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- PO 24** : To develop an independent and responsible work ethics.

B.Sc. Semester – III

DSCC-5 : Chemistry (Theory) V (Code: 033CHE011)

Course Outcomes (CO):

After completion of course, Chemistry (Theory) - V students will be able to:

CO1: Explain free electron theory, physical properties of metals, distinguish between conductors, insulators, extrinsic and intrinsic semi conductors, Appreciate the importance of Hydrogen bond, applications of hydrogen bonding, van der Waals forces and factors affecting the strength and magnitude of van der Waals forces.

CO2 : Explain anomalous properties of lithium, diagonal relationship among elements preparation, uses, structure and bonding in diborane, borazine, boron nitride, carboranes, classification of silicates and their structures, oxides and oxyacids of nitrogen, oxoacids of phosphorus, sulphur and chlorine, inter halogen compounds and xenon compounds.

CO3: Understand preparation, general mechanism and named reactions of benzene and alkyl benzenes.

CO4: Describe theory of orientation, explanation on the basis of stability of sigma complex using electron withdrawing and electron donating groups.

CO5: Understand relative synthesis, mechanisms and reactivities of halogen in alkyl halides, vinyl halides, allyl halides, aryl halides and aryl-alkyl halides.

CO6: Know different methods of synthesis of primary, secondary and tertiary their reactions and mechanisms.

CO7:. Understand different thermodynamic processes, first law of thermodynamics, work done, significance of enthalpy, Joule-Thomson effect and applications Kirchhoff's equation

CO8: Derive Nernst distribution law and under different molecular states.

CO9: Acquaint with the industrial applications of Nernst distribution law.

CO10: Learn the law of chemical equilibrium, Le-Chatelier's principle, relations between K_p , K_c and K_x , ionic equilibria, hydrolysis, pH, common ion effect, solubility and solubility product.

CO11: Understand the principles and processes of metallurgy, extraction of d and f block elements and powder metallurgy.

CO12: Aware of alloys, purpose of making, composition and significance of alloys.

Syllabus DSCC-5: Chemistry (Theory) - V (Code: 033CHE011)	Total Hrs: 56
UNIT-I : CHEMICAL BONDING & CHEMISTRY OF s- & p- BLOCK ELEMENTS	14 hrs
<p>Metallic Bond: Explanation of physical properties of metals (conductivity, lustre, malleability, ductility and cohesive force) based on free electron theory. Band theory of metals to explain conductors, insulators, extrinsic and intrinsic semi conductors.</p> <p>Hydrogen bond: Definition, properties and types of hydrogen bond. Consequences of hydrogen bonding.</p> <p>van der Waals forces: Definition and types of van der Waals forces. Factors affecting the strength and magnitude of van der Waals forces.</p> <p style="text-align: right;">(4 Lectures)</p> <p>Chemistry of s- and p- block elements: General characteristics, anomalous properties of lithium. Diagonal relationship of Li with Mg, and Be with Al. Preparation, uses, structure and bonding in diborane, borazine, boron nitride and carboranes. Silicates-Classification and structures. Preparation, properties and structure of oxides and oxyacids of nitrogen. Preparation and bonding in oxoacids of phosphorus, sulphur and chlorine. Inter halogen compounds (preparation and bonding in ClF₃, BrF₃ and IF₇), Xenon compounds- XeF₂, XeF₄, XeF₆, XeOF₄ and XeO₃ (preparation and bonding).</p> <p style="text-align: right;">(10 Lectures)</p>	
UNIT-II AROMATIC HYDROCARBONS , ALKYL HALIDES, ARYL HALIDES & ALCOHOLS	14 hrs
<p>Aromatic Hydrocarbons Preparation of benzene and alkyl benzenes (Aromatization, cyclic polymerization of ethyne, hydrodealkylation, Wurtz-Fittig reaction). General mechanism for electrophilic aromatic substitution, examples of halogenation, nitration, sulphonation and Friedel-Craft alkylation and acylation reaction. Limitations of Friedel Craft's alkylation. Theory of orientation, explanation on the basis of stability of sigma complex using electron withdrawing and electron donating groups (explain with the energy profile diagram). Oxidation of side chain (Benzene with alkyl groups -CH₃, -CH₂CH₂CH₃ and 1,4-dimethyl benzene)</p> <p style="text-align: right;">(5 Lectures)</p> <p>Alkyl and Aryl halides: Alkyl Halides: Relative reactivities of halogen in alkyl halides, vinyl halides, allyl halides, aryl halides and aralkyl halides. Nucleophilic substitution reactions : S_N¹ and S_N² reactions and their mechanisms, stereochemistry and comparison. S_Nⁱ reaction and mechanism.</p> <p>Aryl-halides: Synthesis of aryl halide from phenols, Sandmeyer's reaction, Gattermann reaction, Raschig-Hooker process and Balz-Schiemann reaction. Aromatic Nucleophilic Substitution reactions : S_NAr, S_N¹ and <i>via</i> Benzyne intermediate along with mechanisms.</p> <p>Effect of nitro substitution on aromatic nucleophilic substitution reactions.</p> <p style="text-align: right;">(5 Lectures)</p> <p>Alcohols: Synthesis of primary, secondary and tertiary alcohols using Grignard reagent, ester hydrolysis. Reduction of aldehydes and ketones, carboxylic acids and</p>	

<p>esters. Reactions of alcohols with halo acids, esterification reaction and oxidation of alcohols with PCC, KMnO_4, Conc. HNO_3 and dichromate salt and Oppenauer oxidation.</p> <p>Diols: Oxidation of diols, Mechanism of Pinacol-Pinacolone rearrangement.</p> <p style="text-align: right;">(4 Lectures)</p>	
<p>UNIT-III: THERMODYNAMICS I, DISTRIBUTION LAW AND SURFACE CHEMISTRY</p>	<p>14 hrs</p>
<p>Thermodynamics I: Thermodynamic processes, heat, work and internal energy, first law of thermodynamics. Concept of enthalpy, derivation of work done in isothermal and adiabatic expansion (T-V and P-V relationships) of an ideal gas for reversible and irreversible processes, numerical problems, Joule-Thomson effect and its derivation. Joule-Thomson coefficient and its derivation. Effect of temperature on enthalpy of reaction (Kirchhoff's equation).</p> <p style="text-align: right;">(5 Lectures)</p> <p>Distribution law: Nernst distribution law and thermodynamic derivation of partition co-efficient. Distribution law for changes in molecular state. (association and dissociation). Applications in solvent extraction- simple and multiple extractions. Derivation for multiple extractions, numerical problems.</p> <p style="text-align: right;">(4 Lectures)</p> <p>Chemical and Ionic Equilibria: Law of chemical equilibrium and its thermodynamic derivation. Factors affecting equilibria (Le-Chatelier's principle). Relations between K_p, K_c and K_x for reactions involving ideal gases. Ionization of acids and bases, hydrolysis of three types of salts and derivation for determination of pH of their solutions. Numerical problems. Common ion effect, solubility and solubility product of sparingly soluble salts.</p> <p style="text-align: right;">(5 Lectures)</p>	
<p>UNIT-IV: INDUSTRIAL CHEMISTRY-I</p>	<p>14 hrs</p>
<p>Principles and processes of metallurgy: Minerals, ores, steps in metallurgy (crushing, concentration, calcination, roasting, smelting/reduction, refining). Characteristics, uses and limitations of Ellingham diagrams for reduction of metal oxides using carbon as reducing agent. Hydrometallurgy. Extraction of titanium from ilmenite, chromium from chromite, nickel by Mond's process and tungsten from wolframite, Extraction of thorium from monazite sand, and uranium from pitchblende. Powder metallurgy-preparation, uses and advantages.</p> <p style="text-align: right;">(11 Lectures)</p> <p>Alloys-Purpose of making alloys, preparation of alloys. Alloy steels-(ferrous alloys) specific effect of alloying elements, applications of alloy steels. Non- Ferrous alloys: composition, characteristics and uses of copper, nickel, zinc and aluminum alloys.</p> <p style="text-align: right;">(3 Lectures)</p>	

Recommended Books/References

1. Modern Inorganic Chemistry: R.D.Madan, S.Chand and Co.Ltd, New Delhi, 2019
2. Chemistry of degree students, R.L.Madan, S.Chand and Co.Ltd, New Delhi.
3. Concise Inorganic Chemistry: J. D. Lee, , 5th Edn, New Age International (1996)
4. Basic Inorganic Chemistry, Cotton, F.A., Wilkinson, G. & Gaus, P.L., 3rd Ed., Wiley.
5. University Chemistry Mahan, B.H. 3rd Ed. Narosa (1998).
6. A Guidebook to Mechanism in Organic Chemistry Peter Sykes, Orient Longman, New Delhi (1988).
7. Advanced Organic Chemistry, Bahl, A. & Bahl, B.S., S. Chand publications, 2010.
8. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
9. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
10. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
11. Organic Chemistry- Mehta and Mehta, 2005.
12. Physical Chemistry W.J. Moore:, 1972.
13. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
14. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
15. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
16. Physical Chemistry - Alberty R. A. and Silbey, R. J. John Wiley and sons, 1992.
17. Engineering Chemistry, P.C. Jain and Monika Jain, Dhanpad Rai and Sons, Delhi, Jalandhar, 1995.
18. Synthetic Organic Chemistry: Gurudeep R. Chatwal. Himalaya Publishing House – 1990.
19. Industrial Chemistry, Clerk Ranken MJP Publisher.
20. Industrial Chemistry, Vijay Varma, Arjun Publishing House.
21. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997-98)

B.Sc. Semester – III

DSCC-6: Chemistry (Practical) - VI (Code: 033CHE012)

Course Outcomes (CO):

After completion of Chemistry (Practical) – VI, students will be able to:

CO1: Understand solubility, solubility product, common ion effect, their applications. Physico-chemical principles of separation of cations into groups in qualitative analysis of inorganic salts

CO2: Develop the skill to perform Semi-micro qualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations.

CO3: Able to write the **chemical** reactions involved in the analysis.

CO6: Study the preparation and mechanism of reactions, recrystallization, determination of melting point and calculation of quantitative yields.

CO7: Prepare the organic compound with bromination, nitration, acetylation, hydrolysis oxidation and reduction

Syllabus	Total Hrs: 52
INORGANIC CHEMISTRY EXPERIMENTS	
Explanation of solubility, solubility product, common ion effect and their applications in separation of cations into groups in qualitative analysis of inorganic salts (students should write in the journal regarding the above). Experiments 1 to 6: Systematic semi-micro qualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations. Anions: CO_3^{2-} , Cl^- , Br^- , NO_3^- , SO_4^{2-} , $\text{C}_2\text{O}_4^{2-}$ and BO_3^{3-} Cations: Cu^{2+} , Al^{3+} , Fe^{2+} , Mn^{2+} , Ni^{2+} , Zn^{2+} , Ca^{2+} , Ba^{2+} , Mg^{2+} , Na^+ , K^+ and NH_4^+ . Note: Student has to write ionic reactions for group test and CT for anions and cations Distribution of Marks: Preliminary tests and presentation - 03 marks , Anions (group test + C.T +ionic reactions) (1+1+1)×2=6 marks, Cations (group test + C.T+ ionic reactions) (1+2+1)×2=8 marks, Journal-3 marks, Viva-Voce-5 marks, Total=25 marks.	
ORGANIC CHEMISTRY EXPERIMENTS	
Experiment No 7 to 12: Preparation of organic compounds 7. Acetylation - Synthesis of acetanilide from aniline using Zn Dust/AcOH. (Green method) 8. Bromination – Acetanilide to p-bromo acetanilide. 9. Nitration – Acetanilide to p-nitro acetanilide. 10. Hydrolysis - Benzamide to benzoic acid. 11. Oxidation – Benzaldehyde to benzoic acid.	

<p>12.Reduction – m-dinitrobenzene to m- nitro aniline. Note: Student has to write mechanism of reactions, calculation of quantitative yield, determination of melting point and to perform recrystallization.</p> <p style="text-align: center;">Distribution of Marks:</p> <p>Reaction & Mechanism-04 marks, calculation of theoretical yield – 02 mark, observed yield -08 marks, M.P- 03 marks, Journal – 03 marks , Viva-Voce-5 marks,(Total=25 marks.)</p> <p>Deduction of marks for observed yield: Less than 10% - 8 marks, 11-15% - 6 marks, 16-20% - 4 marks, 21-25 % - 2 marks & above 25% - zero mark.</p>	
<p style="text-align: center;">I General instructions:</p> <p>In the practical examination, in a batch of ten students, five students each will be performing inorganic and organic experiments. Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. <i>Manual is not allowed in the Examination.</i></p>	

Books recommended:

1. Vogel's Qualitative Inorganic Analysis, G.Svehla, 7th Ed, Longman (2001).
2. Advanced Practical Chemistry, agadamba Singh, R.K.P. Singh, Jaya Singh, L.D.S.Yadav, I.R. Siddiqui, Pragati prakashan, 7th edition, 2017.
3. College Practical Chemistry: V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati. University Press-2011.
4. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
5. Comprehensive Practical Organic Chemistry: V K Ahluwalia, and Renu Aggarwal, University Press-2000.

B.Sc. Semester – III

OEC- 3: Industrial & Environmental Chemistry (Code: 003CHE051)

Course Outcome (CO):

After completion of course, Industrial Chemistry, students will be able to:

CO1: Understand minerals, ores, steps in metallurgy, extraction of metals of d & f block elements and powder metallurgy-preparation,

CO2: Appreciate purpose of making, preparation, composition and applications of alloys.

CO3: Explain manufacture of glass, ceramics, Portland cement, chemical composition of cement, setting and hardening of Portland cement, Electroplating of nickel and chromium, Primary and secondary batteries, battery components and their role.

CO4: Explain sources of energy, nuclear fusion/fission, solar energy, hydrogen and geo-thermal energy.

CO5: Know air pollutants, control measures of air pollution, photochemical smog, green house effect, global warming and ozone depletion.

CO6: Aware of water pollutants and their sources, industrial effluents and their treatment, sludge disposal, water quality parameters for waste water, industrial water and domestic water, disposal of nuclear waste, nuclear disaster and its management.

Syllabus	Total Hrs:
OEC- 3: Industrial & Environmental Chemistry (Code: 003CHE051).	42
UNIT-I METALLURGY & ALLOYS	14 hrs
Metallurgy: Minerals, ores, steps in metallurgy (crushing, concentration, calcination, roasting, smelting/reduction, refining), Extraction of titanium from ilmenite, chromium from chromite, nickel by Mond's process and uranium from pitchblende. Powder metallurgy-preparation, uses and advantages. (10 Lectures)	
Alloys- Purpose of making alloys, preparation of alloys. Alloy steels-(ferrous alloys) specific effect of alloying elements, applications of alloy steels. Non- Ferrous alloys: composition, characteristics and uses of copper, nickel, zinc and aluminum alloys. (4 Lectures)	
UNIT-II GLASS, CERAMICS, CEMENT, PROTECTIVE COATINGS & BATTERY	14 hrs
Glass and Ceramics: General properties, silicate and non silicate glasses, raw materials used, manufacture, types of glass and their applications. Types and manufacture, high-technology ceramics and their applications, super conducting and semi-conducting oxides. (4 Lectures)	
Cement: Classification with properties of cement, raw materials used in the manufacture of cement and their functions. Manufacture of Portland cement, chemical composition of cement, setting and hardening of Portland cement. RCC and quick setting cements.	

<p>Carbon materials: Fullerenes, carbon nanotubes and their applications. (3 Lectures)</p> <p>Protective Coatings: Metallic coating, electroplating of nickel and chromium. (2 Lectures)</p> <p>Battery: Primary and secondary batteries, battery components and their role. Characteristics of battery. Working of Lead-acid battery, Lithium battery, solid-state electrolyte battery, fuel cells and solar cells. (5 Lectures)</p>	
<p>UNIT-III ENERGY AND ENVIRONMENT, AIR, WATER & NUCLEAR POLLUTION AND WATER QUALITY STANDARDS</p>	<p>14 hrs</p>
<p>Energy and Environment: Sources of energy: coal, petrol and natural gas. Nuclear fusion/fission, solar energy, hydrogen and geo-thermal energy. (3 Lectures)</p> <p>Air pollution: Major regions of atmosphere, chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature. Control measures of air pollution. Photochemical smog: its constituents and photochemistry. green house effect, global warming and ozone depletion. (4 Lectures)</p> <p>Water pollution, water quality standards: Water pollutants and their sources. Industrial effluents and their treatment (primary and secondary treatment). Sludge disposal. Water quality parameters for waste water, industrial water and domestic water. Nuclear pollution: Disposal of nuclear waste, nuclear disaster and its management. (7 Lectures)</p>	

Recommended Books/References

1. Environmental Chemistry, A. K. De, 6th Edn. New Age International (P) Ltd.,(2008).
2. Environmental Chemistry-S. K. Banerji, (Prentice Hall India), 1993
3. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997-98)
4. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Organic Chemistry Morrison, R.T. & Boyd, R.N., Pearson, 2010.
7. Advanced Organic Chemistry Bahl, A. & Bahl, B.S., S. Chand, 2010.
8. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
9. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998.
10. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
11. Organic Chemistry- Mehta and Mehta, 2005.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

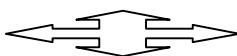
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

DSCC- 7: Chemistry (Theory) - VII (Code: 034CHE011)

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO1: Understand the general characteristics of d and f- block elements with reference to electronic configuration, colors, variable oxidation states, magnetic properties etc., separation of lanthanoids by ion-exchange method and preparation of trans-uranic elements (up to Z=103).

CO2: Acquaint with general properties and types of inorganic polymers, silicones and phosphazines.

CO3: Learn Bronsted-Lowry concept, Lux-flood concept, Lewis concept and Usanvich-sandvich concept and their limitations. HSAB concept and its applications.

CO4: Gain knowledge of acidic character, comparative acid strengths of alcohols and phenols and mechanism of named reactions.

CO5: Familiar with Williamson's ether synthesis, epoxides and Crown Ethers formation and properties

CO6: Understand the synthesis of aldehydes and ketones, their properties, named reactions mechanism.

CO7: Appreciate the significance of entropy, second law of thermodynamics, change in entropy and other thermodynamic parameters with respect temperature.

CO8: Know types of adsorption isotherms, types of catalysis and their theories with examples and autocatalysis.

CO9: Know the manufacture, properties and applications of glass and cement.

CO10: Understand types, composition and manufacture of fertilizers.

CO11: Appreciate the paints and pigments formulations, composition and related properties.

CO12: Learn the types, manufacture of soaps, detergents and their cleansing actions.

Syllabus DSCC- 7: Chemistry (Theory) - VII (Code: 034CHE011)	Total Hrs: 56
UNIT-I : CHEMISTRY OF d- & f- BLOCK ELEMENTS, INORGANIC POLYMERS AND THEORIES OF ACIDS AND BASES	14 hrs
Chemistry of d- and f- block elements: General characteristics with reference to electronic configuration, colors, variable oxidation states, magnetic, catalytic properties and ability to form complexes. General characteristics of f-block elements with reference to electronic configuration, oxidation states, colors and magnetic properties. Lanthanide contraction and its consequences. Separation of lanthanoids by ion-exchange method. Preparation of trans-uranic elements (up to Z=103). <p style="text-align: right;">(6 Lectures)</p> Inorganic Polymers: General properties and types of inorganic polymers. Comparison with organic polymers. Silicones: Classifications, preparation, properties,	

<p>uses and structure. Phosphazines: Preparation, properties, uses and structure. (4 Lectures)</p> <p>Modern concepts of acids and bases, Bronsted-Lowry concept, Lux-Flood concept, Lewis concept and Usanvich-Sandvich concept and their limitations. HSAB concept and its applications. (4 Lectures)</p>	
UNIT-II : PHENOLS, ETHERS & CARBONYL COMPOUNDS	14 hrs
<p>Phenols: Acidic character, comparative acid strengths of alcohols and phenols, Kolbe's reaction, Claisen rearrangement, Fries rearrangement, Ledrer-Mannase reaction, Reimer-Tiemann reaction. Houben-Hoesch reaction, Schotten – Baumann Reaction. (Mechanism to be discussed for all named reactions) (4 Lectures)</p> <p>Ethers: Preparation of ethers, mechanism of Williamson's ether synthesis, mechanism of synthesis of ethers by inter and intra molecular dehydration of alcohols. Reaction of ethers- mechanism of ether cleavage by strong acids. Epoxides: Synthesis from alkenes using peroxides, acid and base catalyzed ring opening of epoxides with mechanism and polyether formation. Crown Ethers: Formation and properties (Phase Transfer Catalyst). (3 Lectures)</p> <p>Carbonyl Compounds: Structure of carbonyl compounds, synthesis of aldehydes and ketones by oxidation of alcohols, aldehydes by reduction of acyl chloride, esters, nitriles and ketones from Gillmann's reagent. General mechanism of nucleophilic addition to the carbonyl compounds, mechanism of addition of hydrogen cyanide and hydroxyl amine, addition of alcohol, amines and phosphorus ylids. Acidity of α-hydrogens, mechanism of aldol condensation, crossed aldol condensation, Perkin's reaction, Claisen's condensation, Dieckman condensation and Darzen's condensation. Reactions of compounds with no α-hydrogens -mechanism of Benzoin condensation and Cannizaro's reaction, crossed Cannizaro's reaction. Reduction of carbonyl groups via Wolf-Kishner reduction and Meerwein-Pondorff Verley reduction. (7 Lectures)</p>	
UNIT-III THERMODYNAMICS-II & SURFACE CHEMISTRY	14 hrs
<p>Thermodynamics II: Concept of entropy and its physical significance, thermodynamic scale of temperature, statements of second law of thermodynamics, molecular and statistical interpretation of entropy, calculation of entropy change for reversible and irreversible processes. Free energy functions: Gibbs and Helmholtz energy, variation of S, G, A with T, V and P. Gibbs-Helmholtz equation, free energy change and spontaneity. Numerical problems. Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. (8 Lectures)</p> <p>Surface chemistry: Adsorption: Types of adsorption isotherms, Freundlich adsorption isotherm (only equation), its limitations. Langmuir adsorption isotherm and its derivation. BET equation and its derivation, numerical problems. Catalysis: Types of catalysis and their theories with examples. Theory of acid-base catalysis, Michaelis-Menten mechanism. Heterogeneous catalysis (unimolecular and bimolecular surface reactions). Applications of heterogeneous catalysts. Autocatalysis with examples. (6 Lectures)</p>	

UNIT-IV : INDUSTRIAL CHEMISTRY -II	14 hrs
<p>Glass and Cement: General properties, silicate and non silicate glasses, raw materials used and manufacture. Composition, properties and applications of soda lime glass, lead glass, armored glass, safety glass, borosilicates glass, coloured glass, photosensitive glass. Classification with properties of cement, raw materials used in the manufacture of cement and their functions. Manufacture of Portland cement, chemical composition of cement, setting and hardening of Portland cement. RCC and quick setting cements. (5 Lectures)</p> <p>Fertilizers: Types of fertilizers, composition of fertilizers, manufacture and uses of urea, calcium ammonium nitrate, ammonium phosphate and super phosphate of lime. Mixed fertilizers (NPK). (3 Lectures)</p> <p>Surface coatings: Classification of surface coatings. Paints and pigments-formulations, composition and related properties, fillers, thinners, enamels and emulsifying agents. Special paints (heat resistant, fire resistant, eco-friendly and plastics paints). Dyes and wax polishing. (2 Lectures)</p> <p>Soaps and detergents: Composition of soaps, types of soaps, manufacture of soap (Hot process and modern continuous process. Detergents: Comparison of soaps and detergents, classification of detergents (anionic, cationic and non-ionic). Preparation of detergents (sodium alkyl sulphate, sodium alkyl benzene sulphonates). Mechanism of cleansing action of soap and detergents (Concept of micelles and CMC). Detergents builders and additives (only examples). (4 Lectures)</p>	

Recommended Books/References

1. Concise Inorganic Chemistry-J. D. Lee, 5th Edn, New Age International (1996)
2. Modern Inorganic Chemistry Sathya Prakash's by R.D.Madan, S.Chand and Co.Ltd, New Delhi.
3. Inorganic Chemistry-Principles of Structure and Reactivity, 4thEdn-J. E. Huheey, E.A. Keiter, R. L. Keiter and O.K. Medhi. Pearson Education (2009).
4. A Guidebook to Mechanism in Organic Chemistry Sykes, P., Orient Longman, New Delhi (1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Organic Chemistry Morrison, R.T. & Boyd, R.N., Pearson, 2010.
7. Advanced Organic Chemistry Bahl, A. & Bahl, B.S., S. Chand, 2010.
8. Organic Chemistry - M. K. Jain, Nagin & Co., 1987.
9. Organic Chemistry- Mehta and Mehta, 2005.
10. Physical Chemistry P.W. Atkins:, 2002.
11. Physical Chemistry W.J. Moore:, 1972.
12. Text Book of Physical Chemistry - P. L. Soni, S. Chand & Co., 1993.
13. Text Book of Physical Chemistry - S. Glasstone, Mackmillan India Ltd., 1982.
14. Principles of Physical Chemistry - B. R. Puri, L. R. Sharma and M. S. Patania, S. L. N. Chand & Co. 1987.
15. Engineering Chemistry, P.C.Jain and Monika Jain, Dhanpad Rai and Sons, Delhi, Jalandhar.
16. Industrial Chemistry, Clerk Ranken MJP Publisher.
17. Industrial Chemistry, Dr. Vijay Varma, Arjun Publishing House.
18. Industrial Chemistry, B.K.Sharma, 9th Edn. Krishna Prakashan Media (P) Ltd. Meerut (1997-98)

B.Sc. Semester – IV
DSCC-8: Chemistry (Practical) - VIII (Code: 034CHE012)

Course Outcomes (CO)

After completion of course (Practical), students will be able to:

CO1: Explain regarding errors, types of errors, accuracy, precision, significant figures, standard deviation, and Use of log table

CO2: Determine the percentage of chlorine in bleaching powder, free acidity in ammonium sulphate fertilizer, phosphoric acid in super phosphate fertilizer, calcium in CAN fertilizer/dolomite ore by complexometric method, copper in brass by iodometric method/ calcium in cement by oxalate method.

CO3: Understand the effect of acid strength on hydrolysis of methyl acetate using HCl and H₂SO₄ for the pseudo first order reaction.

CO4: Determine the change in enthalpy of solution and ionization.

CO5: Learn the concepts of degree of dissociation, adsorption and distribution law.

Syllabus	Total Hrs: 52
DSCC-8: Chemistry (Practical) - VIII (034CHE012)	
Unit-I Industrial chemistry experiments	
1. Determination of percentage of available chlorine in bleaching powder (two samples). 2. Determination of free acidity in ammonium sulphate fertilizer (two samples) 3. Determination of phosphoric acid in super phosphate of lime fertilizer (two samples) . 4. Determination of calcium in CAN fertilizer (two samples) /dolomite ore (in duplicate) by complexometric method 5. Determination of copper in brass by iodometric method (two samples) / calcium in cement (in duplicate) by oxalate method 6. Determination of iron in haematite ore (in duplicate) by reduction method (SnCl ₂) using K ₂ Cr ₂ O ₇ solution Distribution of marks 1. Accuracy: (06+06) Marks 2. Technique and presentation : 02Marks 3. Reactions and Calculations: 03 Marks 4. Viva: 05 Marks 5. Journal: 03 Marks Total 25 marks Deduction of marks for accuracy: : ±0.4 CC -06 marks, ± 0.6 CC- 04 marks, ±0.8 CC- 02 marks, ±1.0 CC- above 1.0 CC - 01 marks.	
Physical chemistry experiments	
Explanation regarding errors, types of errors, accuracy, precision, significant figures, standard deviation, and Use of log table (students should write in the journal regarding the above). 1. Study the effect of acid strength of HCl and H ₂ SO ₄ on hydrolysis of methyl acetate. 2. Study the effect of concentration on velocity constant of second order reaction:	

<p>KI + K₂S₂O₈ (a = b).</p> <ol style="list-style-type: none"> 3. Study the adsorption of acetic acid on animal charcoal (Freundlich adsorption isotherm). 4. Study the distribution of acetic acid/ benzoic acid between water and toluene. 5. Determination of enthalpy of ionization of acetic acid/enthalpy of solution of KNO₃ by calorimetric method. 6. Determination of degree of dissociation of KCl by Landsberger's method. <p style="text-align: center;">Distribution of Marks:</p> <p>Accuracy-10 marks, Technique and Presentation-3marks Calculation and graph- 4 marks, Journal-3 marks, Viva-Voce-5 marks, Total=25 marks.</p> <p style="text-align: center;">Deduction of Marks for accuracy:</p> <p>Error up to 5% - 10 marks, 6 - 10% - 08 marks, 11-15% - 06 marks, 16-20% - 04 marks, above 20% - zero (0) marks</p>	
<p>General instructions:</p> <p>In the practical examination, in a batch of ten students, five students each will be performing Industrial and physical experiments. . Selection of experiments may be done by the students based on lots. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. <i>Manual is not allowed in the examination.</i></p>	

Recommended Books/References

1. Vogel's Qualitative Inorganic Analysis, G.Svehla, 7th Ed, Longman (2001).
2. Advanced Practical Chemistry, agadamba Singh, R.K.P. Singh, Jaya Singh, L.D.S.Yadav, I.R. Siddiqui, Pragati prakashan, 7th edition, 2017.
3. College Practical Chemistry: V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati. University Press-2011.
4. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
5. Comprehensive Practical Organic Chemistry: V K Ahluwalia, and Renu Aggarwal, University Press-2000.

B.Sc. Semester – IV

OEC – 4 : Analytical Chemistry (004CHE051).

Course Outcomes (CO)

After completion of course, Analytical Chemistry students will be able to:

CO1: Understand the principle, classification of volumetric analysis, different methods of expression of concentration term, titration curves of all type of acid-base titrations.

CO2: Understand the theory, titration curves, indicators of precipitation and complexometric titration.

CO3: Acquaint with steps involved in gravimetric analysis and advantages of organic reagents over inorganic reagents.

CO4: Learn the Composition of soil and the determination of pH of soil samples. Estimation of Calcium and Magnesium in the soil.

CO3: Identify pure and contaminated water, water sampling & water purification methods and water quality measurements.

CO4: Understand the principle, techniques and applications of chromatography, paper chromatography, Gas chromatography and High Performance Liquid Chromatography.

CO5 : Learn the ion-exchange chromatography. Resins, types with examples, mechanism of cation and anion exchange processes and applications of ion-exchange chromatography in softening of hard water, separation of lanthanides and industrial applications.

CO6: Know the solvent extraction method, its types and factors affecting the solvent extraction.

CO7: Make out the nutritional value of food, food processing, food preservation and adulteration.

Syllabus	Total Hrs: 42
OEC – 4 : Analytical Chemistry (Code: 004CHE051).	
Unit-I VOLUMETRIC AND GRAVIMETRIC ANALYSIS	14 hrs
Titrimetric analysis: Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials (salts). Acid-base titrimetry: Theory, titration curves for all types of acids – base titrations. Redox titrimetry: Theory, balancing redox equations, titration curves, theory of redox indicators and applications. Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators. (10 Lectures)	

<p>Gravimetric analysis: Steps involved in gravimetric analysis, requisites of precipitation, factors influencing precipitation, co-precipitation and post precipitation. Advantages of organic reagents over inorganic reagents. Determination of Barium and Iron gravimetrically.</p> <p style="text-align: right;">(4 Lectures)</p>	
<p>UNIT-II ANALYSIS OF SOIL, WATER AND FOOD PRODUCTS</p>	14 hrs
<p>Analysis of soil : Composition of soil, Concept of pH and pH measurement. Determination of pH of soil samples. Estimation of Calcium and Magnesium by complexometric titration.</p> <p style="text-align: right;">(3 Lectures)</p> <p>Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods (reverse osmosis, electro dialysis, ionic exchange). Determination of pH, hardness, TDS and alkalinity of a water sample. Determination of dissolved oxygen (DO) and COD of a water sample.</p> <p style="text-align: right;">(6 Lectures)</p> <p>Analysis of food products: Nutritional value of food, idea about food processing and food preservation and adulteration. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, edible oils etc. Analysis of preservatives and colouring matter</p> <p style="text-align: right;">(5 Lectures)</p>	
<p>UNIT-III SEPERATION METHODS</p>	14 hrs
<p>Chromatography: Definition, general introduction on principles of chromatography, classification, selection of stationary and mobile phases. Paper chromatography: principle and applications (separation of mixture of metal ions (Fe^{3+} and Al^{3+})).</p> <p>Thin layer chromatography: principle, advantages over other methods, methodology and applications (To compare paint samples by TLC method).</p> <p>Gas chromatography and High Performance Liquid Chromatography: Principles and applications.</p> <p style="text-align: right;">(6 Lectures)</p> <p>Ion-exchange: Column, ion-exchange chromatography. Resins, types with examples, mechanism of cation and anion exchange processes and applications of ion-exchange chromatography in softening of hard water, separation of lanthanides and industrial applications.</p> <p style="text-align: right;">(4 Lectures)</p> <p>Solvent extraction :- Types, batch, continuous, efficiency, selectivity, distribution coefficient, Nernst distribution law, derivation, factors affecting the partition, relationship between percent extraction and volume fraction . Solvent extraction of iron and copper.</p> <p style="text-align: right;">(4 Lectures)</p>	

Recommended Books/References

1. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, Saunders College Publishing, New York (2005).
2. . Instrumental methods of chemical Analysis, B.K. Sharma, Goel Publishing House, Meerut,
3. .Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, Pearson Education Pvt.Ltd.(2007).
4. Laboratory manual for Environmental Chemistry: Sunita Hooda and Sumanjeet Kaur by S. Chand & Company 1999.
5. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
6. Fundamentals of soil science, Foth, H.D. Wiley Books. .
7. Handbook of Agricultural Sciences, S.S. Singh, P. Gupta, A. K. Gupta, Kalyani Publication.
8. Introduction to soil laboratory manual - J. J. Harsett Stipes.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC (60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್‌ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

*Kul-
22/9/22*
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc.(Hons.) Program

SYLLABUS

Course: Computer Science

With Effect from 2021-22

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM III & IV,

OPEN ELECTIVE COURSE (OEC) FOR SEM III & IV and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM III

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years under Graduate Program in Computer Science for B.Sc. (Hons.)
Effective from 2022-23

Sem.	Type of Course	Theory/ Practical	Course Code	Course Title	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC-5	Theory	033CSC011	Object Oriented Programming using JAVA	04hrs	52	02 hrs	40	60	100	04
	DSCC-6	Practical	033CSC012	Java Lab	04 hrs	52	03 hrs	25	25	50	02
	OEC-3	Theory	003CSC051	Python Programming Concepts	03 hrs	42	02 hrs	40	60	100	03
	*SEC-2	Practical	053CSC061	Artificial Intelligence (SEC-Model 2)	03 hrs	39	02 hrs	25	25	50	02
IV	DSCC-7	Theory	034CSC011	Database Management Systems	04 hrs	52	02 hrs	40	60	100	04
	DSCC-8	Practical	034CSC012	Database Management Systems Lab	04 hrs	52	03 hrs	25	25	50	02
	OEC-4	Theory	004CSC051	Electronic Commerce	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later											

Name of Course (Subject): Computer Science

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in Computer Science students will be able to:

PSO 1 : Understand basic concepts involved in computing.

PSO 2 : Apply the knowledge in computer techniques to solve real world problems.

PSO 3 : Think of new approaches for solving problems in different domains.

PSO 4 : Follow ethics in designing software with team members.

PSO 5 : Develop research-oriented skills

PSO 6 : Understand good lab practices

B.Sc. Semester – III

Discipline Specific Course (DSC)

The course Computer Science in III semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.3 (Theory): **Object Oriented Programming using JAVA: 033CSC011**

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-03	DSCC-5	Theory	04	04	52 hrs.	2hrs.	40	60	100

Course Outcomes (COs):

At the end of the course, (Theory), students will be able to:

- CO 1:** Explain the object-oriented concepts using JAVA.
- CO 2:** Implement Classes, objects and constructors.
- CO 3:** Write JAVA programs using OOP concepts like Abstraction, Encapsulation, Inheritance and Polymorphism.
- CO 4:** Implement multithreading using JAVA.
- CO 5:** Demonstrate the basic principles of creating Java applications with GUI.

Course 3 (Theory): Title-Object Oriented Programming using JAVA

DSC3: Subject Code: 033CSC011

Unit I	<p>Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.</p> <p>Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.</p>	13 hrs.
Unit II	<p>Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.</p>	13 hrs.
Unit III	<p>Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism.</p>	13 hrs.
Unit IV	<p>I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming</p>	13 hrs.

References:

1. Programming with Java, By E Balagurusamy – A Primer, 4th Edition, McGraw Hill Publication.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall.
3. Object Oriented Programming with Java: Somashekara M.T., Guru, D.S., Manjunatha K.S, 1st Edition, PHI Learning 2017.
4. Java 2 - The Complete Reference, Herbert Schildt, 5th Edition, McGraw Hill Publication, 2017.
5. Java - The Complete Reference, Herbert Schildt, 7th Edition, McGraw Hill Publication, 2017.

B.Sc. Semester – III

Course: Computer Science
Discipline Specific Course (DSC)

Course No.3 (Practical): 033CSC012 Title of the Course: JAVA Lab

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-03	DSCC-6	Practical	02	04	52 hrs.	3 hrs.	25	25	50

Course Outcomes (COs):

At the end of the course, (Practical), students will be able to:

CO: Student would be able to implement OOP's concepts using JAVA.

List of Experiments for 52 hrs/ Semester.

Operators, Decision making and Loops:

1. Write a Java program to read the radius of a circle and to find the area and circumference.
2. Write a program to demonstrate String Operators
3. Write a Java program to find N prime numbers reading N as command line argument.
4. Write a program to find factorial of N numbers reading N as command line argument.
5. Write a program to read N numbers and sort them using one-dimensional arrays.

Classes and Methods:

6. Write a Java program to illustrate Method Overloading.
7. Write a Java program to illustrate Operator Overloading.
8. Write a program to demonstrate Single Inheritance.
9. Write a program to illustrate Constructor Overloading
10. Write a program to illustrate Method Overriding

Packages, Threads and Exception Handling:

11. Write a Java program demonstrating Multithreading.
12. Write a Java program demonstrating Exception Handling.
13. Write a Java program to demonstrate user defined package program.

Java Applet Programming

14. Write an Applet program to display Geometrical Figures using objects.
15. Write an Applet program which illustrate Scroll bar object.
16. Write an Applet program to change the background color randomly.
17. Write an Applet program to change the color of applet using combo box.
18. Write an Applet program to implement Digital Clock using thread.

Event Handling:

19. Write an Applet program to implement Mouse events.
20. Write an Applet program to implement Keyboard events.

Note: A minimum of 20 assignments should be done by each student.

General Instructions

Implement all programs using JAVA.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

- 1. 7 Marks (Writing Program 1 + Execution without error)**
- 2. 7 Marks (Writing Program 2 + Execution without error)**
- 3. Viva 6 marks**
- 4. Journal 5 Marks**

Total 25 Marks

Note: Same scheme may be used for IA (Formative Assessment) examination.

B.Sc. Semester – III

Course: Computer Science
Open Elective Course (OEC-3)
(OEC for other students)

Title of the Course : Python Programming Concepts
OEC-3 : Code: 003CSC051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

Course Outcomes (COs):

At the end of the course, (Practical), students will be able to:

CO 1: Explain the fundamentals of Computers.

CO 2: Explain the basic concepts of Python Programming.

CO 3: Demonstrate proficiency in the handling of loops and the creation of functions.

CO 4: Identify the methods to create and store strings.

Unit I	Fundamentals of Computers Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.	11 hrs.
Unit II	Python Basics Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs.	10 hrs.

Unit III	<p>Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.</p> <p>Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs.</p>	11 hrs.
Unit IV	<p>Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs.</p>	10 hrs.

References

1. Computer Fundamentals (BPB), P. K. Sinha & Priti Sinha
2. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online 2015.
@<https://www.greenteapress.com/thinkpython/thinkCSPy.pdf>
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
4. <http://www.ibiblio.org/g2swap/byteofpython/read/>
5. http://scipy-lectures.org/intro/language/python_language.html
6. <https://docs.python.org/3/tutorial/index.html>

B.Sc. Semester – III

Course: Computer Science

Skill Enhancement Course (SEC)-II

Title of the Paper: Artificial Intelligence (Model-2)

Subject Code: 033CSC061

Type of Course	Theory / Practical	Total No. of Lectures/Hours / Semester	Credits	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-II	Theory (13 hrs) + Practical (26 hrs)	39	02	2 hrs.	25	25	50

Course Outcomes (COs):

At the end of the course, students will be able to:

CO 1: Appraise the theory of Artificial intelligence and list the significance of AI.

CO 2: Discuss the various components that are involved in solving an AI problem.

CO 3: Illustrate the working of AI Algorithms in the given contrast.

CO 4: Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.

CO 5: Apply the AI concepts to build an expert system to solve the real-world problems.

Unit – I	Overview of AI: Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI. Intelligent Systems: Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.	05 hrs
Unit- II	AI Applications: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing. AI Examples in daily life: Installation of AI apps and instructions to use AI apps.	05 hrs
Unit- III	Robotics: Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.	03 hrs

Laboratory Activities:

- **Amazon Alexa:**
<https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=en&gl=US>
- **Google Lens:**
<https://play.google.com/store/search?q=google+lens&c=apps&hl=en&gl=US>
- **Image to Text to Speech ML OCR:**
https://play.google.com/store/apps/details?id=com.mlscanner.image.text.speech&hl=en_IN&gl=US
- **Google Pay:**
https://play.google.com/store/apps/details?id=com.google.android.apps.nbu.paisa.user&hl=en_IN&gl=US
- **Grammarly:**
https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl=US
- **Google Map:**
<https://play.google.com/store/search?q=google+maps&c=apps&hl=en&gl=US>
- **FaceApp:**
https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US
- **Socratic:**
https://play.google.com/store/apps/details?id=com.google.socratic&hl=en_IN&gl=US
- **Google Fit: Activity Tracking:**
https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en_IN&gl=US
- **SwiftKey Keyboard:**
<https://swiftkey-keyboard.en.uptodown.com/android>
- **E-commerce App:**
https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en_IN&gl=US

26hrs

Text Books:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", 2nd Edition, Springer International Publishing 2017.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", 2nd Edition, Pearson Education Limited 2005.

References:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, July 2017.

Reference Links:

1. Voice Assistant: <https://alan.app/blog/voiceassistant-2/>
2. Browse with image: <https://www.pocket-lint.com/apps/news/google/141075-what-is-google-lens-and-how-does-it-work-and-which-devices-have-it>
3. OCR: <https://aws.amazon.com/what-is/ocr/>
4. Mobile Payment system: <https://gocardless.com/en-us/guides/posts/how-do-mobile-payment-systems-work/>
5. Grammarly: <https://techjury.net/blog/how-to-use-grammarly/#gref>
6. Travel & Navigation: <https://blog.google/products/maps/google-maps-101-ai-power-new-features-io-2021/>
7. AI in photo editing: <https://digital-photography-school.com/artificial-intelligence-changed-photo-editing/>
8. AI in education: <https://www.makeuseof.com/what-is-google-socratic-how-does-it-work/>
9. AI in health and fitness: <https://cubettech.com/resources/blog/implementing-machine-learning-and-ai-in-health-and-fitness/>
10. E-commerce and online shopping: <https://medium.com/@nyxonedigital/importance-of-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416>

Implement Laboratory activities as specified tools in the SEC-3.

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

1. **7 Marks (Writing Activity 1 + Execution without error)**
2. **7 Marks (Writing Activity 2 + Execution without error)**
3. **Viva 6 marks**
4. **Journal 5 Marks**

Total 25 Marks

Note: Same scheme may be used for IA (Formative Assessment) examination.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2022-23**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

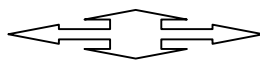
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

Course: Computer Science
Discipline Specific Course (DSC)

The course Computer Science in IV semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Title of the Course: Database Management Systems
Course No.4 (Theory): Code: 034CSC011

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-04	DSCC-7	Theory	04	04	52 hrs	2hrs	40	60	100

Course Outcomes (COs):

At the end of the course, students will be able to:

- CO 1: Explain the various database concepts and the need for database systems.
- CO 2: Identify and define database objects, enforce integrity constraints on a database using DBMS.
- CO 3: Demonstrate a Data model and Schemas in RDBMS.
- CO 4: Identify entities and relationships and draw ER diagram for a given real-world problem.
- CO 5: Convert an ER diagram to a database schema and deduce it to the desired normal form.
- CO 6: Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- CO 7: Explain the transaction processing and concurrency control techniques.

DSC4: Database Management Systems (DBMS)

Unit I	Database Architecture: Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	13 hrs.
Unit II	E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	13 hrs.

Unit III	<p>Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constraints, key constraints, primary & foreign key constraints, integrity constraints and null values.</p> <p>Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL.</p>	13 hrs.
Unit IV	<p>Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.</p> <p>Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.</p>	13 hrs.

References:

1. Fundamentals of Database Systems, RamezElamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

B.Sc. Semester – IV

Course: Computer Science
Discipline Specific Course (DSC)

Title of the Course: Database Management Systems Lab
Course No.3 (Practical) Code: 034CSC012

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-04	DSCC-8	Practical	02	04	52 hrs.	3 hrs.	25	25	50

Course Outcomes (COs):

At the end of the course, (Practical), students will be able to:

CO: Student would be able to create a tables, execute queries and PL/SQL programs.

List of Experiments for 52 hrs/ Semester.

Database 1: EMPLOYEE

Consider the following relations for Employee database application.

EMPLOYEE (Empno, Name, Dept_ID, DOJ, City)

DEPARTMENT (Dept_ID, Name, Manager)

Salary (Empno, Basic, HRA, Deductions, Tax, Net_Pay)

- Create the above tables by properly specifying the primary key.
 - Enter at least five tuples for each relation.
 - Execute the following queries (SQL)
 - Find out the Employees who have the same date of joining.
 - Get Department ID, the average, maximum, and minimum basic pay of all departments having more than two employees.
 - Write PL/SQL procedure to insert a new row (INSERT INTO command).
-

Database 2: Company

Consider the following relations for company database application

EMPLOYEE (Adhar_no, Name, Address, Sex, Salary, DNo)

DEPARTMENT (DNo, DName, Mgr_Adharno, MgrStartDate)

DLOCATION (DNo,DLoc)

PROJECT (PNo, PName, PLocation, DNo)

WORKS_ON (Adhar_no,PNo, Hours)

- a. Create the above tables by properly specifying the primary key.
- b. Enter At least five tuples for each relation.
- c. Execute the following queries (SQL)
 1. Make a list of all project numbers for projects that involve an employee whose last name is 'Smith', either as a worker or as a manager of the department that controls the project.
 1. Retrieve all Employees in department 5 whose salary is between 30000 and 40000.
- d. Write PL/SQL program to demonstrate **%ROWCOUNT attribute**.

Database 3: Insurance

Consider the following relations for an accident recording database application

PERSON (Driverid :String, name:String, Address: String)

CAR (Regno: String, Model(Company): String,Year: int)

ACCIDENT (Reportno :Number, Date: Date, Location: String)

OWNS (Driverid: String, Regno: String)

PARTICIPATED (Driverid:String, Regno:String, Reportno:Number,Damageamount:integer)

- a. Create the above tables by properly specifying the primary key.
- b. Enter At least five tuples for each relation.
- b. Execute the following queries (SQL)
 1. Demonstrate how to update the damage amount for the car with a specific regno.
 2. List the drivers (name, address & damage amt) who have participated in an accident.
- d. Write PL/SQL program demonstrate exception handling for the above query 2.

Database 4: COMPANY (SHIPMENT)

Consider the following relations for an order processing database application in a company

CUSTOMER (Customerno:Integer,Customername:String,City:String)

ORDER (Orderno:integer,orderDate:date, customerno:int,Orderamount:dec)

ITEM (Itemno:int,unitprice:decimal)

ORDERITEM (Orderno:int,Itemno:int,Quantity: int)

WAREHOUSE (Warehno:int,City:String)

SHIPMENT (Orderno:int,Warehno:int,Shipdate:Date)

- a. Create the above tables by properly specifying the primary key
 - b. Enter At least five tuples for each relation.
 - c. Execute the following queries (SQL)
 1. List the item no, unit price, quantity and total price for a particular order no.
 2. List the customer name, city, order number and order amount for a particular customer.
 - d. Write PL/SQL procedure to illustrate, how to create and call a function.
-

Database 5: STUDENTS, COURSES & BOOK ISSUED

Consider the following relations for Student, courses & Book issued database.

STUDENT (Regno:String, Name:String; Major:String; Bdate:Date)
 COURSE (CourseNo:Integer, Cname:String; Dept:String)
 ENROLL (Regno:String; CourseNo;integer; Semester:Integer: Marks:int)
 BOOKADOPTION (CourseNo:Integer ;Semester:Integer;BookISBN:Int)
 TEXT (BookISBN:Int; BookTitle:String;Publisher:String;Author:string)

- a. Create the above tables by properly specifying the primary key.
- b. Enter At least five tuples for each relation.
- c. Execute the following queries (SQL)
 1. Produce a list of textbooks with Book ISBN, Title, publisher, author, course name and course number adopted by some course.
 2. List the name, major, course name, semester and the marks obtained by a particular student.
- d. Write PL/SQL procedure to demonstrate user defined exception handling.

Database 6: BOOK DEALER

Consider the following relations for a database application for a Book Dealer

AUTHOR (Authorid int, Name:String, City:String, Country:String)
 PUBLISHER (Publisherid:int, Name:String, City:String, Country:String)
 CATALOG (Bookid:int, Title:String, Authorid int, Publisherid:int, Categoryid: int, Year:int, Price:int)
 CATEGORY (Categoryid: int, Description:String)
 ORDERDETAIL (Oredrno:int, Bookid:int, Quantity:int)

- a. Create the above tables by properly specifying the primary key.
 - b. Enter At least five tuples for each relation.
 - c. Execute the following queries (SQL)
 1. Demonstrate how to increase the price of the book published by a specific publisher by 10%.
 2. Display the title of the book having maximum sales.
 - d. Write PL/SQL program to demonstrate Implicit/Explicit **cursor**.
-

Database 7: BANK

Consider the following relations for a Bank database application

BRANCH (BranchID: integer, Branchname: String, Branchcity:String, Assets:Real)
ACCOUNT (Accno: Int, BranchID: Integer, Balance: Real)
CUSTOMER (AccountNo: Integer, Customername: String, CustomerCity: String)
LOAN (Loano: Integer, BranchID : Integer, Amount: Real)
BRROWER (AccountNo: Integer, Loano: Integer)

- a. Create the above tables by properly specifying the primary key.
- b. Enter At least five tuples for each relation.
- c. Execute the following queries (SQL)
 1. List the names of the customers with their Loan Amount who have taken loan from the main branch(in any city).
 2. Find all the customers who have accounts at the main branch.
- d. Write PL/SQL Procedure for an application using package.

Note: Draw ER diagram and Schema diagram for each database application

General Instructions

Implement all programs using

Scheme of Practical Examination (distribution of marks): 25 marks for the Semester end examination

- 1. 7 Marks (Creating tables, inserting 5 tuples for any one database application)**
- 2. 7 Marks (Executing SQL and PL/SQL)**
- 3. Viva 6 marks**
- 4. Journal 5 Marks**

Total 25 Marks

Note: Same scheme may be used for IA (Formative Assessment) examination.

B.Sc. Semester – IV

Course: Computer Science Open Elective Course (OEC-4) (OEC for other students)

Title of the Course: Electronic Commerce
OEC-4: Code: 004CSC051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-4	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

Course Outcomes (COs):

CO 1: Compare how internet and other information technologies support business processes.

CO2: Demonstrate an overall perspective of the importance of application of internet technologies in business administration

CO 3: Explain the basic business management concepts.

CO 4: Demonstrate the basic technical concepts relating to E-Commerce.

CO 5: Identify the security issues, threats and challenges of E-Commerce.

UNIT I	Introduction to E-Commerce and Technology Infrastructure Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5.	10 Hrs
UNIT II	Building an E-Commerce Website, Mobile Site and Apps Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App.	10 Hrs
UNIT III	E-Commerce Security and Payment Systems E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems	11 Hrs

UNIT IV	<p>Business Concepts in E-Commerce Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce.</p> <p>UNIT V Project Case Study Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart</p>	11 Hrs
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Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

References:

1. <http://docs.opencart.com/>
2. <http://devdocs.magento.com/>
3. <http://doc.prestashop.com/display/PS15/Developer+tutorials>
4. Robbert Ravensbergen, —Building E-Commerce Solutions with Woo Commerce, PACKT, 2nd Edition

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2022-23**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

4. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

5. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

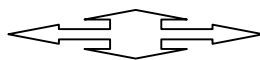
Part-C

6. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022


ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಆಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ


ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಮಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

Four - Year B. Sc. (Hons.) Program

SYLLABUS FOR SEM III & IV

Course: ELECTRONICS

SEMESTER - III:

DISCIPLINE SPECIFIC CORE COURSE(DSCC)

DSCC – 5 : Electronics (Theory) - I (Code:033ELE011)

DSCC – 6 : Electronics (Practical) - II (Code:033ELE012)

OEC- 3 : Basics of Communication Methods (Code: 003ELE051)

SEMESTER - IV:

DSCC – 7 : Electronics (Theory) - III (Code:034ELE011)

DSCC - 8 : Electronics (Practical) - IV (Code:034ELE012)

OEC- 4 : Basic Instrumentation (Code:004ELE051)

Effective from 2022-23

AS PER N E P - 2020

Karnatak University, Dharwad

Sem	Type of Course	Course Code	Instruction hour per week (hrs)	Total hours of Syllabus / Sem	Duration of Exam (hrs)	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC -5 Electronics (Theory) - V	033ELE011	04	56	02	40	60	100	04
	DSCC -6 Electronics (Practical) - VI	033ELE012	04	52	03	25	25	50	02
	OEC- 3 Basics of Communication Methods	003ELE051	03	42	02	40	60	100	03
IV	DSCC -7 Electronics (Theory) - VII	034ELE011	04	56	02	40	60	100	04
	DSCC -8 Electronics (Practical) - VIII	034ELE012	04	52	03	25	25	50	02
	OEC- 4 Basic Instrumentation	004ELE051	03	42	02	40	60	100	03

Details of the other Semesters will be given later

Name of Course (Subject): ELECTRONICS

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years B.Sc. Degree in ELECTRONICS, the students will be able to:

PSO1: Provide learning experiences that provide broad knowledge and understanding of key concepts of Electronics and equip students with advanced scientific / technological capabilities for analysing and tackling then issues and problems in the field of Electronics.

PSO2. Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in Electronics

PSO3: Develop abilities in students to design and develop innovative solutions for the benefit of society.

PSO4: Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as entrepreneurs.

B.Sc. Semester – III

DSCC-5: Electronics (Theory) V (Code: 033ELE011)

Title of the Course (Theory): Digital Design using Verilog and Programming in C

Syllabus-	Total Hrs: 56
Unit-I: Introduction to Verilog:	14 hrs
A Brief History of HDL, Structure of HDL Module, Comparison of VHDL and Verilog, Introduction to Simulation and Synthesis Tools, Test Benches. Verilog: Module, Delays, brief description - data flow style, behavioral style, structural style, mixed design style, simulating design. Language Elements- Introduction, Keywords, Identifiers, White Space Characters, Comments, format, Integers, reals and strings. Logic Values, Data Types-net types, undeclared nets, scalars and vector nets, Expressions: Operands, Operators, types of Expressions Gate level modeling - Introduction, built in Primitive Gates, multiple input gates, Tri-state gates, Illustrative Examples (both combinational and sequential logic circuits).	
Unit-II: Data flow Modeling and Behavioral Modeling:	14 hrs
Data flow Modeling: Continuous assignment, net declaration assignments, delays, net delays and examples. Behavioral Modeling: Procedural constructs, timing controls, block statement, procedural assignments, conditional statement, The 'Case' Statement, 'If' and 'if-Else' Constructs, loop statement, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, procedural continuous assignment, Illustrative Examples	
Unit-III: Basics of “C”- Programming:	14 hrs
Brief explanation of basic block diagram of computer, Computer programming preliminaries, Algorithm, Flowcharts and their symbols, some simple examples. Introduction to C-programming, Importance of C, Character set, Basic Structure of C program, Execution of C, C tokens, key words, identifiers, Constants, Variables and data types,data type modifiers. Declaration of variables, assigning values to variables, defining symbolic constants,Formatted and unformatted Input and output statements,Operators and expressions (All type), Precedence of operators. Solve sufficient problems.	

Unit-IV: Decision Making & Branching, Arrays and Functions:	14 hrs
Conditional & control statements- if statement, if-else statement, Nested if statement, Switch statement and goto- statement. Loop control structures- while, do-while and for statements. Arrays: One- and two-dimensional arrays, Declaration and initialization of arrays, multidimensional arrays. Strings: and initializing of string variables, reading and writing of strings, String handling functions. Functions: Function definition, arguments and parameters, local and global variable, Function declaration, simple C-programs using functions. Solve sufficient problems.	

Course Outcomes

At the end of this course, the students will be able to

- 1) Understand Verilog as hardware description language which is used to model electronic systems.
- 2) Understand basics of system Verilog and development of digital design using Verilog.
- 3) Understand the basics of simulation and synthesis tools.
- 4) Understand basics of HDL, its syntax, data flow modeling and practical examples.
- 5) Build a strong foundation in programming and logical thinking.
- 6) Develop C-Programs.
- 7) Control the sequence of the program using control statements and looping.
- 8) Implement arrays and strings in the program.

Books Recommended.

1. Digital Fundamentals: Thomas Floyd, Pearson publication Eleventh *Edition*.
2. Modern Digital Electronics: R.P. Jain, 3rd Edition, TMH Publications.
3. A Verilog HDL Primer – J. Bhasker, BSP, 2003 II Edition.
4. Verilog HDL-A Guide to Digital Design and Synthesis-Samir Palnitkar, Pearson, 2nd Edition.
5. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, 2004 IEEE
6. Fundamentals of Computers - V Rajaram, Neeharika Adabala - PHI.
7. Computer Fundamentals - Peter Norton, McGraw-Hill Education.
8. Computer concepts and C-Programmimng, P.B. Kotur.
9. Let Us C, Yashavant Kanetkar, BPB Publications
10. Programming in ANSI C, Balagurusamy, 2nd edition, TMH.
11. Byron S Gottfried, Programming with C, Schaum Series

B.Sc. Semester – III

DSCC-6: Electronics (Practical) - VI (Code: 033ELE012)

Title of the Course (Practical): Digital Design using Verilog and Programming in C

List of the Experiments for 52 hrs / Semester

1. Realization of basic gates (OR, AND and NOT) using verilog code.
2. Simplify the given boolean expressions and realize using verilog programme.
3. Realize Adder/subtractor (Full/Half) circuits using verilog data flow description.
4. Realize the following code converters using verilog behavioral description.
 - a) Gray to Binary and Vice – Versa.
 - b) Binary to excess 3 and vice-versa.
5. To realize counters: Up/down (BCD & Binary) using verilog behavioral description.
6. To realize using verilog behavioral description flip flops:
 - a) JK - type (b) SR type (c) T-type (d) D-type.
7. To realize 4-bit ALU using verilog programme
8. C-Program to find i) area of a triangle ii) area of triangle when sides are given iii) area of a circle.
9. C-program using if-else statement i) to check whether given number is odd or even ii) to find whether a given integer is positive or negative.
10. C-program to find largest and smallest of given numbers.
11. C-program to find the roots of a quadratic equation.
12. C-program to illustrate switch statement.
13. C-program to find factorial of a number using while, do and for loops.
14. C-program to generate the Fibonacci series.
15. C-program to find sum of odd and even numbers using functions.
16. Write code to realize basic sum & difference of two matrices using arrays.
17. C-program to find reverse of a number and to check whether it is a palindrome or not.

General instructions:

1. *Minimum of eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (Distribution of Marks): 25 Marks for Semester end Examination

1. Algorithm/Basic formula with description.	- 03 Marks
2. Flow Chart/Tabular Column with quantities	- 03 Marks
3. Writing Programme/Calculations of Required quantities	- 05 Marks
4. Debugging and Execution of Programme	- 10 Marks
5. Viva-Voce.	- 02 Marks
6. Completed & Certified Journal.	- 02 Marks
	Total 25 Marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Course Outcomes

After completing this course, the students will be able to

- 1) Develop C Programs and execute them.
- 2) Control the sequence of the program and give logical outputs.
- 3) Implement strings in C program and will have ability to work with arrays.
- 4) Store different data types in the same memory.
- 5) Manage I/O operations in C program.
- 6) Able to write c programs using loop structures.
- 7) Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog.
- 8) Understand types of modelling, modules, functions of Verilog and simulate and synthesize related Programs.
- 9) Design, Simulate and Synthesize various Verilog descriptions for Combinational circuits.
- 10) Design, Simulate and Synthesize various Verilog descriptions for Sequential circuits.

B.Sc. Semester – III

OEC – 3: Electronics (003ELE051)

Title of the Course: Basics of Communication Methods

Syllabus	Total Hrs: 42
Unit-I: Radio Communication	14 hrs
<p>Antenna: Function of antenna, Types of antenna, working of Yagi- Uda antenna and dish antenna (qualitative only) Classification of EM waves, Propagation of Radio waves: Ground wave propagation, Space wave propagation and Ionosphere: classification of ionosphere in to layers, Sky wave propagation, virtual height, critical frequency, critical angle.</p> <p>Modulation: definition of modulation, Types of modulation, AM FM. Modulation index in AM, FM. Representation of complete communication system using Simple block diagram (both transmitter & Receiver), Explanation of function of each block.</p> <p>Demodulation: AM detection (Diode as detector), Simple FM detector (balanced detector) Concepts of amplifiers used in communication system: audio frequency amplifier, Radio frequency amplifier.</p>	
Unit-II: Optical Fiber Communication:	14 hrs
<p>Fiber Optic Cable (FOC): Optical fiber definition and general construction, Principle of working, Types of FOC: step index, graded index. Cable mode: Single mode and Multi-mode fiber (Construction and profile) comparison of single and multi-mode fiber. Simple Block Diagram of Optical Fiber Communication system: Functions of each block, Sources of Light in OFC: LED: principle & working (qualitative) and Laser diode: Principle & working (qualitative) Comparison of Optical Fiber Communication System with cable communication and Radio communication systems Applications of OFC in other fields</p>	
Unit-III: Satellite Communication:	14 hrs
<p>Satellite Orbits & Positioning: Definition of satellite, satellite orbits: circular orbit & elliptical orbit, Satellite Height, apogee and perigee in case of elliptical orbits, satellite speed, satellite period, (Mention of Kepler's Laws of planetary motion) Angle of elevation, Geosynchronous orbits, position coordinates of satellite in terms of longitude and latitude (with clear illustration) Satellite communication System: general block diagram. Repeaters and transponders (qualitative), up linking and down linking. Frequency allocation. Satellite Applications: Discuss application of satellite in (1) communication (2) GPS (global positioning system) (3) weather forecasting (4) disaster management (5) agriculture Mention of various other applications of satellite to create awareness.</p>	

Course Outcomes

After completing the course, the students will be able to

- 1) Understand the introduction of antennas, their principle of operation and their types.
- 2) Understand ionosphere, and different types of wave propagation.
- 3) Have knowledge about various modulation and demodulation techniques.
- 4) Understand block diagram of communication system.
- 5) Learn the communication satellite mechanics, block diagram of satellite communication system and applications of satellites.
- 6) Familiar with Optical Fiber Communication System, principle, types of OFC and applications.

Books Recommended

1. Principle of Electronic Communication Systems by Lois E Frenzel Jr.: Mc Graw Hill Education Pvt Ltd
2. Electronic Communication by Dennis Roddy & John Coolen: Pearson Education
3. Electronic Communication Systems by George Kennedy & Bernard Davis: Mc Graw Hill Education Pvt Ltd
4. Introduction To Fiber Optics by Ajoy Ghatak & K.Thyagarajan : Cambridge University Press
5. Satellite Communication by Dennis Roddy: Mc Graw Hill

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05marks each. Answer any 04 questions : 20 marks

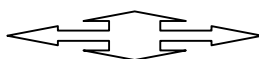
Part-C

3. Question number 12-15 carries 10 marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

DSCC- 7: Electronics (Theory) - VII (Code: 034ELE011)

Title of the Course (Theory) : **Electronic Communication - I**

Syllabus	Total Hrs: 56
Unit-I: Wave Propagation and Communication System	14 hrs
Propagation of “EM” Wave: Introduction, Loss of “EM” Energy due to noise, Ground Wave, Sky-wave and Space-wave propagation. Ionosphere and its effects. Antenna: Introduction, Antenna parameters, Ferrite rod antenna, yagi-Uda antenna, Dish-antenna-principle, Working and applications only. Analog Communication System: Introduction, Block diagram, Noise-effects, Types: Transmitter, channel and receiver (Qualitative analysis only). Modulation: Need, Types, Applications and limitations.	
Unit-II: Analog Modulation and Detection	14 hrs
Analog Modulation: Amplitude Modulation: Graphical representation of “AM” Wave, expression for “AM” Wave, Frequency spectrum, modulation index, Band width, power relations, current relations, side bands. Types of AM: Double sideband, suppressed carrier modulation, single sideband modulation (SSB) and Vestigial Sideband modulation (VSB) – Description graphical representation and applications. “AM” Modulators: Types, Working of Collector Modulators. “AM” Transmitter: Block Diagram, Description, design aspect (Qualitative only) “AM” Detector: Diode AM Detector – Principle and Working, transistor AM detector. Radio Receives: Characteristics of receiver sensitivity, Selectivity, Signal to noise ratio, fidelity, Stability. Super heterodyne receiver- block diagram, Description.	
Unit-III: Frequency Modulation and Detection	14 hrs
Frequency Modulation: Definition, Representation of “FM”, Expression for “FM” wave, modulation index, side bands, bandwidth requirements, frequency deviation, deviation ratio. F.M Generation: Varactor Diode and BJT reactance modulator. F.M Transmitter: Block diagram and description of blocks. FM detector: balanced slope detector, Foster Seeley discriminator, ratio detector.	
Unit-IV: Phase, Pulse and Digital Modulation	14 hrs
Phase Modulation: Definition, Description, Comparison with “FM”. Pulse Modulation: Analog Pulse Modulation, Sampling Theorem PAM, PWM & PPM. Digital Pulse Modulation: Need, Pulse code modulation (PCM). Digital Carrier Modulation: Sampling, Quantization and Encoding, Concept of Amplitude Shift Key (ASK), Frequency Shift Key (FSK) and Phase Shift Key (PSK).	

Course Outcomes

At the end of this course, the students will be able to

1. Know the basic concept of Analog Communication.
2. Understand the principle with which Analog Communication works.
3. Know the Various modulation techniques involved in radio communication before the transmission.
4. Understand the various blocks involved in radio transmitter.
5. Know different detection process involved in receiver to detect the original signal and able to design “AM” and “FM” detectors.
6. Familiar with “AM” and “FM” super heterodyne receiver.
7. Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission and able to construct simple pulse modulation.

Books Recommended:

1. G.K Mithal, “Radio Engineering Vol- II”, Khanna Publishers, New Delhi.
2. K.D Prasad, “Antenna and Wave Propagation”, Satyaprakashan, New Delhi.
3. Sanjeev Gupta, “Electronic Communication Systems”, Khanna Publishers, New Delhi.
4. Roddy and Coolen, “Electronic Communication”, PHI, IV Edition, 2012.
5. George Kennedy, “Electronics and Communication System”, TMH, Edition, 2012.
6. Frenzel, “Principle of electronic communication system”, III edition, Mc Graw Hill Publications.
7. S.Haykin, “Communication Systems”, 2006, Wiley edition

B.Sc. Semester – IV

DSCC-8: Electronics (Practical) - VIII (Code: 034ELE012)

Title of the Course (Practical): **Electronic Communication - I**

List of the Experiments for 52 hrs / Semesters

Minimum 8 Experiments are to be performed.

1. Construct amplitude modulator using transistor / I.C. Determination the modulation index.
2. Construct an A.F amplifier (R-C coupled amplifier). Determine the bandwidth and mid gain.
3. Construct Frequency Modulator Circuit – Determine the Modulation Index.
4. “AM” Linear Diode detector – Trace the input and output waveforms.
5. Construct “AGC” circuit for “AM” Detector and trace the response curve.
6. “FM” Detector – Ratio detector; plot the frequency response curve.
7. Study the “AM” transmitter.
8. Study “AM” receiver.
9. Pulse Amplitude Modulation (PAM) - trace the output waveforms.
10. Pulse Width Modulation (PWM) – trace the output waveforms.
11. Pulse Position Modulation (PPM) - trace the output waveforms.
12. Amplitude Shift Keying (ASK).
13. Frequency Shift Keying (FSK).
14. Phase Shift Keying (PSK).
15. Study the impedance characteristics of Microphone.
16. Study the Characteristics of loud speaker.

General instructions:

1. *Minimum Four Experiments to be performed in each Part*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- | | |
|---|-----------------------|
| 1. Basic formula, Units & Nature of graph,
Circuit Diagram / Ray Diagram / Schematic diagram | - 05 Marks |
| 2. Tabular Column with quantities and unit mentioned,
experimental skills. | - 05 Marks |
| 3. Recording of observations, calculations and drawing graph,
and accuracy of the result | - 11 Marks |
| 4. Viva-voce | - 02 Marks |
| 5. Completed & Certified Journal | - 02 Marks |
| | Total 25 marks |

Note: Same Scheme may be used for IA (Formative Assessment) examination

Course Outcomes

After competing this course, students will be able to:

- 1) Compute modulation index for various analog modulation schemes like AM and FM.
- 2) Evaluate the performance of analog and digital modulation - demodulation techniques.
- 3) Analyse various analog continuous wave modulation and demodulation techniques like AM and FM.
- 4) Construct and analyse AF amplifier, AM transmitter and receiver circuits.
- 5) Implement analog pulse modulation and demodulation methods like PPM and PWM.
- 6) Implement digital pulse modulation and demodulation methods like ASK, FSK and PSK.

B. Sc. Semester – IV

OEC-4: Basic Instrumentation (Code: 004ELE051)

Syllabus	Total Hrs: 42
Unit-I: Basics of Measurements and Instruments	14 hrs
Basics of Measurements: Instrumentation, accuracy, precision, sensitivity, resolution, errors in measurements, classification of instruments Basic d'Arsonval meter movement, principle of voltmeter, construction of multirange voltmeter examples, voltmeter sensitivity, loading effect of voltmeter, principle of ammeter, construction of multirange milliammeter, examples. Ohmmeter- series type ohmmeter construction, problems, Shunt type Ohmmeter Construction, examples. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications and their significance. Electronic Voltmeter: Block diagram, advantages over conventional multimeter for voltage measurement, AC millivoltmeter: Types of AC millivoltmeters: Amplifier-rectifier, rectifier-amplifier. Block diagram of ac millivoltmeter, specifications and their significance.	
Unit-II: Cathode Ray Oscilloscope	14 hrs
Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT. Electron gun, electrostatic focusing and acceleration (Explanation only-no mathematical treatment), brief discussion on screen phosphor, visual persistence and chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of single trace.	
Unit-III: Signal Generators and Analysis Instruments	14 hrs
Signal Generators: Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. Digital Instruments: Principle and working of digital meters. Comparison of analog and digital instruments. Characteristics of a digital meter. Working principle of digital Voltmeter. Digital Multimeter: Block diagram and working of digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution.	

Course Outcomes

After completing the course, the students will be able to

- 1) Understand the fundamental concepts and principles of instrumentation.
- 2) Learn principle of operation, working of different instruments like Voltmeter, Ammeter, Ohmmeter, Multimeter and AC Millivoltmeter.
- 3) Learn the functioning, specification, and applications of signal analyzing Instruments like cathode ray oscilloscope.
- 4) Work in industry with good skill.
- 5) Measure various parameters using proper instruments without errors.
- 6) Understand the importance of electronic instrumentation and measurements,

Books Recommended

1. Electronic Instrumentation and measurements-H S Kalsi
2. Electronic Instrumentation and measurements-David A Bell
3. A course in Electrical and electronic measurements and Instrumentation-A K Sawhney
4. Modern Electronics Instrumentation and measurement techniques- Helfrick Cooper
5. A text book in Electrical Technology- B. L. Theraja – S. Chand and Co.
6. Electronic Devices and Circuits, S. Salivahanan and N. S. Kumar, Third Ed.2012
Tata Mc-Graw Hill.
1. Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting
by R. G. Gupta, Publisher: Tata McGraw-Hill, New Delhi, 2001

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

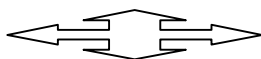
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ - 580003

NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಆಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತಿಗಳು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAKUNIVERSITY, DHARWAD

04-Year B.Sc.(Hons.) Program

*****SYLLA**

BUS

Subject: Mathematics [Effective from 2022-23]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM III & IV
AND OPEN ELECTIVE COURSE (OEC) FOR SEM III & IV.**

AS PER NEP-2020

Karnatak University, Dharwad
Four Years Under Graduate Program in Mathematics for B.Sc.(Hons.)
With Effect from 2022-23

Sem	Type of Course	Theory/Practical	Instruction hours per week	Total hours of Syllabus /Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC: 5 033MAT011	Theory	04hrs	56	02hrs	40	60	100	04
	DSCC: 6 033MAT012	Practical	04hrs	52	03hrs	25	25	50	02
	OEC: 3 003MAT051	Theory	03hrs	42	02hrs	40	60	100	03
IV	DSCC: 7034MAT011	Theory	04hrs	56	02hrs	40	60	100	04
	DSCC: 8034MAT 012	Practical	04hrs	52	03hrs	25	25	50	02
	OEC-4 004MAT051	Theory	03hrs	42	02hrs	40	60	100	03

III Semester

DSCC-5(033MAT011) : Ordinary Differential Equations and Real Analysis–I

DSCC-6(033MAT012) : Practicals on Ordinary Differential Equations and Real Analysis–I

OEC-: 3(003MAT051) : Quantitative Mathematics

(for other students)

IV Semester

DSCC-7(034MAT 011) : Partial Differential Equations and Integral Transforms

DSCC-8(034MAT012) : Practicals on Partial Differential Equations and Integral Transforms

OEC- 4(004MAT05) : Mathematical Finance

(for other students)

B.Sc.Semester–III

Subject: Mathematics
Discipline Specific Course(DSC)

The course Mathematics in III semester has two papers (Theory Paper–033MAT011 for 04 credits & Practical Paper-033MAT012 for 2 credits) for 06 credits: Both the papers are compulsory. Detail soft he courses are as under.

Course No.: 5
Course Code (Theory): 033MAT011

Course Code	Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033MAT011	DSCC	Theory	04	04	56hrs	2hrs	40	60	100

Title of the Course (Theory):**DSCC-5 :Ordinary Differential Equations and Real Analysis–I(033MAT011)**

CourseOutcome(CO):

After completion of the course(Theory), students will be able to:

CO1:Solve first-order non-linear differential equations and linear differential equations.

CO2:To model problems in nature using Ordinary Differential Equations.

CO3:Formulate differential equations for various mathematical models

CO 4: Apply these techniques to solve and analyze various mathematical models.

CO 5:Understand the fundamental properties of the real numbers that lead to define sequence and series in the formal development of real analysis.

CO 6:Learn the concept of Convergence and Divergence of a sequence.

CO 7:Able to handle and understand limits and their use in sequences, series, differentiation, and integration.

CO 8:Apply the ratio, root, alternating series, and limit comparison tests for convergence and absolute convergence of an infinite series.

Syllabus-Course(Theory): DSCC-5	Total Hrs:56
Title-033MAT011:Ordinary Differential Equations and Real Analysis–I	
Unit-I	14hrs
Ordinary Differential Equations: Recapitulation of Differential Equations of the first order and first degree, Exact Differential equations, Necessary and sufficient condition for the equations to be exact, Reducible to the exact differential equations. Differential equations of the first order and higher degree: Equations solvable for p, x, y. Clairaut's equation and singular solution. Orthogonal trajectories of Cartesian and polar curves.	

Unit-II	14hrs
Linear differential equations: Linear differential equations of the n^{th} order with constant coefficients. Particular Integrals when the RHS is of the form e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n , $e^{ax} V$ and $x V$ (with proofs), where V is a function of x . Cauchy – Euler equations, Legendre differential equations, Method of variation of parameters. Simultaneous differential equations with two and more than two variables. Condition for integrability of total differential equations $Pdx+Qdy+Rdz=0$.	
Unit-III	14hrs
Sequences: Sequences of real numbers, Bounded sequences. Limit of a sequence. convergent, divergent, and oscillatory sequences. Monotonic sequences. Algebra of convergent sequences. Limit points of a sequence. Bolzano Weierstrass theorem for sequence. Limit superior and limit inferior of sequences. Cauchy's first and second theorem on limits of a sequence. Cauchy's general principle for convergence of a sequence. Subsequence and their properties.	
Unit-IV	14hrs
Infinite Series: Definition of convergent, divergent, and oscillatory series. Series of non-negative terms, Cauchy's general principle of convergence. Geometric series, P-series (Harmonic series). Comparison tests for positive term series. D'Alembert's ratio test, Raabe's test. Cauchy's Root test and Cauchy's integral test. Alternating series. Leibnitz's theorem. Absolute convergence and conditional convergence of a series. Summation of series: Binomial, exponential, and logarithmic.	

Books recommended:

1. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
2. J. Sinha Roy and S. Padhy: A course of Ordinary and Partial Differential Equation, Kalyani Publishers, New Delhi.
3. D. Murray, Introductory Course in Differential Equations, Orient Longman (India)
4. W. T. Reid, Ordinary Differential Equations, John Wiley, New Delhi.
5. M. L. Khanna and L. S. Varhiney, Real Analysis by, Jai Prakash Nath & Co. Meerut.
6. M. L. Khanna, Differential Equations, Jai Prakash Nath & Co. Meerut
7. S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
8. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2015.
9. Gerald G. Bilodeau, Paul R. Thie, G. E. Keough, An Introduction to Analysis, 2nd Ed., Jones & Bartlett, 2010.
10. K. A. Ross, Elementary Analysis: The Theory of Calculus, (2nd edition), Springer, 2013
11. S. K. Berberian, A First Course in Real Analysis, Springer Verlag, New York, 1994.
12. T. Apostol, Mathematical Analysis, Narosa Publishing House.
13. E. Kreyzig, Advanced Engineering Mathematics, John Wiley, New Delhi.

B.Sc.Semester–III

Subject: Mathematics Discipline Specific Course (DSC)

Course No.: 6

Course Code (Practical): 033MAT012

Course Code	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of Lectures/Hour s /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033MAT012	DSCC	Practical	02	04	52hrs	3hrs	25	25	50

Title of the Course (Practical): **DSCC-6: Practicals on Ordinary Differential Equations and Real Analysis-I (033MAT012)**

Course Outcome (CO):

After completion of the course (Practical), students will be able to:

This course will enable the students to gain hands-on experience of

- CO 1:** Free and Open Source software (FOSS) tools or computer programming.
- CO 2:** Solving exact differential equations
- CO 3:** Plotting orthogonal trajectories
- CO 4:** Finding complementary functions and particular integral of linear and homogeneous differential equations.
- CO 5:** Acquire knowledge of applications of real analysis and differential equations.
- CO 6:** Verification of convergence/divergence of different types of series

List of the Experiments for 52hrs/Semesters

Introduction to the software and commands related to the topic.

1. Fundamentals of Ordinary differential equations and Real analysis using FOSS.
2. Verification of exactness of a differential equation
3. Plot orthogonal trajectories for Cartesian and polar curves
4. Solutions of differential equations that are solvable for x, y, p .
5. To find the singular solution by using Clairaut's form.
6. Finding the Complementary Function and Particular Integral of linear and Homogeneous differential equations with constant coefficients and plot the solutions.
7. Finding the Particular Integral of differential equations up to second order and plot the solutions.
8. Solutions to the Total and Simultaneous differential equations and plot the solutions.
9. Test the convergence of sequences
10. Verification of exponential, logarithm, and binomial series.
11. Verification of geometric series, p -series, Cauchy's Integral test, root test, and D'Alembert's Test
12. Examples on a series of positive terms.
13. Examples on alternating series using Leibnitz's theorem.
14. Finding the convergence of series using Cauchy's criterion for partial sums.

Pedagogy

General instructions: Suggested Software: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Program writing and problem-solving: 10 Marks

2. Programme Execution: 5 Marks

3. Viva: 5 Marks

4. Journal: 5 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended:

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
2. Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011 S. Chand and Company
3. Scilab for very beginners. - www.scilab-enterprises.com
4. M. Kanagasabapathy, Introduction to Maxima for Scientific Computers, BPB Publishers.
5. Kalyanarao Takale, Computational Mathematics using Maxima Software, Nirali Publishers.
6. Vaisak Vena, Maxima, The Computer Algebra System, Notion Press.
7. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
8. J. Sinha Roy and S. Padhy: A course of Ordinary and Partial Differential Equation, Kalyani Publishers, New Delhi.
9. D. Murray, Introductory Course in Differential Equations, Orient Longman (India)
10. W. T. Reid, Ordinary Differential Equations, John Wiley, New Delhi.
11. M. L. Khanna and L. S. Varhiney, Real Analysis, Jai Prakash Nath & Co. Meerut.
12. M. L. Khanna, Differential Equations, Jai Prakash Nath & Co. Meerut.

B.Sc.Semester–III

Subject: Mathematics

Open Elective Course (OEC-3)
(OEC for other students)

Course Code(OEC): 003MAT051

Course Code	Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
003MAT051	OEC	Theory	03	03	42hrs	2hrs	40	60	100

OEC-3 (OEC for other students): 003MAT051

Title of the Course: **Quantitative Mathematics**

Course Outcome (CO):

After completion of the course, students will be able to:

CO1: Understand numbers system and fundamental operations

CO2: Understand the concept of linear, quadratic and simultaneous equations and their applications in real-life problems.

CO3: Understand and solve the problems based on Age.

CO4: Solve Speed and Distance related problems.

Syllabus-003MAT051: Title-Quantitative Mathematics	Total Hrs:42
Unit-I	14hrs
Number System: Numbers, Operations on Numbers, Tests on Divisibility, HCF, and LCM of numbers. Decimal Fractions, Simplification, Square roots, and Cube roots - Problems thereon. Surds and Indices. Illustrations thereon.	
Unit-II	14hrs
Theory of equations Linear equations, quadratic equations, simultaneous equations in two variables, simple application problems - Problems on Ages, Problems on conditional Age calculations, Present & Past age calculations.	
Unit-III	14hrs
Quantitative Aptitude Percentage, Average, Average Speed-problems. Time and distance, problems based on trains, problems on work and time, work and wages, clock and calendar.	

Books recommended:

1. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Limited, New Delhi-110055.

2. Abhijit Guha, Quantitative Aptitude, 5th Edition, Mc.Grawhill publications. 2014.
3. R. V. Praveen, Quantitative Aptitude and Reasoning, PHI publishers.
4. R. S. Aggarwal, Objective Arithmetic, S.Chand & Company Ltd.
5. Qazi Zameeruddin, Vijay K. Khanna, S. K. Bhambri, Business Mathematics-II Edition, S. Chand & Company Ltd.
6. S.K.Sharma and Gurmeet Kaur, Business Mathematics, S.Chand & Sons.
7. Hazarika Padmalochan, A Text Book of Business mathematics for B.Com. and BBACourse, S. Chand & Company Ltd.
8. J. K. Thukrol, Business Mathematics, abcibook:2020, First Edition, The world book depot, India
9. N. G. Das and J.K.Das, Business Mathematics and Statics, McGraw Hill Education, 2017.

DetailsofFormativeassessment(IA)forDSCCtheory/OEC:40%weightagefortotalmarks

TypeofAssessment	Weightage	Duration	Commencement
Writtentest-1	10%	1hr	8 th Week
Writtentest-2	10%	1hr	12 th Week
Seminar	10%	10minutes	--
Casestudy/Assignment / Fieldwork/ Projectwork/Activity	10%	-----	--
Total	40%ofthemaximummarksallottedforthe paper		

**FacultyofScience
04-YearUGHonorsprogramme:2022-23**

**GENERALPATTERNOFTHEORYQUESTIONPAPERFORDSCC/OEC
(60marksforsemesterendExaminationwith2hrsduration)**

Part-A

1. Questionnumber1-6carries2markseach.Answerany5questions :10marks

Part-B

2. Questionnumber7-11carries5 markseach.Answerany4questions :20marks

Part-C

3. Questionnumber12-15carries10 markseach.Answerany3questions :30marks(Mini

imum1questionfromeachunitand10marksquestionmayhavesub questionsfor7+3or6+4or5+5ifnecessary)

Total:60Marks

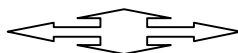
Format for Model question paper Unit wise

033MAT011: Ordinary Differential Equations and Real Analysis–I

Question Number	Number of questions to be set in Unit	Number of questions to be answered	Marks for each question	Max marks for the question
1	Unit-I -----2 Unit-II -----1 Unit-III-----1 Unit-IV-----2 Total: 6	5	2	10
2	Unit-I -----1 Unit-II-----2 Unit-III-----1 Unit-IV-----1 Total: 5	4	5	20
3	Unit-I -----1 Unit-II-----1 Unit-III-----1 Unit-IV-----1 Total: 4	3	10	30

003MAT051 Quantitative Mathematics

Question Number	Number of questions to be set in Unit	Number of questions to be answered	Marks for each question	Max marks for the question
1	Unit-I -----2 Unit-II -----2 Unit-III-----2 Total: 6	5	2	10
2	Unit-I -----1 Unit-II-----2 Unit-III-----2 Total: 5	4	5	20
3	Unit-I -----2 Unit-II-----1 Unit-III-----1 Total: 4	3	10	30

**B.Sc.Semester–IV**

Subject:
Mathematics Discipline Specific Course (DSCC)

The course Mathematics in IV semester has two papers (Theory Paper for 04 credits & Practical paper for 2 credits) for 06 credits. Both papers are compulsory. Details of the courses are as under.

Course No.: 7
Course Code (Theory): 034MAT011

Course Code	Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hour s /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
034MAT011	DSCC	Theory	04	04	56hrs	2hrs	40	60	100

Title of the Course (Theory): **DSCC-7: Partial Differential Equations and Integral Transforms (034MAT011)**

Course Outcome (CO):

After completion of the course (Theory), students will be able to:

- CO1:** Solve the Partial Differential Equations of the first order and second order.
- CO2:** Formulate, classify and transform partial differential equations into canonical form.
- CO3:** Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
- CO4:** Able to take more courses on wave equation, heat equation, and Laplace equation.
- CO5:** Solve PDE by Laplace Transforms and Fourier Transforms.

Syllabus-(Theory): DSCC-7	Total Hrs: 56
Title-034MAT011: Partial Differential Equations and Integral Transforms	
Unit-I	14hrs
Basic concepts – Formation of partial differential equations by elimination of arbitrary constants and functions, Solution of partial differential equations – Solution by Direct integration, Lagrange’s linear equations of the form $Pp + Qq = R$, Standard types of first order non-linear partial differential equations. The integrals of the non-linear equation by Charpit’s method	
Unit-II	14hrs
Homogeneous linear partial differential equations with constant coefficients. Partial differential equations of the second order. Classification of second-order partial differential equations, canonical forms. Classification of second-order linear equations as hyperbolic, parabolic, and elliptic. Solutions of the Heat equation, Laplace equation, and Wave equation (using separation of variables).	
Unit-III	14hrs

Laplace Transforms Definition, Basic Properties. Laplace transforms of some standard functions. Laplace transform of Periodic functions. Laplace transform of derivative and integral of a function. Heaviside function. Dirac-delta function. Convolution theorem. Inverse Laplace transforms and its properties. Solution of differential equations by using Laplace transforms	
Unit-IV	14hrs
Fourier Series and Transforms: Periodic functions. Fourier Coefficients. Fourier series of functions with period 2π and period $2L$. Fourier series of even and odd functions. Half range Cosine and Sine series. Fourier Transforms - Finite Fourier Cosine and Sine transform. Transforms of derivatives. Applications of Fourier Transforms.	

Books recommended:

1. D. A. Murray, Introductory Course in Differential Equations, Orient and Longman
2. H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, CBS Publisher & Distributors, Delhi, 1985.
3. G.F. Simmons, Differential Equations, Tata McGraw Hill.
4. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
5. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
6. K. Sankara Rao, Introduction to Partial Differential Equations, PHI, Third Edition, 2015.
7. I.N. Sneddean, Elements of Partial differential equations, McGraw-Hill International Editions, 1986.
8. Murray R. Spiegel (Schaum's Series), Laplace Transforms, McGraw-Hill International Editions.
9. Goel and Gupta, Laplace Transform, Pragati Prakashan, Meerut, India.
10. Sudhir Kumar Pundir, Integral Transform Methods in Science & Engineering, CBS Engineering Series, 2017, New Delhi.
11. Murray R. Spiegel (Schaum's Series), Fourier Transforms, McGraw-Hill International Editions.
12. Earl David Rainville and Philip Edward Bedient—A short course in Differential Equations, Prentice Hall College Div; 6th Edition.
13. Sathya Prakash, Mathematical Physics, S. Chand and Sons, New Delhi.

B.Sc.Semester–IV

Subject:

Mathematics Discipline Specific Course (DSCC)

Course No.: 8

Course Code (Practical): 034MAT012

CourseCode	TypeofCourse	Theory/Practical	Credits	Instructionhour perweek	Total No. ofLectures/Hour s /Semester	DurationofExam	Formative AssessmentMarks	Summative Assessment Marks	Total Marks
034MAT012	DSCC	Practical	02	04	52hrs	3hrs	25	25	50

Title of the Course (Practical) **DSCC-8: Practical on Partial Differential Equations and Integral Transforms (034MAT012)**

Course Outcome (CO):

After completion of the course (Practical), students will be able to:

- CO1:** Learn Free and Open Source software (FOSS) tools or computer programming.
- CO2:** Solve problems on Partial Differential Equations and Integral Forms.
- CO3:** To find Laplace transform of various functions.
- CO 4:** To find the Fourier Transform of periodic functions
- CO 5:** To solve partial differential equations by using Integral transforms.

List of the Experiments for 52hrs/Semesters

- 1 Solutions of Linear Partial differential equations of type 1 to type 4 and Lagrange's method.
- 2 Solutions of the partial differential equation using Charpit's method.
- 3 Solutions of Second-order homogenous partial differential equation with constant coefficients.
- 4 Solutions to the partial differential equations using the separation of variables method (Heat/ Wave/ Laplace).
- 5 Finding the Laplace transforms of some standard and periodic functions.
- 6 Finding the inverse Laplace transform of simple functions
- 7 Verification of Convolution Theorem.
- 8 To solve ordinary linear differential equations using Laplace transforms.
- 9 To solve the Integral equation using Laplace transform.
- 10 To find full range Fourier series of some simple functions with period 2π and $2L$
- 11 To find Half range sine and cosine series of some simple functions and plotting them.
- 12 To find Cosine Fourier transforms.
- 13 To find Sine Fourier transforms.

General instructions: Suggested Softwares: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Program writing and problem solving: 10 Marks

2. Programme Execution: 5 Marks

3. Viva: 5 Marks

4. Journal: 5 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444.
2. Scilab (A free software to Matlab): H. Ramchandran, A. S. Nair. 2011 S. Chand and Company.
3. Scilab for very beginners. - www.scilab-enterprises.com
4. M. Kanagasabapathy, Introduction to Maxima for Scientific Computers, BPB Publishers.
5. Kalyanarao Takale, Computational Mathematics using Maxima Software, Nirali Publishers.
6. Vaisak Vena, Maxima, The Computer Algebra System, Notion Press.
7. P. N. de Souza, R. J. Fateman, J. Moses and C. Yapp, The Maxima Book.
8. M. D. Raishanania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
9. I. N. Sneddean, Elements of Partial differential equations, McGraw-Hill International Editions, 1986.
10. Murray R. Spiegel (Schaum's Series), Laplace Transforms, McGraw-Hill International Editions.
11. Murray R. Spiegel (Schaum's Series), Fourier Transforms, McGraw-Hill International Editions.

B.Sc.Semester –IV

Subject:
Mathematics Open Elective Course (OEC
-4)
(OEC for other students)

Course Code (OEC): 004MAT051

Course Code	Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
004MAT051	OEC	Theory	03	03	42hrs	2hrs	40	60	100

OEC-4 (for other students): 004MAT051:

Title of the Course: **Mathematical Finance**

Course Outcome (CO):

After completion of the course, students will be able to:

- CO1:** Understand how to compute profit and loss, discount, and Banker's discount.
- CO2:** Understand the concept of Linear equations and inequalities and their use in the Solving the Linear Programming Problems.
- CO3:** Formulation of Transportation Problem and its application in the routing problem. Integrate the concept in business concept with the functioning of global trade.
- CO4:** Understand commercial arithmetic.
- CO5:** Apply decision-support tools to business decision-making.
- CO6:** Apply knowledge of business concepts and functions in an integrated manner.

Syllabus-OEC Title-004MAT051: Mathematical Finance	Total Hrs:42
Unit-I	14hrs
Commercial Arithmetic Bill of exchange, Bill of the discounting procedure. Basic formula related to profit, loss, discount and brokerage, Successive discount, True discount, Banker's discount.	
Unit-II	14hrs
Linear Programming Linear equations and inequalities- Rectangular coordinates, straight line, parallel and intersecting lines, and linear inequalities. Introduction to linear programming, Mathematical formulation of LPP, Solution of an LPP by graphical method, special cases in the graphical method.	

Unit-III	14hrs
Transportationproblem Introduction, Formulation of Transportation problem, Initial basic feasible solution, Steps in solving a transportation problem, optimality check, special cases in Transportation problem. The Traveling salesman Problem (RoutingProblem).	

Booksrecommended:

1. R. S. Aggarwal, Objective Arithmetic, S.Chand& Company Ltd.
2. A. Mizrahi and M. Sullivan, Mathematics for Business and Social Sciences and Application approach, JohnWiley and Sons, India.
3. QaziZameeruddin, Vijay K. Khanna, S. K. Bhambri, Business Mathematics- II Edition, Vikas Publishing House.
4. S.Kalavathy,OperationResearch, Fourth edition,Vikas publication house Pvt. Ltd.
5. Sreenivasa Reddy M, Operations Research, 2ndedition, Sanguine Technical publishers Bangalore.
6. S.D.Sharma, OperationResearch,KedarNath Ram Nath, Meerut.

DetailsofFormativeassessment(IA)forDSCCtheory/OEC:40%weightagefortotalmarks

TypeofAssessment	Weightage	Duration	Commencement
Writtentest-1	10%	1hr	8 th Week
Writtentest-2	10%	1hr	12 th Week
Seminar	10%	10minutes	--
Casestudy/Assignment/Field work/Projectwork/Activity	10%	-----	--
Total	40%ofthemaximummarks allottedforthepaper		

**FacultyofScience
04-YearUGHonorsprogramme:2022-23**

**GENERALPATTERNOFTHEORYQUESTIONPAPERFORDSCC/OEC
(60marksforsemesterendExaminationwith2hrsduration)**

Part-A

1. Questionnumber1-6carries2markseach.Answerany5questions :10marks

Part-B

2. Questionnumber7-11carries5Markseach.Answerany4questions :20marks

Part-C

3. Questionnumber12-15carries10Markseach.Answerany3questions :30marks(

Minimum1questionfromeachunitand10marksquestionmayhavesub questionsfor7+3or6+4or5+5ifnecessary)

Total:60Marks

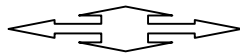
Format for Model question paper Unit wise

DSCCTheory: 034MAT011: Partial Differential Equations and Integral Transforms

Question Numbers	Number of questions to be set in Unit	Number of questions to be answered	Marks for each question	Max marks for the question
1	Unit-I: ----- 2 Unit-II ----- 1 Unit: III-----1 Unit: IV-----2 Total: 6	5	2	10
2	Unit-I -----1 Unit-II -----1 Unit-III -----2 Unit-IV -----1 Total: 5	4	5	20
3	Unit-I -----1 Unit-II -----1 Unit-III-----1 Unit-IV-----1 Total: 4	3	10	30

OEC4:004MAT051: Mathematical Finance

Question Number	Number of questions to be set in Unit	Number of questions to be answered	Marks for each question	Max marks for the question
1	Unit-I -----2 Unit-II -----2 Unit-III-----2 Total: 6	5	2	10
2	Unit-I -----2 Unit-II -----1 Unit-III-----2 Total : 5	4	5	20
3	Unit-I -----1 Unit-II -----2 Unit-III-----1 Total: 4	3	10	30





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

Kud-2022/9/23
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಮಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

B.Sc. (Hons) Programme

DRAFT SYLLABUS FOR

MICROBIOLOGY

DISCIPLINE SPECIFIC COURSE (DSCC), OPEN ELECTIVE COURSE

(OEC) FOR SEM III & IV

UNDER

NATIONAL EDUCATION POLICY (NEP)

Effective from 2022-23

Karnatak University, Dharwad

B.Sc. Semester-III

Subject: Microbiology

Discipline Specific Course (DSCC)

Course No.MCB103T

Title of the Course: Microbial Diversity (Theory)

The course Microbiology in III semester has two papers (Theory Paper-I for 04 credits & Practical Paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No./ Course code	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
MCB103T/033MCB011	DSCC	Theory	04	04	56hrs.	2hrs	40	60	100

Course Outcome(CO):

After completion of course(Theory), students will be able to:

CO1: Knowledge about microbes and their diversity

CO 2: Study, characters, classification and economic importance of Prokaryotic and Eukaryotic microbes

CO 3: Knowledge about viruses and their diversity

GEN103T: Microbial Diversity (Theory)		Total Hrs:56
Unit-I		14hrs
Biodiversity and Microbial Diversity: Concept, definition, and levels of biodiversity; Biosystematics – Major classification systems- Numerical and Chemotaxonomy. Study and measures of microbial diversity; Conservation and Economic values of microbial diversity.		
Unit-II		14hrs
Diversity of Prokaryotic Microorganisms: General characters; Classification; Economic importance; Distribution and factors regulating distribution. Bacteria and Archaea: An overview of Bergey's Manual of Systematic Bacteriology. Escherichia coli, Bacillus subtilis, Staphylococcus aureus. Cyanobacteria- Nostoc, Microcystis Spirulina. Thermus aquaticus, Methanogens Actinomycetes: Streptomyces, Nocordia, Frankia. Rickettsiae- Rickettsia rickettsi Chlamydiae – Chlamydia trachomatis and Spirochaetes- Trepanema pallidum		

Unit-III	14hrs
<p>Diversity of Eukaryotic Microorganism: General characters; Classification and Economic importance</p> <p>Fungi: Ainsworth classification- detailed study up to the level of classes, Salient features and reproduction. Type study: <i>Rhizopus</i>, <i>Saccharomyces</i>, <i>Aspergillus</i>, <i>Agaricus</i>, <i>Fusarium</i></p> <p>Algae: Occurrence, distribution, and symbiotic association- Lichen; thallus organization and types. Type study: <i>Chlorella</i>, <i>Cosmarium</i>, Diatoms, <i>Gracilaria</i>,</p> <p>Protozoa: Classification up to the level of classes. Type study: <i>Amoeba</i>, <i>Euglena</i>, <i>Trichomonas</i>, <i>Paramecium</i>, <i>Trypanosoma</i></p>	
Unit-IV	14hrs
<p>Diversity of Virus: General properties and structure, Isolation and purification and assay of virus. Principles of Viral Taxonomy- Baltimore and ICTV and the recent trends. Capsid symmetry- Icosahedral, helical, complex</p> <p>Animal Viruses: HIV, Corona, Ortho and paramyxovirus, Oncogenic virus</p> <p>Plants viruses: TMV, Ring spot virus</p> <p>Microbial Viruses: T4/T7/lambda/cyano/mycophages.</p>	

Books recommended:

1. Black, J.G. 2002. Microbiology-Principles and Explorations. John Wiley and Sons, Inc. New York
2. Brock, T.D. and Madigan, M.T. 1988. Biology of Microorganisms, V Edition. Prentice Hall. New Jersey
3. Dimmock, N. J., Easton, A. J., and Leppard, K. N. 2001. Introduction to Modern Virology. 5th edn. Blackwell publishing, USA
4. Flint, S.J., Enquist, L.W., Drug, R.M., Racaniello, V.R. and Skalka, A.M. 2000. Principles of Virology- Molecular
5. Biology, Pathogenesis and Control. ASM Press, Washington, D.C
6. Prescott, Harley, Klein's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill
7. Vashishta B.R, Sinha A.K and Singh V. P. Botany – Fungi 2005, S. Chand and Company Limited, New Delhi
8. Kotpal R.L Protozoa 5th Edition 2008, Rastogi Publications, Meerut, New Delhi.
9. Brock Biology of Microorganisms, M.T. Madigan, J.M. Martinko, P. V. Dunlap, D. P. Clark- 12th edition, Pearson International edition 2009, Pearson Benjamin Cummings
10. Microbiology – An Introduction, G. J. Tortora, B. R. Funke, C. L. Case, 10th ed. 2008, Pearson Education
11. General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited

B.Sc.Semester-III

Subject: Microbiology

Discipline Specific Course (DSCC)

Course No.-MCB1033P

Title of the Course: Microbial Diversity (Practical)

CourseNo.	TypeofC ourse/ course code	Theory /Practica l	Credits	Instruction hourperwee k	Total No. ofLectures/Hours /Semester	Duration of Exam	FormativeA ssessmentM arks	Summative Assesse mentMarks	Total Marks
MCB1033P / 033MCB012	DSCC	Practical	02	04	52hrs	3hrs	25	25	50

Course Outcome(CO):

After completion of course(Practical), students will be able to:

CO1: Isolate microbes from different sources

CO 2:phenotypethe microbes by staining and microscopic observation

CO 3:Micrometry for scoring microbial cell dimensions

ListoftheExperimentsfor52hrs/Semesters

1. Study of morphology of bacteria
2. Isolation of bacteria from soil
3. Isolation of bacteria from air and water
4. Isolation of fungi from soil
5. Isolation of fungi from air and water
6. Cultivation of Cyanobacteria
7. Cultivation of Actinomycetes
8. Measurement of microbial cell size by Micrometry
9. Cyanobacteria Nostoc, Microcystis, Spirulina
10. Study of Algae-Chlorella, Diatoms, Gracilaria
11. Study of Fungi-Rhizopus, Saccharomyces, Agaricus
12. Study of Protozoa-Amoeba, Paramecium, Euglena
13. Study of Photographs or Models
14. HIV, TMV, Corona virus T4Phage
15. Paramyxovirus Oncogenic viruses

**Other practical may be added according to requirement and feasibility*

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 6 Marks
2. Minor Question ----- 4 Marks
3. Identification (A-E) ----- 8 Marks
4. Viva ----- 2 Marks
5. Journal ----- 5 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc.Semester-III

Subject: Microbiology

Open Elective Course (OEC)

(OEC for other students)

Course No.: MCB103E

Title of the Course: Microbial Entrepreneurship

CourseNo. / Course code	TypeofCourse	Theory /Practical	Credits	Instruction hourperweek	Total No. ofLectures/Hours /Semester	Duration of Exam	FormativeAssessmentMarks	Summative Assessment Marks	Total Marks
MCB103E 003MCB051	OEC	Theory	03	03	42hrs	2hrs	40	60	100

Course Outcome(CO):

After completion of course ,students will be able to:

CO1:Demonstrate entrepreneurial skills

CO2:Acquire knowledge industrial entrepreneurship

CO3:Acquire knowledge about Healthcare Entrepreneurship

GEN103EMicrobial Entrepreneurship	Total Hrs:42
Unit-I	14hrs
General Entrepreneurship: Entrepreneurship and microbial entrepreneurship - Introduction and scope, Business development, product marketing, HRD, Biosafety and Bioethics, IPR and patenting, Government organization/ institutions/ schemes, Opportunities and challenges	
Unit-II	14hrs
Industrial Entrepreneurship: Microbiological industries – Types, processes and products, Dairy products, Fermented foods, Bakery and Confectionery, Alcoholic products and Beverages, Enzymes – Industrial production and applications. Biofertilizers and Biopesticides, SCP (Mushroom and Spirulina) etc.	
Unit-III	14hrs
Healthcare Entrepreneurship: Production and applications: Sanitizers, Antiseptic solutions, Polyphenols (Flavonoids),Alkaloids, Cosmetics, Biopigments and Bioplastics, vaccines, Diagnostic tools and kits.	

Books recommended:

1. Srilakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2. Srilakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan.C.,RamaSastry B.V., andFoods.NIN.ICMR.Hyderabad. S.C.Balasubramania n (2009),Nutritive value of India
5. Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi

**Details of Formative assessment (IA) for DSCC
theory/OEC:40%weightagefortotalmarks**

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation & Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/ Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

**Faculty of Science
04-Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions :10 marks

Part-B

2. Question number 07-11 carries 05 Marks each. Answer any 04 questions :20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions: 30 marks (Minimum 1 question from each unit and 10 marks question may have subquestions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

B.Sc.Semester–IV

Subject: Microbiology

Discipline Specific Course (DSCC)

CourseNo.: MCB104T

Title of the Course: Microbial Enzymology and Metabolism
(Theory)

The course Human Genetics and Genetic Counselling in IV semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

CourseNo. / Course code	Type of Course / course code	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
MCB104T / 034MCB011	DSCC	Theory	04	04	56hrs	2hrs	40	60	100

Course Outcome(CO):

After completion of course (Theory), students will be able to:

- CO1:** Differentiating concepts of chemoheterotrophic metabolism and chemolithotrophic metabolism.
- CO2:** Describing the enzyme kinetics, enzyme activity and regulation
- CO3:** Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms

Syllabus-Course4(Theory):Microbial Enzymology and Metabolism	Total Hrs:56
Unit-I	14hrs
<p>Metabolism of Carbohydrates: Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation. Concept of aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, Phosphoketolase pathway. TCA cycle.</p> <p>Fermentation - Fermentation balance, concept of linear and branched fermentation pathways. Fermentation pathways: Alcohol fermentation and Pasteur effect; Butyric acid and Butanol- Acetone Fermentation, Mixed acid and 2,3-butanediol fermentation, Propionic acid Fermentation (Succinate pathway and Acrylate pathway), acetate Fermentation Chemolithotrophic Metabolism: Chemolithotrophy - Hydrogen oxidation, Sulphur oxidation, Iron oxidation, Nitrogen oxidation.</p> <p>Anaerobic respiration with special reference to dissimilatory nitrate reduction and sulphate reduction</p>	

Unit-II	14hrs
<p>Metabolism of aminoacids, nucleotides and lipids</p> <p>1. Nitrogen Metabolism Introduction to biological nitrogen fixation Ammonia assimilation. Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification</p> <p>2. Biosynthesis of ribonucleotides and deoxyribonucleotides The de novo pathway. Regulation by feedback mechanisms. Recycling via the salvage pathway</p> <p>3. Amino acid degradation and biosynthesis</p> <p>4. Lipid degradation and biosynthesis</p> <p>5. Metabolism of one carbon compounds: Methylophs :i. Oxidation of methane, methanol, methylamines; ii. Carbon assimilation in methylophic bacteria and yeasts Methanogens: i. Methanogenesis from H₂, CO₂, CHOH, HCOOH, methylamines; ii. Energy coupling and biosynthesis in methanogenic bacteria Acetogens: Autotrophic pathway of acetate synthesis</p> <p>6. Metabolism of two-carbon compounds: Acetate: i. Glyoxylate cycle. Acetic acid bacteria: Ethanol oxidation, sugar alcohol oxidation. Glyoxylate and glycolate metabolism: i.Dicarboxylic acid cycle, ii. Glycerate pathway iii. Beta hydroxyaspartate pathway Oxalate as carbon and energy source</p>	
Unit-III	14hrs
<p>Basics of Enzymes: Definitions of terms – enzyme unit, specific activity and turnover number, exo/ endoenzymes, constitutive/ induced enzymes, isozymes. Monomeric, Oligomeric and Multimeric enzymes.</p> <p>Multienzyme complex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase. Ribozymes, abzymes</p> <p>Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme, NAD, metal cofactors.</p> <p>Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis and Induced Fit hypothesis.</p> <p>Multi substrate reactions -Ordered, Random, Ping-pong.</p> <p>Enzyme catalysis:Catalytic mechanisms with type examples, catalytic mechanisms and testing-Serine proteases and Lysozyme</p>	
Unit-IV	14hrs
<p>Enzyme Kinetics and Regulation: Enzyme Kinetics: Kinetics of one substrate reactions. i. Equilibrium assumptions ii. Steady state assumptions iii. Lineweaver-Burk, Hanes-Woolf, Eadie-Hofstee equations and plots. Kinetics of enzyme inhibition. Competitive, non-competitive and uncompetitive inhibition.Effect of changes in pH and temperature on enzyme catalysed reaction. Kinetics of two substrate reactions. Presteady state kinetics. Kinetics of immobilized enzymes</p> <p>Enzyme regulation:Allosteric enzyme - general properties, Hill equation, KoshlandNemethy and Filmer model, Monod Wyman and Changeux model. Covalent modification by various mechanisms. Regulation by proteolytic cleavage - blood coagulation cascade. Regulation of multi- enzyme complex- Pyruvate dehydrogenase. Feedback inhibition.HIV enzyme inhibitors and drug design</p>	

Books recommended:

1. Philipp. G. Manual of Methods for General Bacteriology.
2. David T. Plummer. An Introduction to Practical Biochemistry
3. Biochemistry- A Problem Approach, Wood W. B. Wilson J.H., Benbow R.M. and Hood L.E. 2nd ed., 1981, The Benjamin/ Cummings Pub.co
4. Biochemical calculations, Segel I.R., 2nd ed., 2004, John Wiley and Sons
5. Biochemical Calculations, Irwin H. Segel, 2nd Edition John Wiley & Sons

B.Sc. Semester – IV
Subject: Microbiology
Discipline Specific Course (DSCC)
Course No: MCB104P
Course Name: (Practical)

CourseNo. / Course code	TypeofCourse	Theory /Practical	Credits	Instruction hourperweek	Total No. ofLectures/Hours/Semester	Duration ofExam	FormativeAssessment Marks	Summative Assessment Marks	Total Marks
MCB104P /034MCB012	DSCC	Practical	02	04	52hrs.	3hrs	25	25	50

Course Outcome(CO):

After completion of course (Practical), students will be able to:

CO 1 : To perform biochemical estimations

CO 2 : Understand the process of fermentation for alcohol production

CO 3 : analyze effect of various factors on enzyme reactions

ListoftheExperimentsfor52hrs./Semesters

1. Handling of micropipettes and checking their accuracy
2. Isolation of cholesterol and lecithin from egg yolk
3. Identification of fatty acids and other lipids by TLC/GC
4. Determination of degree of unsaturation of fats and oils
5. Isolation of lactose from bovine milk
6. Estimation of total sugars by the phenol-sulphuric acid method
7. Estimation of DNA - DPA method & UV absorbance method
8. Estimation of RNA (Orcinol method)
9. Isolation of glutamic acid from gluten
10. Determination of molar absorption coefficient (ϵ) of l-tyrosine
11. Determination of the isoelectric point of the given protein
12. Estimation of polyphenols/ tannins by Folin- Denis method
13. Chemotaxis of Pseudomonas
14. Demonstration of alcoholic fermentation
15. Effect of variables on enzyme activity (amylase): a. Temperature b. pH c. substrate concentration d. Enzyme concentration e. Determination of K_m of amylase (Lineweaver-Burke plot; Michaelis- Menton graph)

General instructions:

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Major Question ----- 6Marks
2. Minor Question ----- 4Marks
3. Identification(A-E) ----- 8Marks
4. Viva ----- 2Marks
5. Journal ----- 5Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended :

1. Satyanarayana, U. (2021). *Biochemistry, 6e-E-book*. Elsevier Health Sciences.
2. Walker, J. M. (2000). *Principles and techniques of practical biochemistry*. Cambridge University Press.
3. Mu, P., & Plummer, D. T. (2001). *Introduction to practical biochemistry*. Tata McGraw-Hill Education.
4. Chawla, R. (2014). *Practical clinical biochemistry: methods and interpretations*. JP Medical Ltd.
5. Wilson, K., Hofmann, A., Walker, J. M., & Clokie, S. (Eds.). (2018). *Wilson and Walker's principles and techniques of biochemistry and molecular biology*. Cambridge University Press.
6. Jain, A., Jain, R., & Jain, S. (2020). *Basic techniques in biochemistry, microbiology and molecular biology* (pp. 9-10). New York, NY, USA: :

B.Sc.Semester-IV

Subject: Microbiology

Open Elective Course (OEC for other students)

Course No.:MCB104E

Title of the Course: Human Microbiome

CourseNo /Course code	TypeofCourse /Course code	Theory /Practical	Credits	Instruction hourperweek	Total No. ofLectures/Hours/ Semester	Duration ofExam	FormativeAssessment Marks	Summative Assessment Marks	Total Marks
MCB104E / 004MCB051	OEC	Theory	03	03	42hrs.	2hrs	40	60	100

Course Outcome(CO):

After completion of course, students will be having basic knowledge of:

CO 1 : Articulate a deeper understanding on biological complexities of human micro biome.

CO 2 : Understand broader goals of biological anthropology

CO3: Compare and contrast the microbiome of different human body sites and impact human health promotion

Syllabus-OEC4:Title-HumanMicrobiome	Total Hrs:42
Unit-I	14hrs
Introduction to microbiome: Evolution of microbial life on Earth, Symbiosis host-bacteria . Microbial association with plants and animals, Symbiotic and parasitic, Normal human microbiota and their role in health. Microbiomes other than digestive system.	
Unit-II	14hrs
Microbiomes and human health: Microbiome in early life, Nutritional modulation of the gut microbiome for metabolic health- role of gut microbiomes in human obesity, human type 2 diabetes and longevity. Probiotics: Criteria for probiotics, Development of Probiotics for animal and human use; Pre and synbiotics. Functional foods-health claims and benefits, Development of functional foods.	
Unit-III	14hrs
Culturing of microbes from microbiomes: Culturing organisms of interest from the microbiome-bacterial, archaeal, fungal, and yeast, viral.Extracting whole genomes from the microbiome to study microbiome diversity Microbiomes and diseases: Microbiome and disease risks: The gut microbiome and host immunity, bacteriocins and other antibacterials. Human microbiome research in nutrition	

Books recommended :

1. Fundamentals of Microbiome Science – how microbes shape animal biology, Princeton University Press, New Jersey, United States. Rob DeSalle and Susan L. Perkins (2015).
2. Welcome to the microbiome. getting to know the trillions of bacteria and other microbes in, on, and around you. Yale University Press. Suggested Readings Rodney Dietert (2016).
3. The Human Superorganism: how the microbiome is revolutionizing the pursuit of a healthy life. Dutton Books. Justin Sonnenburg and Erica Sonnenburg (2014).
4. The good gut: taking control of your weight, your mood, and your long-term health. Penguin Press. Emeran Mayer (2016).
5. The Mind-Gut Connection: How the Astonishing Dialogue Taking Place in Our Bodies Impacts Health, Weight, and Mood. eBook, Harper Wave Books. Martin J. Blaser (2014).
6. Cox, L.M., et al., Altering the intestinal microbiota during a critical developmental window has lasting metabolic consequences. *Cell*, 2014. 158(4): p. 705-21.
7. Douglas, A., Fundamentals of Microbiome Science: How Microbes Shape Animal Biology. 2018, 41 William Street, Princeton, New Jersey 08540: Princeton University Press.
8. HMP,C., Structure, function and diversity of the healthy human microbiome. *Nature*, 2012. 486(7402):p.207-14.
9. Diaz Heijtz, R., et al., Normal gut microbiota modulates brain development and behavior. *Proc Natl Acad Sci U S A*, 2011. 108(7): p. 3047-52.
10. Sonnenburg, E.D., et al., Diet-induced extinctions in the gut microbiota compound over generations. *Nature*, 2016. 529(7585): p. 212-5.
11. Zou, J., et al., Fiber-Mediated Nourishment of Gut Microbiota Protects against Diet-Induced Obesity by Restoring IL-22-Mediated Colonic Health. *Cell Host Microbe*, 2018. 23(1): p. 41-53 e4.
12. Yassour, M., et al., Strain-level analysis of mother-to-child bacterial transmission during the first few months of life. *Cell Host Microbe*, 2018. 24(1): p. 146-154 e4. *Microbiomes and Health – 11:680:475*
13. Dominguez-Bello, M.G., et al., Partial restoration of the microbiota of cesarean-born infants via vaginal microbial transfer. *Nat Med*, 2016. 22(3): p. 250-3.
14. Moeller, A.H., et al., Rapid changes in the gut microbiome during human evolution. *Proc Natl Acad Sci U S A*, 2014. 111(46): p. 16431-5.
15. Prescott's Microbiology, 11th Edition By Joanne Willey and Kathleen Sandman and Dorothy Wood
16. Henderson Gemma et al. (2015), Rumen microbial community composition varies with diet and host, but a core microbiome is found across a wide geographical range, *Scientific Reports*,
17. Salle, A.J. (1992). *Fundamental Principles of Bacteriology*. 7th Edition, Mc. Graw Hill Publishing Co. Ltd., NewYork.

**Details of Formative assessment (IA)for DSCC
theory/OEC:40%weightagefortotalmarks**

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation &Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/ Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

**FacultyofScience
04-YearUGHonorsprogramme:2021-22**

**GENERALPATTERNOFTHEORYQUESTIONPAPERFOR DSCC/OEC
(60marksforsemesterendExaminationwith2hrsduration)**

Part-A

1. Questionnumber1-06carries2markseach.Answerany05questions :10marks

Part-B

2. Questionnumber07-11carries05Markseach.Answerany04questions :20marks

Part-C

3. Questionnumber12-15carries10Markseach.Answerany03questions
:30marks

(Minimum1questionfromeachunitand10marksquestionmayhavesub
questionsfor7+3or6+4or5+5ifnecessary)

Total:60Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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e-mail: academic.st@kud.ac.in

Pavate Nagar, Dharwad-580003
ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ - 580003

NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

Kud-23/9/22
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಮಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

Four - Year B.Sc. (Hons.) Program

SYLLABUS FOR SEM III & IV

COURSE: PHYSICS

SEMESTER - III:

DISCIPLINE SPECIFIC CORE COURSE (DSCC)

DSCC – 5: Physics (Theory) - V (Code:033PHY011)

DSCC – 6: Physics (Practical) –VI (Code: 033PHY012)

OEC- 3: Sports Science (Code: 003PHY051)

SEMESTER - IV:

DSCC – 7 : Physics (Theory) - VII (Code:034PHY011)

DSCC - 8 : Physics (Practical) -VIII (Code:034PHY012)

OEC- 4 : Medical Physics (Code:004PHY051)

Effective from 2022-23

AS PER N E P - 2020

Sem	Type of Course	Course Code	Instruction hour per week (hrs)	Total hours of Syllabus / Sem	Duration of Exam (hrs)	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC -5 Physics(Theory) –V	033PHY011	04	56	02	40	60	100	04
	DSCC -6 Physics (Practical) – VI	033PHY012	04	52	03	25	25	50	02
	OEC- 3 Sports Science	003PHY051	03	42	02	40	60	100	03
IV	DSCC -7 Physics (Theory) – VII	034PHY011	04	56	02	40	60	100	04
	DSCC -8 Physics (Practical) – VIII	034PHY012	04	52	03	25	25	50	02
	OEC- 4 Medical Physics	004PHY051	03	42	02	40	60	100	03
Details of the other Semesters will be given later									

Karnatak University, Dharwad

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in **PHYSICS** students will be able to:

- PSO 1** : Culminate in depth knowledge of almost all basic branches of physics such as mechanics, properties of matter, relativity, electricity and magnetism, wave motion, optics, thermal physics, electronics, classical mechanics, quantum mechanics, spectroscopy, nuclear physics, condensed matter physics and also advanced areas like Nanoscience, energy science, astrophysics, instrumentation.
- PSO 2** : Communicate effectively physics concepts with examples related to day to day life. Acquire ability of recognizing and distinguishing various aspects of physics found in real life.
- PSO 3** : Learn, perform and design experiments in the laboratory to demonstrate the concepts principles, laws of physics, theories learnt in the class rooms.
- PSO 4** : Acquire ability of critical thinking and logical reasoning in physics problems and their solutions. Develop ability to analyze physics problem including simple to thought provoking problems and apply the acquired knowledge to solve.
- PSO 5** : Appreciate the importance of physics subjects and its application for pursuing interdisciplinary and multidisciplinary higher education and research in these areas.
- PSO 6** : Understand the vast scope of physics as theoretical and experimental science with application in finding solution of problems in nature spanning from smallest dimension 10^{-15} m to highest dimension 10^{26} m in space, covering energy ranges from 10^{-10} eV to 10^{25} eV.
- PSO 7** : Think independently and develop algorithm and program using programming techniques for solving real world physics problems.
- PSO 8** : Develop ability of working independently and to make in-depth study of various notions of physics.
- PSO 9** : Develop ability to apply the knowledge and skill acquired through experiments of physics in laboratories to solve real life problems.
- PSO 10** : Pursue advanced studies and research in varied areas of physical science.

B.Sc. Semester – III

DSCC-5 : Physics (Theory) V (Code: 033PHY011)

Course No.5 (Theory): Title of the Course (Theory): **Wave Motion and Optics**

Syllabus	Total Hrs: 56
Unit-I: Wave Motion	14 hrs
<p>Wave Motion: Types of waves, Plane and spherical waves, Transverse and longitudinal wave. Displacement, velocity and pressure curve. Expression for a plane progressive wave, particle velocity. Relation between particle velocity and wave velocity. Differential equation of wave motion, mention of differential equation of three-dimensional wave. Derivation of energy density of a plane progressive wave. Distribution of energy in a plane progressive wave. Expression of intensity of progressive wave. Superposition of waves: Interference-Beats, theory of beats (analytical treatment). Super position of two perpendicular SHM: Lissajous figures with equal and unequal frequency- analytical treatment and use of Lissajous figures. Velocity of transverse wave along stretched string, wave equation for transverse wave in a string. Longitudinal (sound) waves in fluid medium -derivation of Newton's formula - Laplace's corrections for Newton's formula. Effect of pressure, temperature and humidity on the velocity of sound. Group velocity-its relationship with wave (or phase) velocity. Concept of resonance. Theory of Helmholtz resonator.</p> <p>Suggested Activities: please refer foot note</p>	
Unit-II: Geometrical Optics	14 hrs
<p>Fermat principle: Derivation of laws of reflection and refraction, sign convention, refraction at a spherical surface, derivation of Lagrange's law and Helmholtz relation, Abbe's sine condition derivation, aplanatic points of a spherical surface(qualitative).</p> <p>Aberrations: Spherical aberrations: methods to reduce spherical aberration (qualitative). Chromatic aberrations: Conditions for achromatism of two thin lenses in contact, two thin lenses separated by finite distance.</p> <p>Cardinal points: Cardinal points of a optical system. Equivalent focal length of two thin lenses separated by a distance. Location of cardinal points of a thick lens (derivation). Experimental determination of cardinal points of a lens system using Searle's Goniometer and Turn Table (Nodal slide).</p> <p>Suggested Activities: please refer foot note</p>	
Unit-III: Interference	14 hrs
<p>Interference due to division of wave front: Fresnel's biprism. Determination of wavelength of monochromatic light & thickness of a thin film using biprism. Lloyd's single mirror: Determination of wavelength using Lloyd's single mirror.</p> <p>Interference due to division of amplitude: Interference phenomenon with a plane parallel thin film: in case of reflected light and transmitted light (with derivation). Interference using wedge shaped film. Theory of Newton's rings. Determination of wavelength of monochromatic light by Newton's rings. Michelson interferometer: Principle, construction and working. Formation of circular & straight fringes (qualitative). Mention applications of Michelson's Interferometer.</p> <p>Suggested Activities: please refer foot note</p>	

Unit-IV: Diffraction and Polarization	14 hrs
<p>Introduction to diffraction and classification of diffraction phenomena.</p> <p>Fresnel diffraction: Fresnel's treatment of the wavefront and Fresnel assumptions. Theory of half period zones considering plane wave fronts. Zone plate: construction, theory and expression for focal length. Comparison between zone plate and convex lens.</p> <p>Fraunhofer diffraction: Fraunhofer diffraction at a single slit and at a double slit. Diffraction grating. Theory of Plane transmission grating. Dispersive power of grating. Comparison of grating and Prism spectra.</p> <p>Polarization: Review of basics of polarization. Malus law. Huygen's theory of double refraction. Positive and negative crystals. Wave plates: quarter wave plate and half wave plate. Optical activity, specific rotation. Laurent's Half Shade Polarimeter: Construction and working.</p> <p>Suggested Activities: please refer foot note</p>	

Suggested Activities:

1. Preparation of report and presentation on harmonics in musical instruments.
2. Study of Characteristics of loud speaker and microphone.
3. Preparation of report and presentation on resonance phenomenon in natural and artificial systems.
4. Using CDs and DVDs as diffraction gratings.
5. What is the physics behind 3D movies? Group Discussion.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	understand types of waves by their characteristics.
CO2	formulate a wave equation and obtain the expression for different parameters associated with waves. Explain and give an analytical treatment of the superposition of waves under different conditions, such as, equal or different frequencies.
CO3	analyse the formation of standing waves in the case of stretched string.
CO4	calculate velocity of sound at different conditions. Describe resonance in general and Helmholtz resonators in particular.
CO5	explain basics of laws of reflection and refraction.
CO6	describe different types of aberrations, cardinal points of optical instruments.
CO7	demonstrate interference of light due to division of wavefront and amplitude by Fresnel's biprism and Newton's rings experimental setup. Measurement of wavelength of light using experiments like Michelson interferometer.
CO8	explain diffraction due to different objects like single slit, two slits, diffraction of grating, oblique incidence, circular aperture and give the theory and experimental setup for the same.
CO9	explain the polarization of light and obtain how the polarization occurs due to quarter wave plates, half wave plates, and through the optical activity of a medium.

Books Recommended.

1. The Physics of Waves and Oscillations by N. K.. Bajaj Tata McGraw-Hill., 1984.
2. Waves and Oscillations by N. Subramanyam and Brij Lal Vikas Publishing House Pvt. Ltd
3. A Text Book of Sound D R Khanna and RS Bedi Atma Ram & Sons, Third Edition 1952
4. Oscillations and Waves by Satya Prakash Pragathi Prakashan, Meerut, Second Edition 2003
5. Optics by Ajoy Ghatak McGraw Hill Education (India) Pvt Ltd 2017
6. A text Book of Optics by Brij Lal, M N Avadhanulu & N Subrahmanyam S. Chand Publishing 2012
7. Mechanics by D. S. Mathur P. S. Hemne S. Chand Publishing 2012
8. Berkeley Physics Course – Waves, Frank S Crawford Jr Tata Mc Graw-Hill 2011
9. Optics Eugene *Hecht* Pearson Paper back 2019
10. Introduction To Optics Pedrotti and Frank L Pearson India 3rd Edition
11. Fundamentals of Optics Francis Jenkins Harvey White McGraw Hill Education 2017
12. Geometrical Optics (I-Edition) – D. P. Acharya – Oxford & IBH Pub. Co., New-Delhi, 1970.
13. Geometrical Optics – A. Verstraeten. Publisher: Bombay Orient Longmans 1961
14. Optics & Spectroscopy (VI-Edition) Murugesan, Kirutiga & Shivaprasath - S. Chand & Company.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – III

DSCC-6: Physics (Practical) - VI Code: 033PHY012

Title of the Course (Practical): Wave Motion and Optics

List of the Experiments for 52 hrs / Semesters

1. Velocity of sound through wire using Sonometer.
2. Study of Lissajous Figures.
3. Helmholtz resonator using tuning fork/electrical signal generator.
4. Calibration of a spectrometer.
5. Dispersive curve and dispersive power of a prism.
6. Polarimeter: Determination of specific rotation of sugar solution
7. Study of elliptically polarized light/Verification of Malus law
8. Goniometer.
9. Turn table.
10. Newton's rings.
11. Resolving power of grating.
12. Determination of wavelength of monochromatic light using biprism/Lloyd's mirror.
13. Michelson interferometer: Determination of wavelength of monochromatic light.
14. Determination of wavelength of laser light by diffraction single slit method.
15. Determination of wavelength of laser light by Interference Young's Double slit method.

General instructions:

1. *Minimum of eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS.*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1 Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram	- 05 Marks
2 Tabular Column with quantities and unit mentioned, experimental skills.	- 05 Marks
3 Recording of observations, calculations and drawing graph, and accuracy of the result	- 11 Marks
4 Viva-voce	- 02 Marks
5 Completed & Certified Journal	- 02 Marks
	Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Course Outcomes	
At the end of the course Students will be able to:	
CO1	determine velocity of sound in different medium (solid/fluid).
CO2	observe different Lissajous figures when two SHM are acting Perpendicular to each other with different frequencies and able to calculate unknown frequency of a component.
CO3	set up a spectrometer experiment for the measurement of wavelength, dispersive power of a prism etc.
CO4	explain the calculation of specific rotation of a sugar solution by using half shade polarimeter.
CO5	calculate cardinal points of optical systems using goniometer and turn table experimental setup.
CO6	demonstrate interference of light due to division of wave front and amplitude in case of Fresnel's biprism/Lloyd mirror and Newton's rings experimental arrangements.
CO7	explain diffraction grating and hence calculation of resolving power.
CO8	measure wavelength of monochromatic light using Michelson interferometer. diffraction due to single slit and double slit experiments.
CO9	measure the wavelength of laser light using single/double slit experiment.

Books Recommended.

- 1 Physics for Degree Students B. Sc. Second Year, by C. L. Arora and P. S. Hemne S. Chand &Co.
- 2 Electronics Instrumentation by H. S. Kalasi.
- 3 B.Sc. Practical Physics – C.L. Arora.
- 4 Advanced Practical Physics – Samir Kumar Ghosh.
- 5 Advanced Practical Physics – Worshnop and Flint.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – III

OEC- 3: Sports Science (Code: 003PHY051)

Syllabus	Total Hrs: 42
Unit-I: Measurements, Newton's Laws and Projectile Motion	14 hrs
<p>Measurement: Physical quantities. Standards and Units. International system of Units. Standards of time, length and mass. Precision and significant figures.</p> <p>Newton's laws of motion: Newton's first law. Force, mass. Newton's second law. Newton's third law. Mass and weight. Applications of Newton's laws.</p> <p>Projectile motion: Shooting a falling target, Physics behind Shooting, Javelin throw and Discus throw.</p> <p>Topics for self - Study (if any): https://www.real-world-physics-problems.com/physics-of-sports.html</p>	
Unit-II: Conservation Laws and Gravitation	14 hrs
<p>Conservation Laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing).</p> <p>Centre of mass: Physics behind Cycling, rock climbing, Skating,</p> <p>Gravitation: Origin, Newton's law of gravitation. Archimedes principle, Buoyancy (Physics behind swimming)</p> <p>Topics for self-study (if any) Archimedes' Principle: Made EASY Physics in You tube</p>	
Unit-III: Food and Nutrition, Energy and Physics Exercises	14 hrs
<p>Food and Nutrition: Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins.</p> <p>Energy: Different forms of Energy, Conservation of mass-energy.</p> <p>Physical exercises: Walking, Jogging and Running, Weight management.</p> <p>Topics for self - Study (if any): 10 Best Exercises for Everyone – Healthline</p>	
<p>Suggested Activities:</p> <p>1. Identify the methods of measurement of time, length and mass from ancient time and build models for them. Reference : History of measurement - Wikipediahttps://en.wikipedia.org > wiki > History_of_measurement.</p> <p>2. Identify Physics principles behind various Sports activities. https://www.real-world-physics-problems.com/physics-of-sports.html</p> <p>3. List the difficulties experienced in Gymnastics, Cycling and weight lifting</p> <p>4. List the difficulties experienced in swimming.</p>	

Course Outcomes	
At the end of the course Students will be able to:	
CO1	use different types of units in day today life.
CO2	explain various fundamental terms like mass, weight, velocity, speed, force, etc.
CO3	apply the knowledge of projectile motion in the field of sports like Javelin, Disc and Hammer throw.

CO4	describe and apply conservation laws, centre of mass of a system, angular momentum, Archimedes principle, Buoyancy and freefall under gravity in various events of sports.
CO5	realise and aware about importance of nutritious food.
CO6	incorporate good life style by practicing walking, jogging, running and exercise.

Books Recommended:

SI No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics for Entertainment	Yakov Perelman	Createspace Independent Pub.	
2	Physics Everywhere	Yakov Perelman	Prodinnova	2014
3	Mechanics for Entertainment	Yakov Perelman	Prodinnova	2014
4	Handbook of Food and Nutrition	M Swaminathan	Bangalore Press 2012	2012
5	Food Science	B. Srilakshmi	New Age International Pub	2015
6	Physics	Resnick, Halliday and Krane, Vol 1	Wiley Student Edition.	
7	For the love of Physics	Walter Lewin	Taxman Publications Private Limited	2012
8	An Introduction to the Physics of Sports	VassiliosMcInnesS pathopoulos	Create Space Independent Publishing Platform	2013

Internet resources <https://www.topendsports.com/biomechanics/physics.htm>
<https://www.real-world-physics-problems.com/physics-of-sports.html>
<https://www.healthline.com/>
<https://www.mayoclinic.org/>

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme: 2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05 marks each. Answer any 04 questions : 20 marks

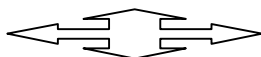
Part-C

3. Question number 12-15 carries 10 marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

DSCC-7: Physics (Theory): VII (Code: 034PHY011)

Title of the Course (Theory): **Thermal Physics and Electronics**

Syllabus	Total Hrs:
Unit-I: Thermodynamics-I	14 hrs
Second Law of Thermodynamics: Review of basics of thermodynamics. Statements of second law of thermodynamics, Carnot theorem: statement and proof. Steam engine, Otto engine (Internal combustion engine) and expression for efficiency. Diesel engine and expression for efficiency. Entropy: Concept of entropy, change in entropy, physical concept of entropy, change of entropy in reversible cycle, principle of increase of entropy, change of entropy in irreversible process with examples. Temperature- entropy diagram, physical significance of entropy, entropy of a perfect gas. Second law of thermodynamics in terms of entropy. Entropy of the Universe. Third law of thermodynamics: Nernst's heat theorem statement. <i>Suggested Activities: please refer foot note</i>	
Unit-II: Thermodynamics-II	14 hrs
Maxwell's Thermodynamic Relations: Thermodynamic variables, extensive and intensive variables. Derivation of Maxwell's thermodynamical relations (general relationship). Applications: specific heat equation for Van der Waals gas, Joule-Thomson-cooling and Joule-Thomson coefficient for perfect and Van der Waal gas. Clausius - Clapeyron's equation (first latent heat equation). Thermodynamic Potentials: Internal energy, Enthalpy, Helmholtz free energy, Gibbs free energy. Significance of thermodynamic potentials. Relations of thermodynamical potentials with their variables. First and second order phase transitions. <i>Suggested Activities: please refer foot note</i>	
Unit-III: Electronics - I	14 hrs
Current and voltage sources and Network Theorems: Concept of voltage source: ideal and practical voltage source. Concept of current source: ideal and practical current source. Thevenin's and Norton's Theorems: statement and proof. Power supply: Power supply with filters (LC and π - section), IC regulated power supply (78XX). Bipolar Junction Transistor: BJT characteristics in CE mode, Operating point. Biasing of BJT: Mention different types of biasing, analysis of voltage divider biasing, derivation of I_C and V_{CE} . DC h -parameters and their determination using low frequency transistor model. Single stage RC coupled CE amplifier, Expression for current gain and voltage gain, input impedance and output impedance, frequency response. Brief explanation of positive and negative feedback. Transistor as an oscillator: Hartley, Colpitts and Phase shift oscillators (qualitative only). Junction Field Effect Transistor: Types, characteristics and parameters of JFET. <i>Suggested Activities: please refer foot note</i>	

Unit-IV: Electronics - II	14 hrs
<p>Integrated Circuits (ICs): Introduction of ICs, Types of ICs, IC555 internal configuration, IC555 timer as astable multivibrator.</p> <p>Operational Amplifier (Op-Amp): Ideal Op-Amp and its characteristics, practical Op-Amp, concept of virtual ground, Op-Amp parameters, Op-Amp with negative feedback, Inverting Op-amp: close loop voltage gain expression, input and output impedance. Non-inverting Op-Amp: close loop voltage gain expression. Op-Amp as adder, subtractor, voltage follower, integrator and differentiator.</p> <p>Digital Electronics: Positive and negative logic levels, logic operations, NOT, OR, AND operations, construction of truth table. Digital logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR gates. Input-output timing diagram for NAND and NOR gates. Boolean theorems, De Morgan's theorems using truth table, using gates. Design of basic gates using NAND and NOR. Simplification of Boolean expressions.</p> <p>Suggested Activities: please refer foot note</p>	

Suggested Activities:

1. Make a dissertation on Laws of thermodynamics.
2. Make a write up of heat engines and refrigerators.
3. List the reversible and irreversible processes which we may come across.
4. Three important concepts in the study of thermodynamics are, temperature, heat, and internal energy. Discuss the meaning of these three concepts being careful to distinguish between them.
5. Wire a DC power supply on a bread board or groove board to give a regulated output voltage of + 5 V; +15 V; Dual power output : ± 5 V; Dual power output : ± 15 V
6. In the case of power transistors, learn how to fix a heat sink for the transistor.
7. Understand the concept of virtual ground of an Op-Amp.
8. Learn the different types of Op-Amps used for different applications.
9. What is a buffer? Prepare a report on the application of buffers in instrumentation electronics.
10. Learn how to implement logic functions (AND, OR) using just diodes, resistors and transistors.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may kindly be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Course Learning Outcomes	
At the end of the course, the students will be able to:	
CO1.	apply the laws of thermodynamics and analyze the thermal system and compare the efficiency and working of steam, Otto and Diesel engine.
CO2.	analyze the temperature entropy-diagram with physical significance.
CO3.	study the Maxwell's thermodynamical relations with different applications.
CO4.	analyze the significance of thermodynamic potentials and develop the relation between thermodynamical potential with their variables.
CO5.	distinguish the current and voltage source and construct the power supply with different filter circuits and its importance in real life.
CO6.	use the concept of semiconductor to describe BJT, FET etc and explain their functions and applications.
CO7.	describe the construction of IC-555 and its use in the astable multivibrator to generate rectangular waveform.
CO8.	explain the functioning of op-Amp and use them as the building blocks of applications. use of logic gates with different theorems of Boolean algebra followed by logics circuits.

Books Recommended.

1. Heat & Thermodynamics and Statistical Physics by Brijlal Subramanyam & Hemne - S Chand., Delhi
2. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
4. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1958, Indian Press
5. Heat and Thermodynamics (I-Edition) – D.S. Mathur - S. Chand & Company Ltd., New-Delhi, 1991.
6. A text book of heat - J. B. Rajam S. Chand and Co.
7. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springe
8. An Introduction to Thermal Physics, Daniel V Schroeder, 2020, Oxford University Press
9. Electronic Devices and Circuits by David A. Bell PHI, New Delhi 2004.
10. Integrated Electronics by Jacob Millman and CC Halkias.
11. Digital Fundamentals by Floyd PHI, New Delhi 2001.
12. Principle of Electronics by V. K. Mehta and Rakshit.
13. Basic electronics and solid state physics- B. L. Theraja- S. Chand Publication, New Delhi
14. Basic Electronics- B. L. Theraja- S. Chand Publication, New Delhi.
15. Integrated Electronics- Millmans And Halkias-McGraw Hill, New Delhi.
16. Electronic devices and circuits- Allan Mottersed-.McGraw Hill, New Delhi.
17. Basic Electronics and Linear Circuits- TTTI- Bhargav & Others. McGraw Hill Education (1983)
18. A text book Thermodynamics by Y. V. C. Rao, Universities Press (Ind.) Hyderabad.
19. A text book of heat by G. R. Noakes, London Macmillan and Co. Ltd.
20. Berkely Physics, Vol. No. I – ABC Publications, Bangalore & New-Delhi.
21. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – IV

DSCC-8: Physics (Practical) - VIII Code : 034PHY012

Title of the Course (Practical): Thermal Physics and Electronics

List of the Experiments for 52 hrs / Semesters

1. Thermal conductivity of a bad conductor by Lee's and Charlton's method.
2. Thermal conductivity of copper by Searle's apparatus / Angstrom's method.
3. Verification of Clausius – Clapeyron equation and determination of specific enthalpy.
4. Mechanical equivalent of heat Callender and Barnes method.
5. To find the ratio of specific heats at constant pressure and constant volume for air using Clement and Desorme's apparatus.
6. Specific Heat by cooling.
7. Norton's and Thevenin's theorem using unbalanced Wheatstone network.
8. Power supply using π - section filter and study of IC regulator 78XX
9. Astable multivibrator using IC 555
10. Hybrid parameters of BJT in CE mode
11. Single stage RC coupled CE amplifier
12. JFET characteristics
13. Hartley /Colpitt's oscillator using BJT / Phase shift Oscillator using OP-Amp
14. Op-Amp as Inverting and non-inverting amplifier
15. Basic gates using IC-7400./ Verification of D' Morgan's theorem and Boolean expressions.

General instructions:

1. *Minimum of Eight experiments to be performed.*
2. *Any new experiment may be added to the list with the prior approval from the BOS*

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- | | |
|---|-----------------------|
| 1. Basic formula, Units & Nature of graph,
Circuit Diagram / Ray Diagram / Schematic diagram | - 05 Marks |
| 2. Tabular Column with quantities and unit mentioned,
experimental skills. | - 05 Marks |
| 3. Recording of observations, calculations and drawing graph,
and accuracy of the result | - 11 Marks |
| 4. Viva-voce | - 02 Marks |
| 5. Completed & Certified Journal | - 02 Marks |
| | Total 25 marks |

Note: Same Scheme may be used for IA (Formative Assessment) examination.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	determine the thermal conductivity of bad conductor by Lee's and Charlton method. Compare the result with theoretical value.
CO2	determine of thermal conductivity of conductor like copper using different methods such as Searle's, Angstrom methods.
CO3	verification of Clausius- Clapeyron equation experimentally Determine the specific heat ratio for air using Clement and Desormes apparatus.
CO4	learn how to apply Thevenin's and Norton's theorem to given network. Also they will learn basics of voltage/current power supply.
CO5	study in depth about transistor/JFET by performing many experiments using them
CO6	learn about very popular versatile device such as Operational amplifier and its applications
CO7	learn how to implement logic function using IC-7400/any other IC's

Books Recommended:

1. Physics for Degree Students B. Sc. Second Year, by C. L. Arora & P. S. Hemne S. Chand &Co.
2. Electronics Instrumentation by H. S. Kalasi.
3. B.Sc. practical Physics – C.L. Arora.
4. Advanced practical Physics – Samir Kumar Ghosh.
5. Advanced practical Physics – Worshnop and Flint.

B.Sc. Semester – IV

OEC- 4: Medical Physics (Code: 004PHY051)

Syllabus	Total Hrs: 42
Unit-I: Human Anatomy and Physiology	14 hrs
Overview of human anatomy - cells, cell structure, type of cells and their functions, tissues, organs, and their functions. Different systems in the human body, their structure and function, physiological properties of the circulatory system, digestive system, respiratory system endocrine system and nervous system.	
Unit-II: Physics of Medical Diagnostics	14 hrs
Principle of production of X-rays. Use of X-rays in medical diagnosis, X-ray imaging systems. Computed Tomography (CT): principle and generation of CT. Magnetic Resonance Imaging (MRI): basic principle and image characteristics. Ultrasound Imaging: production of ultrasound, transducers, Interaction of sound waves with body tissues, , acoustic coupling, image formation, modes of image display and color Doppler.	
Unit-III: Radiation Physics	14 hrs
Radiation units, exposure, absorbed dose, units: Rad, gray. Relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with matter: Compton and Photoelectric effect, Rem and Sievert, linear attenuation coefficient. Radiation detectors: Thimble Chamber, Condenser Chambers, Geiger Muller counter, Scintillation counters and solid state detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.	
Class Room Activities Unit I: Students can demonstrate the shape, size, positions and functions of different organs in the body with the help of models. Unit II: The use of X-rays in the diagnosis of the fractured bone can be demonstrated with the help of a gamma source and a gamma ray survey meter. As the density of materials between the source and the detector changes the reading on the meter (or intensity of the beeping sound) changes. Unit III: (i) Students can be asked to list out different type of cancers and possible causative factors. They can be asked to list out the healthy practices to reduce the risk of cancers. (ii) As there will be students from different disciplines in the OE course, group discussion can be arranged to discuss about their programme and outcome. This will be an opportunity for the students to know about other disciplines. Other related activities/projects:	

1. Visit to nearby hospitals/diagnostic centers to study the working of X-ray machines.
2. Visit to ultrasound diagnostic centers to study the principle and use of ultrasound in diagnosis.
3. Project on principle and use of X-ray films in imaging.
4. Visit to radiotherapy centers to study the modalities of radiotherapy.

Text Books

1. C. H. Best and N. B. Taylor. A Text in Applied Physiology. Williams and Wilkins Company, Baltimore, 1999.
2. C. K. Warrick. Anatomy and Physiology for Radiographers. Oxford University Press, 2001.
3. Jerrold T. Bushberg. The Essential Physics for Medical Imaging (2nd Edition). Lippincott Williams & Wilkins, 2002.
4. Jean A. Pope. Medical Physics: Imaging. Heinemann Publishers, 2012.
5. Faiz M. Khan and Roger A. Potish. Treatment Planning in Radiation Oncology. Williams and Wilkins, USA, 2003.
6. D. Baltas. The physics of modern brachytherapy for oncology. Taylor and Francis, 2007.

Reference Books

1. J. R. Brobek. Physiological Basis of Medical Practice. Williams and Wilkins, London, 1995.
2. Edward Alcamo, Barbara Krumhardt. Barron's Anatomy and Physiology the Easy Way. Barron's Educational Series, 2004.
3. Lippincott, Anatomy and Physiology. Lippincott Williams & Wilkins, 2002.
4. W. E. Arnould Taylor. A textbook of anatomy and physiology, Nelson Thornes, 1998.
5. G. S. Pant. Advances in Diagnostic Medical Physics. Himalaya Publishing House, 2006.
6. Sabbahaga, Diagnostic Ultrasound applied to OBG. Maryland, 1980.
7. Faiz M Khan. The Physics of Radiation Therapy (3rd edition). Lippincott Williams & Wilkins, USA, 2003.
8. Jatinder R. Palta and T. Rockwell Mackie. Intensity Modulation Radiation Therapy. Medical Physics publishing, Madison, Wisconsin, 2003.
9. AAPM Report No. 72. Basic Applications of Multileaf collimators, AAPM, USA, 2001.
10. AAPM Report No. 91. Management of Respiratory motion in radiation oncology, 2006.
11. CA Joslin, A. Flynn, E. J. Hall. Principles and Practice of Brachytherapy. Arnold publications, 2001.
12. Peter Hoskin, Catherine Coyle. Radiotherapy in Practice. Oxford University Press, 2011.
13. W. R. Handee. Medical Radiation Physics. Year Book Medical Publishers Inc., London, 2003.
14. Donald T. Graham, Paul J. Coke. Principles of Radiological Physics. Churchill Livingstone, 2003.
15. Thomas S. Curry. Christensen's Physics of Diagnostic Radiology (4th Edition). Lippincott Williams & Wilkins, 1990.
16. Madison. MRI – Perry Sprawls – Medical Physics Publishing. Wisconsin, 2000.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	understand human body anatomy and its physiological properties of the circulatory system, digestive system, respiratory system endocrine system and nervous system.
CO2	understand physics behind. medical equipment's such as X-rays, CT and MRI and sonography.
CO3	apply the principle of radiation physics, learn more about nuclear radiation detectors and how these radiation principles are used in radiation therapy.
CO4	know real time applications of this course by visiting diagnostic canter. Etc.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme: 2022-23

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05 marks each. Answer any 04 questions : 20 marks

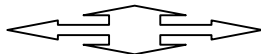
Part-C

3. Question number 12-15 carries 10 marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub question for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.





KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್

NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಆಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ (NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಆದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

Kud-2022/9/22
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರಿಶೀಲನೆ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

Four - Year B.Sc. (Hons.) Program

SYLLABUS FOR III & IV SEMESTER

Course: ZOOLOGY

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) AND
OPEN ELECTIVE COURSE (OEC)**

III-SEMESTER:

**DSCC – 5: Molecular Biology, Bioinstrumentation and Techniques in
Biology (Theory) - V (Code: 033ZOO011)**

**DSCC – 6: Molecular Biology, Bioinstrumentation and Techniques in
Biology (Practical) - VI (Code: 033ZOO012)**

OEC- 3: Endocrinology (Code: 003ZOO051)

IV-SEMESTER:

**DSCC – 7: Gene Technology, Immunology and Computational
Biology (Theory) - VII (Code: 034ZOO011)**

**DSCC - 8: Gene Technology, Immunology and Computational
Biology (Practical) - VIII (Code: 034ZOO012)**

OEC- 4: Animal Behaviour (Code: 004ZOO051)

Effective from 2022-23

AS PER NEP - 2020

Karnatak University, Dharwad

Subject: Zoology

Semester	Type of Course	Course Code	Instruction hour / week (hrs)	Total hours of Syllabus / Semester	Duration of Exam (hrs)	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC-5: Molecular Biology, Bioinstrumentation and Techniques in Biology (Theory) - V	033ZOO011	04	56	02	40	60	100	04
	DSCC-6: Molecular Biology, Bioinstrumentation and Techniques in Biology (Practical) -VI	033ZOO012	04	52	03	25	25	50	02
	OEC- 3 Endocrinology	003ZOO051	03	42	02	40	60	100	03
IV	DSCC -7: Gene Technology, Immunology and Computational Biology (Theory) - VII	034ZOO011	04	56	02	40	60	100	04
	DSCC -8: Gene Technology, Immunology and Computational Biology (Practical) - VIII	034ZOO012	04	52	03	25	25	50	02
	OEC- 4: Animal Behaviour	004ZOO051	03	42	02	40	60	100	03
Details of the other semesters will be given later									

Programme Outcome (PO)

After the completion of 03/ 04 years Degree in Zoology, students will be able to:

PO 1: Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms

PO 2: Analyze complex interactions among the various animals of different phyla, their distribution and their relationship with the environment

PO 3: Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms

PO 4: Understands the complex evolutionary processes and behaviour of animals

PO 5: Correlates the physiological processes of animals and relationship of organ systems

- PO 6:** Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species
- PO 7:** Gain knowledge of agro based small scale industries like sericulture, fish farming, butterfly farming and vermicompost production
- PO 8:** Understands about various concepts of genetics and its importance in human health
- PO 9:** Apply the knowledge and understanding of Zoology to one's own life and work
- PO 10:** Develops empathy and love towards the animals
- PO 11:** Candidates find opportunities in government departments, environmental agencies, universities, colleges, biotechnological, pharmaceutical, environmental/ecological fields
- PO 12:** There are numerous career opportunities for candidates completing their B.Sc, M.Sc and Ph.D. in Zoology in public and private sectors

Programme Specific Outcomes (PSO)

PSO III:

- PSO 1:** Understanding of the processes of central dogma viz. transcription, translation etc. underlying survival and propagation of life at molecular level
- PSO 2:** Understanding how genes are ultimately expressed as proteins, which are responsible for the structure and function of all the organisms
- PSO 3:** Learn how four sequences (3 letter codons) generate the transcripts of life and determine the phenotypes of organisms
- PSO 4:** Understand the basics of various instruments like microscopes and bioinstruments used in biological studies and their applications
- PSO 5:** They are able to understand the use of biological instrumentation and proper laboratory techniques
- PSO 6:** The students will be acquiring basic experimental skills in various techniques in the fields of molecular biology
- PSO 7:** To learn various techniques used in biology like histochemistry and immunotechniques

PSO IV:

PSO 1: To understand the principles of genetic engineering and its applications

PSO 2: To understand the basics of immunology and various mechanisms involved in immunity and their response

PSO 3: Acquired skills in diagnostic testing, haematology, staining procedures used in clinical and research laboratories, will provide them opportunity to work in diagnostic or research laboratory.

PSO 4: Acquired practical skills in biostatistics, bioinformatics can be used to pursue career as a scientist in drug development industry in India or abroad.

PSO 5: To know various type of biostatistical and bioinformatics techniques

PSO 6: Students gain skills in basics of computers, operating systems, overview of programming languages, internet services, sequencing techniques

PSO 7: Attained knowledge of data collection, tabulation and presentation of data and measures of central tendency, probability and Chi-square test.

PSO 8: Know the applications of internet and statistical bioinformatics in research

B.Sc. Semester – III

DSCC-5: Molecular Biology, Bioinstrumentation and Techniques in Biology (Theory) - V (Code: 033ZOO011)

Course Outcome (CO):

After completion of this course (Theory)-V, students will be able to:

CO1: Acquire better understanding and comprehensive knowledge regarding most of the essential aspects of molecular biology subject, which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.

CO2: The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.

CO3: Acquiring knowledge on instrumentation and techniques in biology.

Syllabus	
DSCC-5: Molecular Biology, Bioinstrumentation and Techniques in Biology (Theory)-V (Code: 033ZOO011)	Total Hrs: 56
Unit I:	14 hrs
Chapter 1: Process of Transcription <ul style="list-style-type: none">• Fine structure of gene (Cistron, Recon, Muton)• RNA polymerases - types and functions• Transcription in prokaryotes and eukaryotes Chapter 2: Process of Translation <ul style="list-style-type: none">• Genetic code and its salient features• Translation in prokaryotes and eukaryotes	08
Unit-II :	14 hrs
Chapter 3: Regulation of gene expression-I <ul style="list-style-type: none">• Regulation of gene expression in prokaryotes- lac operon (inducible) and trp operon(repressible) in <i>E. coli</i>• Regulation of gene expression in eukaryotes - Role of chromatin (euchromatin and heterochromatin) in gene expression• Post-transcriptional modifications: capping, splicing, polyadenylation• Concept of RNA editing (mRNA), gene silencing, and, RNAi. Chapter 4: Regulation of gene expression-II <ul style="list-style-type: none">• Post-translational modifications: purpose, advantages, and significance; glycosylation, methylation, phosphorylation, and acetylation.• Intracellular protein degradation (lysosomal autophagy and ubiquitin proteasome pathway).	09
	05

Unit-III:	14 hrs
Chapter 5: Microscopy <ul style="list-style-type: none"> Principles and applications of Light microscopy, Dark field microscopy, Phase contrast microscopy, Fluorescence microscopy, Confocal microscopy and Electron microscopy (SEM and TEM). Micrometry: Principle and applications of micrometry 	09
Chapter 6: Centrifugation and Chromatography <ul style="list-style-type: none"> Centrifugation: Principles, types, and applications (High speed and Ultracentrifugation) Chromatography : Principle and applications of: TLC, HPLC and GC 	05
Unit IV:	14 hrs
Chapter 7: Biochemical Instrumentation <ul style="list-style-type: none"> Colorimetry and Spectrophotometry: Beer-Lambert's law, Absorption spectrum, UV-VIS spectrophotometer. pH meter, measurement of pH Principle, applications and safety measures of Radio-tracer techniques - Autoradiography. 	06
Chapter 8: Molecular Techniques <ul style="list-style-type: none"> Principle and applications of Agarose Gel- Electrophoresis, SDS-PAGE, DNA Sequencing (Sanger's Dideoxy method), PCR, DNA Fingerprinting, ELISA, Southern Blotting and Western Blotting. 	08

Recommended Books/References:

- Principles & Techniques of Biochemistry And Molecular Biology Keith Wilson and John Walker 7th Edition Cambridge University Press (2010)
- Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
- Alberts et al: Molecular Biology of the Cell: Garland (2002).
- Cooper: The Cell: A Molecular Approach: ASM Press (2000).
- Karp: Cell and Molecular Biology: Wiley (2002).
- Watson et al. Molecular Biology of the Gene. Pearson (2004).
- Lewin. Genes VIII. Pearson (2004).
- Pierce B. Genetics. Freeman (2004).
- Sambrook et al. Molecular Cloning Vols I, II, III. CSHL (2001).
- Primrose. Molecular Biotechnology. Panima (2001).
- Clark and Switzer. Experimental Biochemistry. Freeman (2000)
- Principles of Genetics Robert H. Tamarin WC B/McGraw-Hill (1999)
- Animal Microtechniques by Humason (1962)
- De- Robertis- Cell and Molecular Biology.
- Verma, P.S. and Agrawal, V.K. Molecular Biology
- Bioinstrumentation by L. Veerakumari

B.Sc. Semester – III

DSCC-6: Molecular Biology, Bioinstrumentation and Techniques in Biology (Practical) - VI (Code: 033ZOO012)

Course Outcomes (CO):

After completion of this Course (Practical) - VI, students will be able to:

- CO 1:** To understand the principle of qualitative and quantitative analysis of nucleic acids (DNA and RNA)
- CO 2:** Understand the basic principles and applications of bioinstruments and biotechniques
- CO 3:** Understand the basic principles of microscopy, working of different types of microscopes
- CO 4:** Understand the principle of measuring the concentrations of macromolecules in solutions by colorimeter and spectrophotometer
- CO 5:** Learn about some of the commonly used separation techniques like centrifugation, chromatography
- CO 6:** To know about measurement of cells types through micrometry and also to get knowledge about virtual labs

Syllabus

DSCC-6: Molecular Biology, Bioinstrumentation and Techniques in Biology (Practical) - VI (Code: 033ZOO012)

List of the experiments for 52 hrs / Semester

1. To study the working principle of Simple, Compound, and Binocular microscopes
2. To study the working principle of various laboratory equipments: pH Meter, Electronic balance, Laminar air flow, Incubator, Centrifuge, Micropipettes, Chromatography apparatus, Colorimeter, Spectrophotometer, PCR, Electrophoresis.
3. To prepare fixatives, stains and buffers (Phosphate, Citrate, Tris-HCL buffer).
4. To learn the working of measurement of the absorbance of any sample by using Colorimeter and/ or Spectrophotometer
5. To study Blotting techniques (working principle, procedure and applications)
6. Estimation of RNA by Orcinol method.
7. Estimate of DNA by Diphenyl Amine (DPA) method
8. To identify different unknown amino acids using ascending paper chromatography.
9. Isolation of DNA extraction from blood or any tissue samples.
10. Micrometry study of different cell types
11. Demonstration of differential centrifugation to fractionate components in a given mixture.
12. To estimate amount of protein by Lowry's method
13. Visit to nearby University/Research Institutions for demonstration of molecular biology techniques, bioinstruments/ biotechniques for students (not mandatory)
14. Any other practical's related to this paper may be added based on the feasibility

Recommended Books/References:

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell, 4th edition. New York: Garland Science (2002).
2. Daniel L. Hartl and Maryellen Ruvolo. Genetics: Analysis of Genes and Genomes, 8th Edition. Burlington, Mass.: Jones & Bartlett Learning (2012).
3. Gerald Karp. Cell and Molecular Biology: Concepts and Experiments, 5th Edition. Wiley Publication (2008).
4. Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Freeman. Molecular Cell Biology, 5th edition. W. H. & Company (2003).
5. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick. Molecular Biology of the Gene, 5th edition. Cold Spring Harbor Laboratory Press (2003).
6. Stryer, Lubert. Biochemistry, 2nd Edition. W. H. Freeman and Company, New York (1981).

General instructions:

Perform all the experiments as per the instructions in each question.

Scheme of Practical Examination (distribution of marks): 25 marks for

Semester end Examination

1. Major Experiments	08 Marks
2. Minor Experiments	05 Marks
3. Identifications (A-D)	08 Marks
4. Viva	02 Marks
5. Journal	02 Marks

Total 25 Marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc. Semester – III

OEC- 3: Endocrinology (Code: 003ZOO051)

Course Outcome (CO):

After completion of this course, Endocrinology, students will be able to:

CO 1: Differentiate among endocrine, paracrine and autocrine systems.

CO 2: Describe the different classes and chemical structures of hormones.

CO 3: Identify the glands, organs, tissues and cells that synthesize and secrete hormones, hormone precursors and associated compounds.

CO 4: Identify and discuss the integration of the endocrine system in general with focus on specific interactions.

CO 5: Explain the consequences of under- and overproduction of hormones.

Syllabus OEC-3: Title- Endocrinology (Code: 003ZOO051)	Total Hrs: 42
Unit-I:	14 hrs
Chapter 1: About Endocrine glands <ul style="list-style-type: none">• Endocrine glands and classifications of hormones.• Characteristics and Transport of Hormones. Chapter 2: Hypothalamus-Hypophysis <ul style="list-style-type: none">• Hypothalamus as a neuroendocrine organ• Pituitary – Structure and functions• Chemical nature, mode of action, and functions.• Pituitary disorders Chapter 3: Pineal gland <ul style="list-style-type: none">• Structure and functions of Pineal gland.• Hypo- and hyperactive states of the gland.	
Unit-II:	14 hrs
Chapter 4: Thyroid and parathyroid <ul style="list-style-type: none">• Histological structure of the glands.• Chemical nature, mode of action, and functions of the hormones.• Hypo- and hyperactive states of the glands. Chapter 5: Adrenal cortex and medulla <ul style="list-style-type: none">• Histological structure of the gland. Chemical nature, and functions• Hypo- and hyperactive states of the gland. Chapter 6. Prostaglandins	

Unit-III:	14 hrs
<p>Chapter 7: Pancreas</p> <ul style="list-style-type: none"> • Pancreatic islets - histological structure. Chemical nature, and function. Hormonal control of blood sugar. • Hyperinsulinism and diabetes mellitus. <p>Chapter 8: Gastro-intestinal hormones</p> <ul style="list-style-type: none"> • Functions and regulation of secretion of the hormones. <p>Chapter 9: Different types of Rhythms</p> <ul style="list-style-type: none"> • Ultradian, circadian, infradian. Different zeitgebers and their relation with circadian clock • Neural basis of biological clock and role of suprachiasmatic nuclei. Sleep-wakefulness cycle. Time keeping genes. Jet-lag and shift work. 	

Recommended Books/References:

1. William's Text Book of Endocrinology Larsen et al.: An Imprint of Elsevier.
2. Endocrinology, Mac E. Hadley, Pearson Education.
3. The Kidney-An outline of Normal and Abnormal Functions, by H.E. Dewardener, ELBS.
4. Vander's Human Physiology, E.P. Widmaier et al., McGraw-Hill, Higher Education.
5. Concise Medical Physiology by S.K. Chaudhuri, New Central Book Agency.
6. Endocrinology. Vols.I, II and III by L.O. DeGroot. W.B. Saunders Co.
7. The Physiology of Reproduction, Vols.I & II, by E. Knobil and J.D. Neil. Raven Press.
8. Guyton and Hall. Textbook of Medical Physiology. 13th Edition.
9. Histology: A Text and Atlas. Sixth Edition. Ross & Pawlina. Lippincott Williams & Wilkins.
10. Vertebrate Endocrinology by David O. Norris.

Details of Formative Assessment (IA) for DSCC/OEC (Theory):40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for Semester end Examination with 2 Hrs duration)**

Part-A

1. Question number 1-06 carries 2 Marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 07- 11 carries 05 Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub-questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

B.Sc. Semester – IV

DSCC- 7: Gene Technology, Immunology and Computational Biology (Theory) - VII (Code: 034ZOO011)

Course Outcome (CO):

After completion of this course (Theory)-VII, students will be able to:

CO1: Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.

CO2: An understanding on application of genetic engineering techniques in basic and applied experimental biology.

CO3: To acquire a fundamental working knowledge of the basic principles of immunology.

CO4: To understand how these principles, apply to the process of immune function.

CO5: Use, and interpret results of, the principal methods of statistical inference and design; helpsto communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.

Syllabus DSCC- 7: Gene Technology, Immunology and Computational Biology (Theory) - VII (Code: 034ZOO011)	Total Hrs: 56
Unit-I:	14 hrs
Chapter 1: Principles of Gene Manipulation <ul style="list-style-type: none">● Recombinant DNA Technology: Introduction, steps involved.● Restriction enzymes and Ligases and Nucleic acid modifying enzyme.● Gene cloning vector: Concept of Plasmids-pBR322, Lamda phage vectors, Cosmids● Gene transfer techniques (Direct and indirect).● Screening and selection of recombinant colonies/cells	07
Chapter 2: Applications of Genetic Engineering <ul style="list-style-type: none">● Transgenic animals (Transgenic Cow, Transgenic Fish); Transgenic plants (cry protein); Gene silencing (Knock out and Knock in mouse).● Production of Human Recombinant insulin and● Hybridoma technology: Synthesis and applications of Monoclonal antibodies● Gene Therapy (SCID)● Biosensors and its applications	07
Unit-II:	14 hrs
Chapter 3: Introduction to the Immune System <ul style="list-style-type: none">● Defence against diseases: Introduction, First and second line of defence, Types of immunity: Innate and acquired immunity; Antigen presenting cells (APC's), Role of Band T-lymphocytes (Humoral immunity and Cell mediated immunity), primary and secondary immune response.● Functional aspects of organs of the Immune system - Thymus and bone marrow spleen, Lymph Node, Small intestine and Liver (Peyer's patchesand Von Kupffer cells).	07

Chapter 4: Antigens and Antibodies <ul style="list-style-type: none"> Antigens and haptens: Properties (foreignness, molecular size, heterogeneity). Recommended Books/References: B and T cell epitopes. Structure of IgG and functions of different classes of immunoglobulins. Major histocompatibility complex - Structure of MHC I & II. 	07
Unit-III:	14 hrs
Chapter 5: Clinical Immunology <ul style="list-style-type: none"> Immunity against diseases of viral, bacterial and protozoan infections. Vaccines: Types and Uses - Immunization schedule for children. Transplantation immunology: Transplantation of organ- Types, graft rejection and Immuno-suppressors. Chapter 6: Bioinformatics <ul style="list-style-type: none"> Databases: Sequence and structural Sequence analysis (Homology): Pairwise and Multiple Sequence alignment- BLAST, CLUSTALW, Sequence alignment- FASTA. Scope and applications of Bioinformatics. 	07
Unit-IV:	14 hrs
Chapter 7: Biostatistics I <ul style="list-style-type: none"> Measures of central tendency: Mean, Median, Mode. Data summarizing: Frequency distribution, Graphical presentation - Bar diagram, Pie diagram, Histogram. Chapter 8: Biostatistics II <ul style="list-style-type: none"> Measures of dispersion: Range, Standard Deviation, Variance. Correlation and Regression. Tests of significance: F-test, ANOVA, t-test and Chi square test. 	07

- les of Genome Analysis and Genomics. Blackwell (2003).
- Hartl & Jones. Genetics: Principles & Analysis of Genes & Genomes. Jones & Bartlett (1998).
- Sambrook *et al.* Molecular Cloning Vols I, II, III. CSHL (2001).
- Primrose. Molecular Biotechnology. Panima (2001).
- An Introduction to Genetic Engineering by Desmond S. T. Nicholl
- Principles of Genetics by D. Peter Snustad and Michael J. Simmons
- Fundamental Immunology by William E. Paul
- A Textbook of Immunology by Dr. P Madhavee Latha
- Basic Bioinformatics by S. Ignacimuthu
- Kuby Immunology by Punt, W. H. Freeman
- Introduction to Bioinformatics (2003) by T.K. Attwood & D.J. Parry
- Statistical Methods by G. W. Snecdeor and W. G. Cochran, Willey Blackwell.
- Introductory Biological Statistics by John E. Havel, Raymond E. Hampton and Scott J. Meiners.
- Sambrook *et al.* Molecular Cloning Vols I, II, III. CSHL (2001).
- Clark and Switzer. Experimental Biochemistry. Freeman (2000)
- Animal Microtechniques by Humason (1962)
- De- Robertis- Cell and Molecular Biology.
- Verma, P.S. and Agrawal, V.K. Molecular Biology
- Bioinstrumentation by L. Veerakumari

**DSCC-8: Gene Technology, Immunology and Computational Biology
(Practical) – VIII (Code: 034ZOO012)**

Course Outcomes (CO)

After completion of this course (Practical)-VIII, students will be able to:

- CO 1:** Understand the principles of genetic engineering with hands on experiments in detection of diseases
- CO 2:** Get introduced to DNA testing and utility of genetic engineering in forensic sciences.
- CO 3:** Understand the basics of immunology and its applications in clinical research.
- CO 4:** Study on immune system and its components
- CO 5:** Apply knowledge and awareness of the basic principles and concepts of biology, computers science and mathematics existing software's effectively to extract information from large data bases to use this in computer modeling
- CO 6:** Use bioinformatics tools to find out evolutionary/ phylogenetic relationship of organisms using gene /protein sequences
- CO 7:** Understand and can apply biostatistics and bioinformatics tools in research.

Syllabus

**DSCC-8: Gene Technology, Immunology and Computational
Biology (Practical) - VIII (Code: 034ZOO012)**

List of the Experiments for 52 hrs / Semesters

1. Calculate the mean, median, mode and standard deviation (Measurement of pre and post clitellar lengths (with suitable examples).
2. Measure the height and weight of all students in the class and apply statistical measures.
3. Determination of ABO Blood group and Rh factor.
4. To study of lymphoid organs: Thymus, Bone marrow, Spleen, Tonsil, Lymph node (Slides /Charts/ Video)
5. Preparation of blood smears to study various blood cells like RBC, WBC, Platelets, Lymphocytes & Monocytes
6. Separation of different blood cells like RBC, WBC, Platelets, Lymphocytes & Monocytes
7. To study Restriction enzyme digestion using teaching kits (Demonstration only).
8. To detect genetic mutations by Polymerase Chain Reaction (PCR) using teaching kits (Demonstration only).
9. Demonstration of agarose gel electrophoresis for detection of DNA.
10. Demonstration of Polyacrylamide Gel Electrophoresis (PAGE) for detection of proteins.
11. To calculate molecular weight of unknown DNA and protein fragments from gel pictures. (<https://youtube/mCiCiO0cfbg>)
12. To learn nucleotide sequence database.
13. To learn sequence alignment: Pairwise alignment (Protein/ DNA).
14. To learn about basics of computer applications in biology
15. Visit to nearby University/Research Institutions for demonstration of genetic engineering / Immunology/Bioinformatic techniques for students
16. Any other practical's related to this paper may be added based on the feasibility

Recommended Books/References:

1. Primrose & Twyman. Principles of Genome Analysis and Genomics. Blackwell (2003).
2. Hartl & Jones. Genetics: Principles & Analysis of Genes & Genomes. Jones & Bartlett (1998).
3. Sambrook *et al*. Molecular Cloning Vols I, II, III. CSHL (2001).
4. Primrose. Molecular Biotechnology. Panima (2001).
5. An Introduction to Genetic Engineering by Desmond S. T. Nicholl
6. Principles of Genetics by D. Peter Snustad and Michael J. Simmons
7. Fundamental Immunology by William E. Paul
8. A Textbook of Immunology by Dr. P Madhavee Latha
9. Basic Bioinformatics by S. Ignacimuthu
10. Kuby Immunology by Punt, W. H. Freeman
11. Introduction to Bioinformatics (2003) by T.K. Attwood & D.J. Parry
12. Statistical Methods by G. W. Snecdeor and W. G. Cochran, Willey Blackwell.
13. Introductory Biological Statistics by John E. Havel, Raymond E. Hampton and Scott J. Meiners.

General instructions:

Perform all the experiments as per the instructions in each question.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end Examination

1. Major Experiments	08 Marks
2. Minor Experiments	05 Marks
3. Identifications (A-D)	08 Marks
4. Viva	02 Marks
5. Journal	02 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

B.Sc. Semester – IV

OEC – 4: Animal Behaviour (004ZOO051)

Course Outcomes (CO)

After completion of this course, Animal Behaviour students will be able to:

CO 1: Understand types of animal behaviour and their importance to the organisms

CO 2: Explain about behaviour, migration and communication in animals

CO 3: Understand about ecological aspects of behaviour and social behaviour

CO 4: Understand animal behaviour and response of animals to different instincts

CO 5: Understand the proximate controls of behavior including the role of pheromones

CO 6: Learn about reproductive behaviour and parental care in animals

Syllabus OEC-4: Animal Behaviour (Code: 004ZOO051)	Total Hrs: 42
Unit-I:	14 hrs
Chapter 1: Introduction to Animal Behaviour <ul style="list-style-type: none">Brief contributions of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen.Proximate and ultimate causes of behaviour. Chapter 2: Patterns of Behaviour <ul style="list-style-type: none">Stereotyped Behaviors - Orientation and Reflex.Individual Behavioural patterns: Instinct and Learned BehaviourAssociative learning, classical and operant conditioning, Habituation, Imprinting.	
Unit-II:	14 hrs
Chapter 3: Social Behaviour: <ul style="list-style-type: none">Social organization in termites and honey bees.Social behaviour: Altruism.Conflict behaviour. Chapter 4: Sexual Behaviour <ul style="list-style-type: none">Sexual dimorphism, Mate choice in peacock.Intra-sexual selection (male rivalry in red deer).Kinship theory: Relatedness & inclusive fitness.Parental care in fishes (Nest Building & cost benefit)	
Unit-III:	14 hrs
Chapter 5: Chronobiology <ul style="list-style-type: none">Brief historical developments in chronobiology.Adaptive significance of biological clocks.Biological Rhythms Chapter 6: Communications in animals <ul style="list-style-type: none">Bioluminescence in deep sea fishes and insectsTerritoriality in Monkeys and DogsRole of pheromones in animal communication- Insects and Vertebrates,Communication in Honey bees (Waggle Dance)	

Recommended Books/References:

1. Drickameré Vessey: Animal Behaviour, Concepts, Processes and Methods (Wadsworth)
2. Grier: Biology of Animal Behaviour (Mosby College)
3. Immelmann: Introduction to Ethology (Plenum Press)
4. Lorenz: The Foundation of Ethology (Springer-Verlag)
5. Manning: An Introduction to Animal Behaviour (Addison - Wesley)
6. McFarland: Animal Behaviour, Psychology, Ethology and Evolution (Pitman)
7. Price & Stoker: Animal behaviour in laboratory and field (Freeman)
8. Wood-Gush: Elements of Ethology (Chapman and Hall)
9. Animal Behaviour by Alock (2013)
11. Introduction to Animal Behaviour by Manning A. & M.S.Dawkins (2012)
12. Ecology by Charles J. Krebs (2009)
13. Elements of Ecology by Clarke (2015).

Details of Formative Assessment (IA) for DSCC /OEC (Theory):40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC (60 marks for Semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 Marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 07- 11 carries 05 Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.