SWAMI RAMANAND TEERTH MARATHWADA UNIVERISTY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR
Under Graduate Programme
Faculty of Science and Technology

SUBJECT : BOTANY

B.Sc. Third Year

With Effect from June 2018..

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
BOTANY – CURRICULUM
B.Sc. General (CBCS Pattern)

Introduction:

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in the curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

As a result, the grading system is considered to be better than the conventional marks system and hence it has been followed by our university. So, it is desirable to introduce uniform Choice Based Credit System CBCS system. This will facilitate student mobility across institutions, within and across countries and also enable potential employers to assess the performance of students.

The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses). The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our university has already introduced the choice based credit system. The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning.

Keeping in mind BoS in Botany prepared the curriculum to ensure up-to-date level of understanding of plant sciences. Studying plant sciences prepares the student for a career working in either an educational institution or an industry in which you can be directly involved in the research and development and Knowledge of modern and applied plant science and excellent career prospects.

The study of Botany aims to expand and increase current knowledge about plants in order to solve problems in many fields including agriculture, ecology, medicine, biotechnology and horticulture. These are some of the objectives kept in mind during drafting the syllabi.

How plants function at the cellular, tissue, organ, and organismal levels? How evolution of plants and how they contribute to biodiversity. How interactions with each other impact their physical environment are the core objectives.

The addition of Skill enhancement course aims to develop skills in plant sciences and practical experience to the students.

At the end of the curriculum, the student should have increased an aptitude towards science and nature , undertakes the fundamental and applied research in plant science for the benefit of the human and nature.

At last comments, suggestions are welcome from all the teachers, stakeholders and students for the upbringing the curriculum.

Salient Features :

The syllabus of B Sc IIIrd year Botany has been framed to meet the requirement of Choice based Credit System. The courses offered here in will train and orient the students in the field of Botany.

The Section A of DSEB deals with Plant Physiology, Plant Metabolism, Biochemistry and Biotechnology. The Section B of DSEB with choice provides an option to learn courses like Plant Pathology-I & II, Systematic Botany-I & II and Herbal Technology-I & II.

This would help students to lay a strong foundation in the field of Botany.

Overall after completion of this course, students will also acquire fundamental knowledge in Plant Science and also understand that Botany is an integral part of the human life and developments.

Skill Enhancement Courses like Fruit and vegetable processing, Herbal drug technology, Floriculture, Bioinstrumentation, Medicinal plant product preparation skill, Fungal biomass production skill (Mushroom cultivation), Fungal biomass production for biocontrol and Algal biomass production skill (*Spirulina* cultivation) offered during this program are designed with the aim of imparting specific skills to the students which will lead to the self employability through development of their own enterprises.

Utility of Course

This program will train and orient the students in the field of Genetics and Molecular Biology , Plant Breeding , Diversity of Plants, Anatomy and Embryology of Angiosperms, Environmental Biology, Plant Physiology, Biochemistry and Biotechnology, Plant Pathology, Systematic Botany and Herbal Technology in relation to Environment and Agriculture as well as Biotechnological, Pharmaceutical and Herbal Industries. This will help the students for their career development.

Skill Enhancement Courses offered during this program will provide additional specific skills to the students for self employability through the development of their own enterprises.

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Learning Objectives :

The Objective of this program are :

1. To provide an updated education to the students at large in order to know the importance and scope of the discipline and to provide mobility to students from one university or state to other.

2. To update curriculum by introducing recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.

3. To impart knowledge of plant science as the basic objective of Education.

4. To develop a scientific attitude to make students open minded, critical and curious.

5. To develop an ability to work on their own and to make them fit for the society.

6. To expose themselves to the diversity amongst life forms.

7. To develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of plant materials and data.

8. To make aware of natural resources and environment and the importance of conserving the same.

9. To develop ability for the application of the acquired knowledge in the fields of life so as to make our country self reliant and self sufficient.

10. To appreciate and apply ethical principles to plant science research and studies.

Prerequisite :

The optional courses are offered to the students registered for undergraduate programs. Such students should have the basic knowledge of Plant Science and willing to gain additional knowledge in the field of Botany.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERISTY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR
Under Graduate Programme
Faculty of Science and Technology

SUBJECT : BOTANY

Class : B.Sc. Third Year

An Outline:

Semester/ Annual	Course No		Name of the Course	Total Periods (Periods/ Week)	Marks for		Credits (Marks)
					External (ESE)	Internal (CA)	
Semester-V	DSEB-I	Section -A	Theory Paper-XII: Plant Physiology	45 (03/week)	40	10	Credits:02 (Marks: 50)
		Section -B	Theory Paper-XIII: **B I:** Plant Pathology-I OR **B II:** Systematic Botany-I OR **B III:** Herbal Technology-I	45 (03/week)	40	10	Credits:02 (Marks: 50)
Semester-VI	DSEB-II	Section -A	Theory Paper-XIV: Plant Metabolism, Biochemistry and Biotechnology	45 (03/week)	40	10	Credits:02 (Marks: 50)
		Section -B	Theory Paper-XV: **B I:** Plant Pathology-II OR **B II:**	45 (03/week)	40	10	Credits:02 (Marks: 50)

			Systematic Botany-II OR **B III:** Herbal Technology-II				
Annual Pattern	DSEBP-I (DSEB I & II Section A)	--	Practical Paper XVI: Practicals based on theory papers-XII & XIV	16 Pract. (03/week/ Batch)	40	10	Credits:02 (Marks: 50)
	SECB III	--	SEC- III A Or B	01 Skill (03/week/ Batch)	25	25	Credits:02* (Marks: 50)
Annual Pattern	DSEBP-II (DSEB I & II Section B)	--	Practical Paper XVII: Practicals based on theory papers-XIII & XV	16 Pract. (03/week/ Batch)	40	10	Credits:02 (Marks: 50)
	SECB IV	--	SEC- IV A OR B	01 Skill (03/week/ Batch)	25	25	Credits:02* (Marks: 50)
Total Credits Semester –V & VI					240+50 = 290	60+50 =110	Credits:12+4* = 16 (Marks: 300+100* = 400)

ESE : End Semester Examination, **CA** : Continues Assessment, **SECB**: Skill Enhancement Course Botany, **DSEB**: Discipline Specific Elective Botany, **DSEBP**: Discipline Specific Elective Botany Practical

Distribution of Credits: 80 % of the total credits for the ESE and 20% for CA

CA of 10 Marks (Theory) : 05 Marks for test & 05 Marks for Assignment

CA of 10 Marks (Practicals): : 05 Marks for test & 05 Marks for Record Book ,Submission of collection and field note and Excursion Report.

CA of 25 Marks : 15 Marks for Seminar & 10 Marks for Test

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – V
DSEB-I
Theory Paper –XII : Plant Physiology
(Compulsory)

Periods – 45   **Maximum Marks – 50**

UNIT-I: PLANT WATER RELATIONS (11 periods)

Importance of water in plant life

Different bio-physico-chemical phenomenon: Permeability, Diffusion, Osmosis,Plasmolysis and Imbibition.
Ascent of sap: Introduction and mechanism (transpiration pull theory),
Transpiration: Definition, types, structure of stomata, mechanism of opening and closing of stomata (starch-sugar theory and K+ pump theory.
Plant movements: Introduction, classification, paratonic and nastic movements.

UNIT-II: MINERAL NUTRITION (11 periods)

Major and Minor elements: Introduction, source, deficiency symptoms and their role.
Mineral salt absorption: Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory)
Translocation of organic solutes: Introduction, mechanism of translocation (Munch-Mass flow hypothesis)

UNIT-III: GROWTH AND DEVELOPMENT (12 periods)

Growth and Plant growth regulators: Introduction, phases of growth, measurement of growth (arc indicator and Pfeiffer's auxanometer), factors affecting growth, Chemical nature and practical applications of Auxins, gibberellins, cytokinins, abscisic acid and ethylene.
Seed dormancy: Introduction, causes of seed dormancy and methods of breaking seed dormancy
Seed germination: Introduction, types and mechanism of seed germination,
Physiology of flowering: Introduction, Photoperiodism (LDP, SDP and DNP),
Vernalization and devernalization: Introduction, mechanism and significance,

UNIT-IV: BIOMOLECULES AND SECONDARY METABOLITES (11 periods)
Biomolecules:
Carbohydrates: introduction, structure and classification, Monosaccharides, disaccharides and polysaccharides (starch and cellulose)
Protein- Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure
Lipids: Introduction, structure classification and biological functions of lipids

Secondary metabolites: Biological functions of tannins, terpenoids, flavonoids, alkaloids, essential oils and organic acids

Theory paper-XII: Plant physiology (Compulsory)-Unit wise distribution of periods and marks

Unit	Title	Periods Allotted	Maximum Marks
I	Plant Water Relations	11	20
II	Mineral Nutrition	11	20
III	Growth and Development	12	20
IV	Biomolecules and Secondary Metabolites	11	20
	Total	**45**	**80**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – V
Theory Paper-XII

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
                 (ii)   All questions carry equal marks
                 (iii)   Draw neat and well labeled diagrams wherever necessary

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Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit

Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)

Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)

Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)

Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – V
DSEB-I
Theory Paper –XIII

SEMESTER-V (OPTIONAL-I)
PLANT PATHOLOGY-I (B-I)

Periods – 45   **Maximum Marks – 50**

UNIT-I : FUNDAMENTALS OF PLANT PATHOLOGY *(11 periods)*
Scope, importance, history and advancement of plant pathology, classification of plant diseases on the basis of causal organism and symptoms, field and laboratory diagnosis- Isolation of plant pathogens from infected plant parts, soil and air, Pure culture technique, Koch's postulates for pathogenicity.

UNIT-II : PLANT DISEASE DEVELOPMENT *(11 periods)*
Disease development- Mode of entry of pathogens (through stomata, wounds, root hairs and buds), Factors affecting disease development- Temperature, moisture, wind and soil pH, Dispersal of plant pathogens (by air, water, insects and animals), chemical weapons of pathogen: enzymes, toxins and growth regulators..

UNIT-III : PLANT DISEASES-I *(12 periods)*
Symptoms, causal organisms, disease cycle and control measures of Green ear of Bajra, leaf spot of tomato, Grain smut of Jowar, Red rot of Sugarcane, Angular leaf spot of cotton, , Bacterial blight of Pomegranate, Anthracnose of mango

UNIT-IV : PLANT DISEASES-II *(11 periods)*
Symptoms, causal organisms, disease cycle and control measures of White rust of Mustard, Whip smut of Sugarcane, Powdery mildew of pea, Leaf spot of Turmeric (*Colletotrichum capsci*), Citrus canker, Sigatoka disease of Banana, leaf blight of Rice.

Theory paper-XIII: B-I - Plant pathology-I (Optional) **– Unit wise distribution of periods and marks :**

Unit	Title	Periods Allotted	Maximum Marks
I	Fundamentals of Plant Pathology	11	20
II	Plant Disease Development	11	20
III	Plant Diseases-I	12	20
IV	Plant Diseases-II	11	20
	Total	**45**	**80**

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – V, Plant Pathology-I (Optional-I)
Theory Paper-XIII

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   All questions carry equal marks
               (iii)   Draw neat and well labeled diagrams wherever necessary

Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – V
DSEB-I
Theory Paper –XIII
SEMESTER-V (OPTIONAL-II)
SYSTEMATIC BOTANY-I (B-II)

Periods – 45   **Maximum Marks – 50**

UNIT –I: CLASSIFICATION *(11 periods)*
Introduction- Definition, aims, scope and application of angiosperms taxonomy, Types of classification- Artificial, Natural and Phylogenetic, Outline of Bentham and Hooker, Engler and Prantl and Hutchinson's systems of classification of angiosperms with merits and demerits

UNIT –II: PRINCIPLES OF TAXONOMY *(10 periods)*
ICN (International Code of Nomenclature)-Brief history, principle of priority, effective and valid publication, typification and author citation, Species concept- Morphological and biological, Role of phytochemistry, cytology, anatomy and palynology in relation to taxonomy.
Pollen morphology with reference to pollen grains of *Hibiscus, Ipomoea* and Grasses

UNIT –III: STUDY OF MONOCOT FAMILIES-I *(12 periods)*
Study of following families according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance
Musaceae, Zingiberaceae, Cannaceae

UNIT –IV: STUDY OF MONOCOT FAMILIES-II *(12 periods)*
Study of following families according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance
Orchidaceae, Commelinaceae, Cyperaceae

Theory paper-XIII: B-II - Systematic Botany-I (Optional-II) - **Unit wise distribution of periods and marks:**

Unit	Title	Periods Allotted	Maximum Marks
I	Classification	11	20
II	Principles of taxonomy	10	20
III	Study of Monocot families-I	12	20
IV	Study of Monocot Families-II	12	20
	Total	**45**	**80**

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – V , Systematic Botany-I (Optional-II)
Theory Paper-XIII

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   All questions carry equal marks
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit

Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)

Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)

Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)

Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – V
DSEB-I
Theory Paper –XIII

SEMESTER-V (OPTIONAL-III)
HERBAL TECHNOLOGY-I (B-III)

Periods – 45   **Maximum Marks – 50**

UNIT-I: MEDICINAL AND AROMATIC PLANTS (MAP) (11 periods)

Introduction, History, importance, demand and supply of MAP in India, Indian systems of medicine- Ayurvedic, Unani, homeopathic, siddha, yoga and naturopathy, tribal medicine sources, Herbal sources, Animal sources, Mineral sources, their collection, purification and processing.

UNIT-II: CRUDE PLANT DRUGS (11 periods)

Definition, Classification- Alphabetic, taxonomic, morphological, chemical, pharmacological and Chemotaxonomic, Methods of cultivation and factors affecting the cultivation of drug plants, Collection, harvesting, drying and storage of crude drugs, organized crude drugs- Leaves, stem, Flowers, fruits, seeds, barks, underground and entire plant drugs, Unorganized drugs- Gums, Mucilage, resins, dried juices, latex and extracts

UNIT-III: PHARMACOGNOTIC STUDIES (11 periods)

Distribution, morphology, anatomical, chemical constituents and uses of Root drugs- Shatavari, Ashwagandha, Stem drugs- Ginger, turmeric, Gulvel, Chandan, Leaf drugs- Adulsa, Korphad (*Aloe*), Fruit drugs- Behda, Hirda and Entire plant drugs- Tulsi and Aghada

UNIT-IV: MEDICINAL PLANT BIOTECHNOLOGY AND STANDARDIZATION OF DRUGS (12periods)

Genetics as applied to medicinal herbs and transgenic plants, Plant tissue culture as source of biomedicines, Importance of drug standardization, Problems of standardization of herbs, Drug adulteration, Methods of drug evaluation- Morphological, microscopic, chemical, physical and Biological. Tissue culture of medicinal important plants, secondary metabolites production (Alkaloids, Flavonoids)

Theory paper-XIII: B-III- Herbal technology-I (Optional-IV) - **Unit wise distribution of periods and marks:**

Unit	Title	Periods Allotted	Maximum Marks
I	Medicinal and Aromatic Plants (Map)	11	20
II	Crude Plant Drugs	11	20
III	pharmacognostic studies	11	20
IV	Medicinal Plant Biotechnology and Standardization of Drugs	12	20
	Total	**45**	**80**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – V , Herbal Technology-I (Optional-III)
Theory Paper-XIII

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
              (ii)   All questions carry equal marks
              (iii)   Draw neat and well labeled diagrams wherever necessary

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Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – VI
DSEB -II
Theory Paper –XIV : Plant Metabolism,
Biochemistry and Biotechnology
(Compulsory)

Periods – 45   **Maximum Marks – 50**

UNIT-I: PHOTOSYNTHESIS AND RESPIRATION (12 periods)

Photosynthesis: Introduction, significance, ultra structure of chloroplast, photosynthetic pigments, concepts of two Photo systems, Mechanism of photosynthesis, Light reaction, Hill reaction, Cyclic and Non cyclic photophoshorylation, Dark phase, Calvin cycle (C3) and Hatch and Slack (C4) pathway, CAM pathway

Respiration: Introduction, significance, ultra structure of mitochondria, structure and functions of ATP, **Types of respiration**:
Aerobic respiration- Glycolysis, Kreb's cycle, Electron Transport System.
Anaerobic respiration- Fermentation (alcoholic and lactic acid)

UNIT-II: : ENZYMES AND NITROGEN METABOLISM (11 periods)

Enzymes: Introduction, nomenclature and classification (IUB), mechanism of enzyme action (lock and key model, induced fit model), Concept of holoenzyme, mechanism of regulation of enzyme activity-Feedback and allosteric regulation.

Nitrogen metabolism: Introduction, sources and forms of nitrogen, types of nitrogen fixation-physical and biological (symbiotic and asymbiotic), Ammonification, nitrification and denitrification

UNIT –III: BIOTECHNOLOGY (11periods)

Tissue culture: Introduction and basic aspects of tissue culture, media, culture techniques, cellular totipotency.

Applications of tissue culture: Micropropagation, Production of disease free plants, production of secondary metabolites, Anther culture and production of haploids, protoplast culture and somatic hybridization, synthetic seeds

UNIT-IV: GENETIC ENGINEERING (11 periods)

Introduction, tools and techniques of recombinant DNA technology, Cloning vectors, Gene cloning, Genomic library and cDNA library, *Agrobacterium* mediated gene transfer, transgenic plants.
Bioinformatics: Introduction, Biological database, NCBI, BLAST.

Theory paper-XIV: Plant metabolism, biochemistry and biotechnology (Compulsory) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Photosynthesis and Respiration	12	20
II	Enzymes and Nitrogen Metabolism	11	20
III	Biotechnology	11	20
IV	Genetic Engineering	11	20
	Total	**45**	**80**

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – VI
Theory Paper-XIV

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   All questions carry equal marks
               (iii)   Draw neat and well labeled diagrams wherever necessary

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Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – VI
DSEB -II
Theory Paper –XV

SEMESTER-VI (OPTIONAL-I)
PLANT PATHOLOGY-II (B-I)

Periods – 45   Maximum Marks – 50

UNIT-I : AEROBIOLOGY AND SEED PATHOLOGY *(11 periods)*
Aerobiology- Definition, scope and importance and disease forecasting, Seed pathology-Definition, seed borne pathogens (external and internal) detection of seed borne pathogens by blotter paper and agar plate methods, seed treatment (hot water, solar, chemical) and seed certification.

UNIT-II : DEFENSE MECHANISM AND PLANT DISEASE MANAGEMENT *(11 periods)*
Structural (pre-existing and Post infectional) and biochemical defense-pre-existing and Post infectional (phytoalexins) Exclusion and eradication, Chemical control- General account of Sulphur, Copper, systemic fungicides and antibiotics, Integrated pest management.

UNIT-III : PLANT DISEASES-I *(11 periods)*
Symptoms, causal organisms, disease cycle and control measures of Tikka disease of groundnut, Ergot of Bajra, Loose smut of Wheat, Rust of Jowar, Phanerogamic parasites(Cuscuta), Leaf curl of tomato.

UNIT-IV : PLANT DISEASES-II *(12 periods)*
Symptoms, causal organisms, disease cycle and control measures of Downy mildew of Grape, Stem rust of Wheat, Wilt of Tur, late blight of Potato, Grassy shoot of Sugarcane, Papaya mosaic, Rust of Soybean, Leaf spot of cabbage.

Theory paper-XIII: B-I- Plant pathology-II (Optional-I) **– Unit wise distribution of periods and marks :**

Unit	Title	Periods Allotted	Maximum Marks
I	Aerobiology and Seed Pathology	11	20
II	Defense Mechanism and Plant Disease Management	11	20
III	Plant Diseases-I	11	20
IV	Plant Diseases-II	12	20
	Total	**45**	**80**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – VI, Plant Pathology-II (Optional-I)
Theory Paper-XV

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   All questions carry equal marks
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – VI
DSEB- II
Theory Paper –XV

SEMESTER-VI (OPTIONAL-II)
SYSTEMATIC BOTANY-II (B-II)

Periods – 45   **Maximum Marks – 50**

UNIT –I: STUDY OF DICOT FAMILIES (Gamopetalae) *(12 periods)*
Study of following families according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance
Rubiaceae, Apocynaceae, Convolvulaceae, Bignoniaceae, Acanthaceae, Verbenaceae,

UNIT –II: STUDY OF DICOT FAMILIES (Polypetalae) *(12 periods)*
Study of following families according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance
Papaveraceae, Combretaceae, Myrtaceae, Rutaceae, Mimosaceae, Cucurbitaceae Nyctaginaceae (Monochlamydeae)

UNIT –II: TAXONOMIC TOOLS *(10 periods)*
Herbarium- Techniques of plant preservation, Importance of herbarium, Botanical gardens-Role in plant taxonomy, Important Botanical gardens, Plant identification key-Types and use

UNIT –II: ORIGIN OF ANGIOSPERMS *(11 periods)*
Place and Time of origin of angiosperms, Probable ancestors of Angiosperms: Benettitalean theory, Gnetalean theory, Pteridosperm theory

Theory paper-XV: B-II-Systematic Botany-II (Optional-II) - **Unit wise distribution of periods and marks:**

Unit	Title	Periods Allotted	Maximum Marks
I	Study of Dicot families (Gamopetalae)	12	20
II	Study of Dicot families (Polypetalae)	12	20
III	Taxonomic tools	10	20
IV	Origin of angiosperms	11	20
	Total	**45**	**80**

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – VI ,Systematic Botany- II
Theory Paper-XV Optional -II

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   All questions carry equal marks
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Semester pattern curriculum under
Choice Based Credit System (CBCS) for
BOTANY
B.Sc. T.Y.
Semester – VI
DSEB -II
Theory Paper –XV

SEMESTER-VI (OPTIONAL-III)
HERBAL TECHNOLOGY-II (B-III)

Periods – 45   *Maximum Marks – 50*

UNIT-I: HERBAL FORMULATION (11periods)

Steps of herbal formulation- Grinding, extraction, filtration, concentration, Dosage forms-Infusion, decoction, tincture, capsule, medicated wines, syrups, tablets, ointment and creams, Comparative study of- Ayurvedic and modern dosage forms. Preparation and therapeutic uses of Triphalachurna, Kumariasav, Arjunarishtha (Aristha), Gooti, Vatti and Telam

UNIT-II: DRUG CONSTITUENTS AND BIOSYNTHETIC PATHWAY. (11periods)

Introduction, occurrence and chemistry and Biosynthetic pathway of glycosides, alkaloids and steroids Flavinoids. Alkaloid: Reserpine, Morphin. Glycosides: Glycyrrhizin, Digitoxin. Steroids: Withanoloids. Flavonoids: Quercetin, Ritin. Carotenoids: Lycopene-carotene.

UNIT-III: ANALYTICAL AND CHROMATOGRAPHIC TECHNIQUES. (11 periods)

Principles and applications of spectral techniques in drug analysis: Colorimeter, UV-visible spectrophotometer, IR and NMR spectroscopy, paper chromatography, TLC, HPTLC, column and GC chromatography.

UNIT-IV: HERBAL COSMETICS (12 periods)

Classification of cosmetics, brief account of raw material used for cosmetic preparation, stability testing of herbal cosmetics, quality control and packaging of cosmetics. Study and preparation of skin care product (moisturizing creams and anti-ageing cream, hair care product (Hair oil, shampoos)

Theory paper-XV: B-III- Herbal technology-II (Optional-IV) - **Unit wise distribution of periods and marks:**

Unit	Title	Periods Allotted	Maximum Marks
I	Herbal Formulation	11	20
II	Drug Constituents and Biosynthetic pathways	11	20
III	Analytical Chromatographic Techniques	11	20
IV	Herbal cosmetics	12	20
	Total	**45**	**80**

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS)

Skeleton Question Paper
B. Sc. Third Year
Semester – VI, Herbal Technology-II (Optional-III)
Theory Paper-XV

Time: TWO hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
                 (ii)   All questions carry equal marks
                 (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Attempt any Four of the following (Each of 02 Marks)   08
a)
b)
c)
d)
e)
f)
 (Based On Unit I, II, III, IV) Minimum one and maximum two from each Unit
Q2.   Attempt any Two of the following (Each of 04 Marks)   08
a)
b)
c)
(Based On Unit I, II)
Q3.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit I, II)
Q4.   Attempt any Two of the following (Each of 04 Marks)   08

a)
b)
c)
(Based On Unit III, IV)
Q5.   Attempt any One of the following (Each of 08 Marks)   08
a)
b)
(Based On Unit III, IV)

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)
Choice Based Credit System (CBCS) Pattern
B. Sc. THIRD YEAR

Annual Pattern

PRACTICAL PAPER-XVI: BASED ON THEORY PAPERS-XII & XIV

(Compulsory)

Practicals   Maximum Marks – 50

Practical Exercises:

1. To determine the water potential of potato tuber
2. To determine the osmotic potential of vacuolar sap by plasmolysis
3. To study the effect of temperature on permeability of plasma membrane (Beet root) by using colorimeter / spectrophotometer
4. To study the effect of concentration of different organic solvents on permeability of plasma membrane (Beet root) by using colorimeter/spectrophotometer
5. To study the effect of different organic solvents on permeability of plasma membrane (Beet root) by using colorimeter/ spectrophotometer
6. Separation of photosynthetic pigments by paper chromatography
7. To study the effect of light colour on rate of photosynthesis
8. Determination of RF value and identification of amino acids in a mixture
9. Preparation of standard graph of starch using Colorimeter/ Spectrophotometer and determination of starch content of the given plant material
10. Preparation of standard graph of glucose using Colorimeter/ Spectrophotometer and determination of glucose content of the given plant material
11. Preparation of standard graph of protein using Colorimeter/ Spectrophotometer and determination of protein content from given plant material
12. To estimate the percentage of oil content in given oil seeds using Soxhlet extractor.
13. Study of catalase activity under different pH
14. Study of catalase activity under different temperature
15. Demonstration of osmosis by potato osmoscope
16. To study the mineral deficiency symptoms in at least four locally available plants
17. Demonstrations of the Arc indicator (lever auxanometer), Clinostat (Geotropism),Kuhn's fermentation tube experiment (Requirements, procedure and workings of the same are expected)
18. Study of tools used in GE/ Tissue culture laboratory for sterilization and inoculation. Principle and working of Autoclave, oven, incubator, Laminar Air flow, Inoculating chamber, callus culture, plantlet, Anther culture and protoplast culture
19. Study major biological databases
20. Study of gene sequence in FASTA Format
21. Qualitative analysis of proteins (Biuret/ Xanthoproteic/ Millon tests)
22. Qualitative analysis of Carbohydrates (Molisch /Fehlings /Benedict's) Glucose, sucrose, starch, Cellulose and Pectin
23. Qualitative test of tannin, terpenoids, saponins, flavonoids and alkaloids
24. Micro chemical test for organic acids – Tartaric acid, Citric acid, Oxalic and Malic acid
25. Botanical Excursions (Two short excursions and one long excursion and visits to laboratories / companies/ factory etc.)

Note: Minimum of 16 practicals need to be conducted as per the question paper format

Skeleton Question Paper
B. Sc. THIRD YEAR BOTANY
DSEBP-I Annual Pattern
PRACTICAL PAPER-XVI: BASED ON THEORY PAPER-XII & XIV
(Compulsory)

Time: Four hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
               (ii)   Show your preparation to the examiner
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Perform any one experiment (From practical exercise 1 to 5)   /

       Perform any one experiment (From practical exercise 6 to 13)   (12 marks)

Q2.   Describe procedure and working of any one experiment (From practical exercise 14 to 17)
                                                                            (10 marks)

Q3.   Perform any four micro-chemical tests (Protein-1, carbohydrates-1, Secondary metabolites-1,
       Organic acids-1)   (10 marks)

Q4.   Spotting- Four spots (Instrument- 1, Callus/ Anther/ Protoplast culture- each 1) (04 marks)

Q5.   Viva –Voce   (04 marks)

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)

Choice Based Credit System (CBCS) Pattern
B. Sc. THIRD YEAR
Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
PLANT PATHOLOGY –I & II (Optional –I)

Practicals   Maximum Marks – **50**

Practical Exercises:

1. Study of laboratory equipment's- Autoclave, Hot air oven, inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge   (1 practical)

2. Preparation of culture media – PDA, NA   (1 Practical)

3. Micrometry- Calibration of microscope and measurement of fungal spores
                                                                              (1 practical)

4. Isolation of fungal pathogens from diseased plant parts, Toxins & Enzymes
                                                                              (1 practical)

5. Isolation and identification of seed-borne pathogen by blotter / agar plate method
                                                                              (1 Practical)

6.   Study of air – borne pathogen by exposed petri plates / air sampler   (2 Practical)

7. Proving of pathogenicity   (1 Practical)

8. Effect of pH on growth of pathogens   (1 Practical)

9.   Effect of Temperature on growth of pathogens   (1 Practical)

10. Effect of fungicide on spore germination by hanging drop technique   (2 Practical)

11. Study of symptoms and causal organisms of Stem rust of wheat   (1 Practical)

12. Study of symptoms and causal organisms of Late blight of potato and Downy mildew of grapes
                                                                              (1 Practical)

13. Study of symptoms and causal organisms of Tikka disease of groundnut & Anthracnose of guava   (1 Practical)

14. study of symptoms and causal organisms of Leaf spot of tomato and leaf spot of turmeric
                                                                              (1 Practical)

15. Study of symptoms and causal organisms of Rust of Jowar and Grain smut of Jowar
                                                                              (1 practical)

16. Study of symptoms and causal organisms of Loose smut of Wheat, &   leaf blight of rice
                                                                              (1 Practical)

17. Study of symptoms and causal organisms of Green ear and ergot of Bajra
                                                                              (1 Practical)

18. Study of symptoms and causal organisms of wilt of Tur and Whip smut of sugarcane

(1 Practical)

19. Study of symptoms and causal organisms of white rust of Mustard / leaf spot of cabbage

(1 Practical)

20. Study of symptomology of the following diseases-citrus canker, Root knot of tomato, Angular leaf spot of cotton, papaya mosaic , Rust of soybean , sigatoka disease of Banana , Anthracnose of mango , phanerogamic disease due to cuscuta

(3 practicals)

21. Botanical excursions – Several local at least lone long excursion

Note: Minimum of 16 practicals need to be conducted as per the question paper format

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
BOTANY – CURRICULUM
B.Sc. General (CBCS Pattern)

Skeleton Question Paper
B. Sc. THIRD YEAR BOTANY
DSEBP-II-Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
PLANT PATHOLOGY –I & II (Optional –I)

Time: Four hours   **Maximum Marks: 40**

Note: -   (i)   Attempt all questions
               (ii)   Show your preparation to the examiner
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q.1   Calibrate the microscope and measure the size of given spores   (10)

Q.2   Identify and describe the symptoms and morphology of causal organism from the given specimen –B   (12)

Q.3   Identify and describe the symptoms of diseased specimen – C&D   (10)

Q.4   Identify and describe the given spots – E,F,G & H (E- Equipment, F- Diseased plant material , G- Toxins / Enzymes, H- Plant protectant   (04)

Q5.   Viva –Voce   (04)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)

Choice Based Credit System (CBCS) Pattern
B. Sc. THIRD YEAR
Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
SYSTEMATIC BOTANY –I & II (Optional –II)
Practical :   Maximum Marks – 50

Practical Exercises:
1. Description, identification and classification with sketches, floral formulae and floral diagrams of locally available plants of the following families -
    Papaveraceae, Combretaceae, Myrtaceae, Cucurbitaceae, Rutaceae, Rubiaceae, Apocynaceae, Bignoniaceae, Acanthaceae, Convolvulaceae, Verbenaceae, Nyctaginaceae, Musaceae, Cannaceae, Commelinaceae, Cyperaceae (16 practical)
2. Preparation of dichotomous key by studying locally available plants of the same family (**1practical**)
3. Identification of at least six locally available plants up to species level with the help of flora (sketches, floral formulae and floral diagrams are not expected) (**2 practical**)
4. Study of pollen morphology by temporary preparation of pollen grains of Hibiscus, Ipomoea and Grasses by using acetolysis method (**2 practical**)
5. Botanical excursions

Note 1: Student must attend at least one long and two short botanical excursions.

Note 2: Minimum of 16 practicals need to be conducted as per the question paper format

BOTANY – CURRICULUM
B.Sc. General (CBCS Pattern)

Skeleton Question Paper
B. Sc. THIRD YEAR BOTANY
DSEBP-II, Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
SYSTEMATIC BOTANY–I & II (Optional –II)

Time: 04 hours   **Maximum Marks: 40**

Note: -   (i)   Attempt all questions
               (ii)   Show your preparation to the examiner
               (iii)   Draw neat and well labeled diagrams wherever necessary

_____

Q1.   Describe, identify and classify the given specimen-**A & B** to its respective families
       With floral formulae and floral diagrams

                                                                           (16 Marks)

Q2.   Identify the given specimen-**C** up to species level using key and flora   (08 Marks)

Q3.   Make a temporary preparation of pollen grain of the given specimen-**D** identify and
       Describe   (08 Marks)

Q4.   Identify and describe the spots-**E, F, G** and **H** as per the given instructions
       (2 spots on morphology; 2 spots on economic importance)   (04 Marks)

Q5.   Viva –Voce   (04 marks)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM
B.Sc. General (Semester Pattern)

Choice Based Credit System (CBCS) Pattern
B. Sc. THIRD YEAR
Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
HERBAL TECHNOLGY –I & II (Optional –III)

Practicals: **Maximum Marks – 50**

Practical Exercises:

1. Study of composition, preparation and uses of Ayurvedic medicine.
    (Triphala,Decotion ,Syrup)   (3 practicals)
2. Macroscopic and microscopic evaluation of medicinal plants used as –Root drug, Stem drug, Leaf drug, (mentioned in theory)   (5 practicals)
3. Study of leaf constant (stomatal number, stomatal index and palisade ratio) (2 practicals)
4. Preliminary phytochemical screening of alkaloids flavonoids, steroids, glycosides, carotenoids (mentioned in syllabus) (2 practicals)
5. Isolation and extraction of crude drug by using soxhlet / reflex assembly.(2 practicals)
6. Separation of alkaloids / flavonoids/ steroid / carotenoids / glycosids drug using paper / TLC / HPTLC.(2 practicals)
7. Quantitative estimation of secondary metabolites (mentioned in theory) (2 practicals)
8. Preparation of herbal formulation (antiseptic creams/hair oils / skin moisturizer / facial creams / shampoo) (2 practicals)
9. Excursion (3-Short and one long excursion are compulsory to visit pharmaceutical industry, field tour, research laboratories)

Note : Minimum of 16 practicals need to be conducted as per the question paper format

BOTANY – CURRICULUM
B.Sc. General (CBCS Pattern)

Skeleton Question Paper
B. Sc. THIRD YEAR BOTANY
DSEBP-II, Annual Pattern
PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV
HERBAL TECHNOLOGY –I & II (Optional –III)

Time: 04 hours   Maximum Marks: 40

Note: -   (i)   Attempt all questions
            (ii)   Show your preparation to the examiner
            (iii)   Draw neat and well labeled diagrams wherever necessary

Q No 1. Macroscopic and microscopic evaluation of root/ stem / leaf drug.   10 M

            OR

    Preparation and study of herbal formulation: hair oil / skin moisturizers / antiseptic
            creams / triphalachurna / decoction/ syrup

Q. No. 2. Study of leaf constant (stomatal number, index, palisade ratio)   10 M

            OR

    Isolation and extraction of crude drug by suitable methods.

Q. No. 3.Preliminary phytochemical test or screening of any two drugs.   10 M

            OR

    Separation of alkaloids/ flavonoids/ steroids/ carotenoids/ glycosides using paper / TLC /
    HPTLC methods.

Q. No. 4. Spotting(6 spots)   06 M

        01 Root drug.
        02 Stem drug.
        03 Leaf drug.
        04 & 05 Herbal formulations.
        06 Instrument(identification and working)
Q5. Viva –Voce   04 M

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR

Under Graduate (UG) Programme

Faculty of Science and Technology

SUBJECT: BOTANY CLASS: B.Sc. THIRD YEAR

ANNUAL PATTERN

SECB (SKILL ENHANCEMENT COURSE BOTANY)

SECB-III (A)

Periods:45   **Credits : 02 (Marks-50)**

SECB –III (A) – FLORICULTURE

Unit-I) Fundamentals of Floriculture : Branches of floriculture, Present situation & scope. Study of floricultural tools used in maintenance and in propagation.

Unit-II) Propagation by runners, suckers, off shoots & other vegetative means. Study of cut flowers, pot plants, seeds and bulbs, essential oil.

Unit-III) Soils and other media, manures and fertilizers, Irrigation. micro irrigation techniques like drip, sprinkler, fogger, fumigation, etc.

Unit-IV) Methods of propagation. Time of Propagation. Handling of seeds, bulbs, cut, flowers, nursery plants, pot plants. Control of diseases, insects and weeds.

Practicals:

 1)Method of identifying major types of flowering plants (Trees, Shrubs, Climbers, Cacti, Succulents, House plants etc.), Pruning and shaping of the plants.
2) Cultural practices like planting time and distances and methods of planting, nutrition, irrigation & plant protection.
3) Making of floriculture.
4) Visit to flowering plants field.

Reference Books :
1.Floriculture in India-Gurucharan Singh Randhawa.
2. Advances in Floriculture-Suresh Malhotra.
3. Floriculture- APEDA
Note : Minimum of 5 practicals need to be conducted.

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SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR

Under Graduate (UG) Programme

Faculty of Science and Technology

SUBJECT: BOTANY CLASS: B.Sc. THIRD YEAR

ANNUAL PATTERN

SECB (SKILL ENHANCEMENT COURSE BOTANY)

SECB-III (B)

Periods:45   **Credits : 02 (Marks-50)**

SECB –IIIB – BIOINSTRUMENTATION

Unit I Chromatography and Centrifugation: General principles of separation, paper chromatography, thin layer, affinity, gel permeation, ion exchange, GLC, HPTLC, preparative and analytical centrifugations and their application

Unit II Electrophoresis and Spectroscopy: Basic principles of electrophoresis, Factor affecting electrophoretic mobility, native and denaturing PAGE, isoelectric focusing, 2DE, Pulse field gel electrophoresis. Spectroscopy: Theory and applications of Ultra violet and visible spectroscopy, IR, Nuclear magnetic resonance, Mass and applications.

Practicals
1. Centrifugation
   a. Isolation of cell organelles like cell membrane, mitochondria, ribosomes etc.
   b. Determination of molecular weight of protein by centrifugation
2. Chromatography
   a. Separation of amino acids by paper chromatography
   b. Separation of sugars by TLC
   c. Separation of plant pigments by paper/ TLC
   d. Purification of proteins by Column / ion exchange / Molecular sieve chromatography
3. Electrophoresis
   a. Separation of soy bean proteins by PAGE

4. Spectroscopy
   a. Validation of Lambert-Beer's law (Photometer)
   b. Estimation of DNA by DPA method (UV spectrophotometer)
   c. Estimation of reducing sugars by DNSA method (VIS-Spectro.)

Note : Minimum of 5 practicals need to be conducted.

Reference Books :

1. Practical Biochemistry Paperback – 2016

by Damodaran Geetha K

2. An Introduction to Practical Biochemistry Paperback – 1 Jul 2017

by David Plummer

3. Practical Biochemistry Paperback – Import, 31 Jan 2013

by R. C. Gupta

4. Practical Biochemistry: A Student Companion Paperback – Import, 10 Jul 2015

by Tiwari Anand

5. Laboratory Manual For Practical Biochemistry Paperback – 2013

by Shivaraja Shankara Ym

6. A Text Book of Practical Biochemistry: 1 Paperback – Large Print, 1 Apr 2006

by Rashmi A. Joshi, Manju Saraswat

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR

Under Graduate (UG) Programme

Faculty of Science and Technology

SUBJECT: BOTANY CLASS: B.Sc. THIRD YEAR

ANNUAL PATTERN

SECB (SKILL ENHANCEMENT COURSE BOTANY)

SECB-IV (A)

Periods:45   **Credits : 02 (Marks-50)**

SECB –IVA – FRUIT AND VEGETABLE PROCESSING

Unit I

Production and processing scenario of fruits and vegetables in India and World, Scope of fruit and vegetable preservation industry in India. present status, constraints and prospects, Overview of principles and preservation methods of fruits and vegetables (Physical and Chemical), Commercial processing technology of fruits and vegetables, Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables, Minimal processing of fruits and vegetables Blanching operations and equipment.

Unit II

Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc; Problems on squash and RTS; Processing and equipment for above products and FSSAI specification Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and candies, Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, pickles, sauce, paste, ketchup; toffee, cheese, lather, soup powders; FSSAI specification, Commercial processing technology of selected fruits and vegetables for production of various value added processed products.

Practicals :

1. Preparation of jam/ jelly from selected fruit

2. Preparation of RTS beverage e.g. Amala, Mango and Pineapple etc

3. Preparation of squash

4. Preparation of fruit candy

5. Preparation of fruit leather

6. Preparation of fruit toffee

7. Preparation of pickle

8. Preparation of banana and potato wafers

9. Visit to fruits and vegetables processing unit

Note : Minimum of 5 practicals need to be conducted.

Text Books:

	Name of Book	Author	Publisher
1.	Fruit and Vegetable Preservation Principles and Practices	Srivastava R.P. and Sanjeev Kumar	International Book Distributing Company, New Delhi 2005
2.	Post Harvest Technology of Fruits and Vegetables : Handling, Processing, Fermentation and Waste Management vol. I & II	Varma L. R. and Joshi V.K.	Indus Publishing, 2000
3.	Preservation of Fruits and Vegetables	Khader	ICAR, New Delhi 2010
4.	Preservation of Fruits and Vegetable	G. Lal, G.S. Siddappa, G.L. Tandan	ICAR Publication, New Delhi 1996

Reference Books:

	Name of Book	Author	Publisher
5.	Name of Book	Author	Publisher
6.	Fruit and Vegetable Processing	M.G. Danthy	FAO, Rome
7.	Post harvest Handling and Processing of Fruit and Vegetable	I.S. Singh	Text book
8.	Fruit Processing	David Arthey,	Reference book
9.	Handbook of Fruit and	Sinha and Hui	John Wiley and

	Vegetable Processing		Sons, 2010
10.	Fruit and Vegetable Preservation -Principles and Practices	Srivastava RP & Kumar S	International Book Distributors, 2003
11.	Handbook of Fruit Science &Technology: Production, Composition and Processing.	Salunkhe DK & Kadam SS.	Marcel Dekker 1995

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR

Under Graduate (UG) Programme

Faculty of Science and Technology

SUBJECT: BOTANY CLASS: B.Sc. THIRD YEAR

ANNUAL PATTERN

SECB (SKILL ENHANCEMENT COURSE BOTANY)

SECB-IV (B)

Periods:45   **Credits : 02 (Marks-50)**

SECB –IVB – HERBAL DRUG TECHNOLOGY

Unit- I

1.0   Introduction:

l.l   Role of natural products in herbal medicine

1.2   General status and importance of herbal medicine

1.3   Safety of herbals / herbal pharmacovigilance

1.4   WHO policy on herbal medicine

2.0   Herbs as raw materials:

2.1   Definition of herb , herbal medicine, herbal medicinal product, herbal drug preparation

2.2   Source of Herbs

2.3   Selection, identification and authentication of herbal materials drying and processing of herbal raw material

Unit -II

3.0   Extraction of Herbal Materials

3.1   Choice of solvent for extraction

3.2   Methods used for extraction and principles involved in extraction

4.0   Standardization of herbal formulations & herbal extracts

4.1   Standardization of herbal extracts as per WHO and cGMP guidelines

4.2   Physical, chemical. Spectral and toxicological standardization, qualitative and quantitative estimations exemplified by the method of preparation of at least two standardized extracts

4.3   Stability studies for extract

4.4   Predictable chemical and galenical changes

Practicals:

1. Qualitative and Quantitative Microscopic Examination: Microscopic evaluation of powder drugs and their mixtures with adulterants
2. Exercises based on standardization and quality control of plant drugs
3. Qualitative and Quantitative Estimation of Phytoconstituents
4. Determination of phytoconstituents in crude drugs and commercial herbal formulations
5. Pharmacopoeial evaluation of natural products
6. Determination of ash values, extractive values, Swelling index and foaming index of crude drugs as per WHO Guidelines
7. Preparation of detailed monograph of at least one plant drug covering Pharmacognosy and Phytochemical investigation with its use in traditional system of medicine
8. Experiment   on raw material standardization, purification of extracts with chromatographic techniques
9. Isolation of piperine from pepper
10. Isolation of Hespiridine from orange peel
11. Isolation & TLC of reserpine from Rauwolfia root
12. Isolation & TLC of Menthol from Mentha oil
13. Preparation and Evaluation of Herbal formulations

Note : Minimum of 5 practicals need to be conducted.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
SEMESTER PATTERN CURRICULUM UNDER
CHOICE BASED CREDIT SYSTEM (CBCS) FOR
Under Graduate (UG) Programme
Faculty of Science and Technology
SUBJECT: BOTANY
CLASS: B.Sc. THIRD YEAR
ANNUAL PATTERN
SECB (SKILL ENHANCEMENT COURSE BOTANY)
SECB-III &IV
END OF SEMESTER EXAMINATION (ESE)

SEAT NO:

MARK SHEET

Sr. No.	END OF SEMESTER EXAMINATION (ESE)	Maximum Marks	Obtained Marks
1	Skill Work report submission	10	
2	Over all skill judgment	10	
3	Skill Work presentation	05	
Total		25	

Name & Signature of:

Examiner- 1:

Examiner- 2:

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Selected Readings for Semester-V & VI:

- A text book of systematic botany – R.N.Sutaria
- A textbook of plant physiology and Biochemistry – Verma S.K.
- Aerobiology – S.T.Tilak
- Anb introduction to taxonomy of angiosperms – N.C.Kumar
- Angiosperms – G.L.Chopra
- College botany – Das, Datta & Ganguly
- College Botany- Sunder Rajan S
- College botany Vol-III – B.P.Pandey
- Diseases of crop plants in India – G.Rangaswami
- Diseases of crop plants in India – G.Rangaswami & Mahadevan
- Economic Botany – Hill A.F.
- Economic botany – S.N.Pandey & A. Chanda
- Economic botany – Sharma & Avasthi
- Elements of plant physiology – Sarabhai B.P.
- Essentiales of plant pathology – V.N.Pathak
- Experiments in plant physiology – Bajrararcharya D.
- Experments in microbiology, plant pathology, tissue culture & mushroom cultivation – K.R.Aneja
- Flora of Kolhapur – S.R.Yadav & Sardesai
- Flora of Maharashtra – Almeda
- Flora of Marathwada – Chief Ed. By Dr. V.N. Naik
- Flora of Osmanabad – V. N. Naik.
- Flora of Tirupati – Madhed Chetty
- Flowering plants – Origin and dispersal – A.L. Takhtajan
- Fungi and plant diseases – B.B.Mundkur
- Fungicides in plant diseases control – Y.L.Nene
- Illustrated genera of fungi imperfectii – Barnett
- Illustrated kingdom of fungi – D.S.Mukadam
- Introduction to Principles of Plant Pathology – R.S.Singh
- Plant Dieases – R.S.Singh
- Plant Pathaology – B.P.Pandey
- Plant Pathaology – G.N.Agrios
- Plant Pathaology – R.S.Mehrotra
- Plant physiology – Dubey B.P.
- Plant physiology – Shrivastava H.S.
- Plant physiology, a laboratory guide – Wadje S.S. & MMV Baig
- Plant protection – Chattopadhay
- Pollen morphology of angiosperms – N.P.K.Nair
- Seed pathology – D. Suryanarayana
- Seed pathology – D.K.Jha
- Seed pathology- Paul Neergaard
- Takhtajan A.L. (1997) Diversity and classification of flowering plant – Colubia University, press New York.
- Taxonomy of angiosperms – B.P.Pandey
- Taxonomy of angiosperms – P.C.Vasistha
- Taxonomy of angiosperms – Singh V. & D.K.Jain

- Taxonomy of angiosperms – V.N.Naik
- Taxonomy of angiosperms – Vasudevan Nair
- Taxonomy of Vascular plants – Lawrence G.H.M.
- Text book of Modern plant pathology – K.S.Bilgrami & H.C.Dube
- The evolution and classification of flowering plants – Cronquist A.
- Woodland, D.W. (1991) – Contemporary plant systematics : Pentice Hall, New Jersey
- Pharmacognosy – Kokate et al.
- Herbal drug technology – Agrawal S.S. and M.Purohit
- Encyclopedia of medicinal plants used in homoeopathy Vol-1&2 – K.S.Gopi
- Indian medicinal plants: Forgotten healers, a guide to ayurvedic herbal medicine – Prakash Paranjape
- Practical pharmacognosy – Khandelwar K.R.
- Biochemical analysis – S. Sadasivam and A. ManiCkam
- Pharm forestry: Field guide to medicinal plants – Dinesh kumar Tyagi
- Modern methods of plant analysis Vol-1&2 – Peach and M.V.trecey

- Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy, Tobert E. Kreigher Pub. Co. New York
- Grant. V. (1971) – Plant Speciation – Columbia University Press New York.
  - Harrison, H.J. (1971) – New concepts in flowering plant Taxonomy – Hieman Educational Books Ltd. London
  - Heslop – Harrison J. (1967) – Plant Taxonomy- English Language Book Soc. and Edward Arnold Pub. Ltd. UK.
  - Hey wood. V.H. and Moore D.M. (1984) – Current concepts in plant Taxonomy,   - Academic press, London.
  - Jones A.D. and Wilbins, A.D. (1971) – Variation and adaptations in plant,   species. Hieman & Co-Educational Books Ltd. London.
  - Jones S.B. Jr. and Luchsinger, A.E. (1986) – Plant systmatics (2nd edition), Mc Graw Hill Book Co., New York.
  - Nordenstam, B.EL Gazaly, G. and Kassas, M. Zooo – Plant systematic for 21st   Century. Portland press Ltd. London.

- Biochemistry by Mathews C.F. (2003) - Addison Wesley, New Delhi
- Gill P.S. (2000) - Plant Physiology, S.Chand & Co. New Delhi
- JainV.K. ():Fundamental of Plant Physiology, S.Chand &Co., New Delhi
- Jayaraman J. (1992) - Laboratory Manual in Biochemistry, Wiley Eastern Ltd., New Delhi
- Plant Taxonomy and Bio Systematics (2nd, edition) – Edward Arnold Ltd. London
- Radford, A.E. (1986) – Fundamentals of plant systematics – Harper & Row   Publications, USA.
- Rastogi (2000) - Biochemistry Tata McGraw Hill, New York
- Salisbury P.B. & W. Ross (1992) - Plant Physiology , New York Pub. Co. California USA
- Shrivastava H.S. (1993) - Elements of Biochemistry Rastogi Publication, Meerut
- Shrivastava H.S.(2000) - Plant Physiology, Rastogi Publication, Meerut
- Stebbins G.L. (1974) – Flowering plant Evolution Above species level – Edward Arnold Ltd., London.
- Subhash Chandra Dutta (1992) - Plant Physiology, Wiley Eastern, New Delhi
- Verma V. (1995) - Text book of Plant Physiology, Emkay Publication N.Delhi

☐	A manual of laboratory experiments in cell biology	C Edward Gasque	Universal book Stall, New Delhi.
☐	An Introduction to Microbiology	P. Tauro, K.K. Kapoor, K S Yadav	Wiley Eastrevn Limited, New Delhi.
☐	Applied Microbiology	Vinita Kale, Kishore Bhusari	Himalaya publishing Hourse, Mumbai.
☐	Biochemical methods 2nd ed.	S. Sadasivam, A. Manickam.	New Age International Publisher (P) Ltd, New Delhi.

☐ Biotechniques Theory and Practice	S Y S Rana	Rastogi Publications, Meerat 250002
☐ Experiments in Microbiology, Plant Pathology and Tissue Culture	K.R. Aneja,	Wishwa Prakashan, New Delhi.
☐ Frontiers in Applied Microbiology	K.G. Mukerji, N C Pathak, Vedpal Sing	Print Hall, Lucknow
☐ Industrial Microbiology	Richard W Thomas	Dowden, Hutchinson & Ross Inc. Stroudtiury Penasytuna.
☐ Instrumental Methods of Chemical Analysis 5th Ed.	Galen W Ewing.	Mc Graw Hill International
☐ Microbial Genetics	Stanley R Maloy, John E. Cronan David Freitelder	Narosa Publishing House, New Delhi.
☐ Modern experimental biochemistry 3rd ed.	Rodney Boyer	Pearson education Inc.
☐ Plant tissue culture	Kalyan Kumar DC	New Central Book Agency (P) Ltd. Calcutta 700009.
☐ Practical Microscopy	Martin and Johnsen	Blackie and Sen Limited, London
☐ Research Experiences in plant physiology.-A Laboratary Mannual	Thomas C. Moore	Spinger-Verlag,Berlin.

☐ Biophysical Chemistry.	M. Sataske, Y. Hayashi, M.S. Sethi, S A Iqbal,	Discovery Publishing House (1997) New Delhi – 110002.
☐ Instrumental Methods of Chemical Analysis 5th Ed.	Galen W Ewing.	Mc Graw Hill International
☐ Practical Microbiology.	R. C. Dubey, D K Maheshwari	S Chand and company Ltd. New Delhi
A manual of laboratory experiments in cell biology	C Edward Gasque	Universal book Stall, New Delhi.
An Introduction to Microbiology	P. Tauro, K.K. Kapoor, K S Yadav	Wiley Eastrevn Limited, New Delhi.
Applied Microbiology	Vinita Kale, Kishore Bhusari	Himalaya publishing Hourse, Mumbai.
Biochemical methods 2nd ed.	S. Sadasivam, A. Manickam.	New Age International Publisher (P) Ltd, New Delhi.
Biotechniques Theory and Practice	S Y S Rana	Rastogi Publications, Meerat 250002
Experiments in Microbiology, Plant Pathology and Tissue Culture	K.R. Aneja,	Wishwa Prakashan, New Delhi.
Frontiers in Applied Microbiology	K.G. Mukerji, N C Pathak, Vedpal Sing	Print Hall, Lucknow
Industrial Microbiology	Richard W Thomas	Dowden, Hutchinson & Ross Inc. Stroudtiury Penasytuna.
Microbial Genetics	Stanley R Maloy, John E. Cronan David Freitelder	Narosa Publishing House, New Delhi.

Modern experimental biochemistry 3rd ed.	Rodney Boyer	Pearson education Inc.
Plant tissue culture	Kalyan Kumar DC	New Central Book Agency (P) Ltd. Calcutta 700009.
Practical Microscopy	Martin and Johnsen	Blackie and Sen Limited, London
Research Experiences in plant physiology.-A Laboratary Mannual	Thomas C. Moore	Spinger-Verlag,Berlin.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

CLASS: B. Sc. THIRD YEAR

Subject: Electronics - Semester V&VI

(W. e. f. June 2018)

Semester	Paper No	Name of Course	Instruction Hours/ Week	Total periods	CA	ESE	Total Marks	Credits
V	DECE-I (Section A)	Communication Electronics-I (P-XII) (Compulsory)	03	45	10	40	50	02
	DECE-I [(Section B) Elective]	Power Electronics-I (P-XIII- A) OR Introduction to Microcontroller(8051) (P-XIII-B)	03	45	10	40	50	02
	SEC-III	SEC-III(A): Linear Circuit Designing SEC-III(B): PCB Designing	3	45	25	25	50	02
VI	*DECE-II (Section A)	Communication Electronics-II (P-XIV) (Compulsory)	03	45	10	40	50	02
	DECE-II [(Section B) Elective]	Power Electronics-II(P-XV-A) OR Microcontroller 8051 Programming and Interfacing (P- XV-B)	03	45	10	40	50	02
	SEC-IV	SEC-IV(A): Digital Logic Design SEC-IV(B): Programming Skill in 'C'	3	45	25	25	50	02
V & VI	DECEP-I Section A)	P-XVI	03	24	05	20	25	1
		Practicals based on P-XII						
		Practicals based on P-XIV	03	24	05	20	25	1
	DECEP II (Section B)	P-XVII	03	24	05	20	25	1
		Practicals on P- XIII (A or B)						
		Practicals on P-XV(A or B)	03	24	05	20	25	1
Total credits								16

*DECE – Discipline Specific Elective Course in Electronics

Outline of B. Sc. Third Year Electronics Course:

As Electronics has been consistently growing in terms of new technologies, ideas, principles and applications, the course is tailored to meet the demands of industry and market. The course is focused on industrial electronics where use of electric power, efficiency, power control, and automatic power control is of great importance. The wireless communication is now part of everybody's life. So, part of the syllabus is allocated to communication electronics. Some part is designated to practical techniques of creating and handling versatile and improved implements, such as microcontrollers, interfacing and embedded systems. The course is well-crafted to play as a bridge between basic sciences, applied sciences and technological disciplines.

The Couse consists of :

1. TWO compulsory Courses (papers) on Communication Electronics as Discipline Specific Electives (DECEs), one for each semester.
2. The students have to choose ONE of the following options:
   (i)   TWO courses (papers) on Power Electronics as DECEs
   (ii) TWO courses (papers) on Microcontrollers, ALP and Interfacing as DECEs.
3. FOUR Skill Enhancement Courses (SECs) have been designed for the students of Electronics as well as from other allied disciplines. The SECs are designed to train the students to acquire skills in related field and to increase the employability. SECs impart lot of hands on practice and handling of testing and measuring instruments. Each student has to opt one SEC for each semester.
4. The four SECs are as follows:
   (i)   Linear Circuit Designing
   (ii) PCB Designing
   (iii) Digital Logic Designing
   (iv) Programming Skill in C
5. The Lab Courses (Practicals) are designed such that it improves the understanding of theory courses DECEs and SECs.

Learning Objectives:

The learning objectives are given in the beginning of syllabus for each course (paper).

Utility of the course:

1. Upon completion of this course students will acquire in-depth understanding of Communication Electronics, Industrial Electronics, Microcontrollers, Assembly Language Programming, and Interfacing.
2. The students can be employed in the field of power sector, defence services, TV and music industry, automisation, IT, optical communication.
3. They can work as :
   - Electronic Circuit Designer
   - Electronic Consultant (Installation and maintenance of Electronic consumer Products)
   - An Entrepreneur
4. They readily can compete for advanced courses like M. Sc. (Electronics), M. Phil.(Electronics), MBA.

Pre-Requisites for the Course:

1. The student seeking admission to B. Sc. TY Electronics Course must have completed successfully B. Sc. FY and B. Sc. SY Electronics Courses, where they are exposed to the basic electronic principles, components, devices and their characteristics.
2. They must be competent to handle various testing and measuring instruments of electronics labs.
3. They must have skills of constructing, soldering and de-soldering of given circuits.
4. TWO Skill Enhancement Courses (SECs) are designed(one for each semester) such that any student of B. Sc. TY from any other science discipline can choose from.

Paper-XII: Communication Electronics-I

Credit :02 Periods: 45	Maximum Marks: 50 C.A. (Internal): 10 ESE : 40

Learning objectives:

1. To study basics of communication systems.
2. To study and understand the analog modulation techniques (Amplitude and Frequency).
3. To study and understand the basics of Analog pulse modulation.
4. To study the Digital pulse modulation.

Unit I: Basics of Communication Systems   **(07 periods)**

Introduction, Block diagram of Communication System, Classification of Communication Systems: Direction, Nature of signal and Technique of transmission, Need for Modulation, Types of Modulation, Bandwidth. (Numerical Problems)

Unit II: Amplitude Modulation   **(18 periods)**

Amplitude Modulation Theory, Mathematical representation of AM wave, Modulation index, Frequency spectrum of AM wave, Bandwidth of AM, Power relations in AM wave, AM circuits: Basic circuit for BJT Collector modulation, Amplitude demodulator circuit. (Numerical Problems)

Unit III: Frequency Modulation   **(10 periods)**

Theory of Frequency modulation, Mathematical Representation of FM wave, Band width,Generation of FM, Direct method for FM generation, Transistor reactance modulator, Varactor reactance modulator. (Numerical Problems)

Unit IV: Pulse Modulation   **(10 periods)**

Introduction, Classification of Pulse modulation systems, Sampling theorem, Nyquist criteria, Basic principles of Pulse-Amplitude modulation (PAM), Pulse-Width modulation(PWM), Pulse-Position modulation (PPM),Generation and detection of PAM only, **Digital pulse modulation**: Pulse-Code modulation (PCM) PCM transmitter, PCM receiver and quantization process, quantization error, application, advantages and disadvantages of PCM. (Numerical Problems)

References:

1. Electronic Communications, Dennis Roddy and John Coolen (Fourth Edition),PHI Publication.

2. Electronic Communication Systems, George Kennedy, (Third Edition), Mc GrawHill International Edition.

3. Communication Engineering, J.S. Katre, Technova Educational Publications, Pune.

Paper XIII (A) Power Electronics – I

Credit :02	Maximum Marks: 50
Periods: 45	C.A. (Internal): 10
	ESE : 40

Learning objectives:

1) To introduce Thyristor family,
2) To study construction and characteristics of SCR, DIAC, TRIAC, UJT, and MOSFETs
3) To study different triggering techniques for SCR.
4) To study SCRs connected in series and parallel.
5) To study static equalising network and dynamic equalising network.

UNIT -I : Thyristor : Principles and characteristics :   (15 periods)

Principle of operation of SCR, Static Anode - Cathode Characteristics of SCR, The two transistor model of SCR, Thyristor Construction, gate characteristics of SCR, Turn on methods of a thyristor. [Numerical]

UNIT – II : Power semiconductor devices :   (8 periods)

Power semiconductor devices, structure and V-I characteristics of DIAC, TRIAC, Power MOSFET & IGBT, Symbol and V-I characteristics of SUS, SBS, SCS & LASCR (Numericals)

UNIT – III : Gate triggering circuits :   (10 periods)

Introduction, firing of thyristors, gate current amplitude and rise time, gate pulse duration, pulse waveforms, Pulse transformers, pulse transformer in triggering circuits, Gate trigger circuits, resistance firing circuits, resistance - capacitance firing circuit, resistor - Capacitor - full - wave trigger circuit, UJT as an SCR trigger [Numerical]

UNIT - IV: Series and parallel operation of Thyristors :   (12 periods)

Introduction, series operation of Thyristors, need for equilising network, unequal distribution of voltage, difference in reverse recovery characteristics, equilising network design, static equilising network, dynamic equilising network, parallel operation of thyristors, methods for ensuring proper current sharing, string efficiency, derating (Numerical)

References:

1) Power Electronics, M.D. Singh & K.B. Khanchandani (2nd Edition), Mc Graw Hill - education.
2) Power Electronics, Muhammad H. Rashid (4th edition), Pearson.
3) Power Electronics (Revised edition), K. Haribabu, Scitech Publication.
4) Industrial Electronics & Control, S.K. Bhattacharya, S. Chatterjee, TTTI, Chandigarh
5) Power electronics, P.C. Sen, Mc Graw Hill – education

Paper-XIII (B) Introduction to Microcontroller 8051

Credit :02 Periods: 45	Maximum Marks: 50 C.A. (Internal): 10 ESE : 40

Learning Objectives:

1. To know the difference between a microprocessor and a microcontroller.
2. To study architecture of microcontroller 8051
3. To study the instruction set of 8051
4. To study structure of Assembly Language Program for 8051

Unit-I: **Microprocessors to Microcontrollers**   (03 Lectures)

Block Diagram of a microprocessor, Block Diagram of a microcontroller, Comparison between microprocessor and microcontroller.

Unit-II: **Introduction to Microcontroller 8051**   (15 Lectures)

Features, Pin diagram, functional pin diagram and pin description, Architecture, Reset, Memory organization, CPU timings.

Unit-III: Instruction Set of Microcontroller 8051   (15 Lectures)

Addressing modes, Data transfer Instructions, Arithmetic Instructions, Logical Instructions, Branch Instructions, Bit Manipulation Instructions

Unit-IV: **Assembly Language Programming For Microcontroller 8051** (12 Lectures)

Introduction to 8051 Assembly programming, Assembling and running an 8051 program, The Program Counter and ROM space in 8051, 8051 Data types and Directives, Simple Assembly Language Programs for 8051.

Reference Books:

1. The 8051 Microcontroller - Kenneth Ayala – Cengage Learning India Private Limited - (3/e)
2. Microprocessors and Microcontrollers - U. S. Shah - Tech-Max Publications, Pune (Revised 2/e)
3. 8051 Microcontroller: Hardware, Software and Applications
   V. Udayshankara and M. S. Mulikarjun Swamy – McGraw Hill
4. The 8051 Microcontroller and Embedded Systems Using Assembly and C
   -M. A. Mazidi, J. G. Mazidi and R. D. McKinlay – Pearson – (2/e)

Skill Enhance Course –III (A): Linear Circuit Designing

Credit :02 Periods: 45 (Theory + Lab)	Maximum Marks: 50 C.A. (Internal): 25 ESE or Skill Exam : 25

Objectives:

1) To know basics of some electronic components and circuits of practical importance.
2) To equip the students with skill of circuit designing for a given requirement.
3) To impart hands on practice: circuit assembling, testing and troubleshooting.

Unit I: **(Periods: 10)**

LED interfacing to given source, designing of buffer for LED interfacing with ICs such as 7476, 8255 etc., voltage clipper, voltage clamper, designing of single stage C-E amplifier (class A).

Unit II: **(Periods: 20)**

Designing of Colpitt's oscillator, Phase-shift oscillator, designing of fixed voltage regulators using ICs 78XX and 79XX, study of load regulation and line regulation of a given power supply, designing of constant current source.

Hands-on Exercises: **(15 Lectures)**

1) Design the circuit to interface LED of Vd = ….V, to a voltage source V = ….V. Take maximum LED current 10 mA.
2) Design the buffer amplifier to interface LED to some TTL chip operating at 5 V and can source only 40 micro ampere. Take Vd = …..V and Id = 10 mA.
3) Design voltage clipper to clip the given waveform at V = +….V or − …V.
4) Design waveform clamper to clamp the given waveform at V = +2V
5) Design single stage RC coupled CE amplifier for the gain of A = - 10.
6) Design and build the fixed voltage regulator for Vo = +5V / 1 A, using IC 7805
7) Design and build the split-power supply for Op-Amp = +12V n -12V using ICs 7812 and 7912.
8) Study the load regulation of given power supply.
9) Study the line regulation of given power supply.
10) Design and build the constant current source of 1 mA, operating at =12V for the load which varies over 0 - 5 Kohms.
11) Design and build the Colpitt's oscillator / RC Phase shift oscillator for a given frequency.

Reference Books:

1. *Electronic Principle* -by Albert Malvino, David J. Bates, 7th Edition, TMH, 2007 (5th Reprint,2008)
2. *Grob's Basic Electronics* -by Mitchel E. Schultz, 10th Edition, TMH, New Delhi, Rs 585/-
3. *Electronic Devices and Circuits* -by I. J. Nagrath, PHI, 2007, Rs 325/-
4. *Electronic Devices* -by Thomas Floyd, 6th Edition(4th Reprint), PEARSON Education, 2005

Web Resources:

1. https://www.electronics-tutorials.ws/diode/diode_8.html
2. https://www.elprocus.com/types-of-clipper-and-clamper-circuits-and-application/
3. https://www.electronics-tutorials.ws/amplifier/amp_2.html
4. https://www.engineersgarage.com/contribution/ambhatt/how-to-design-regulated-power-supply
5. http://www.radio-electronics.com/info/circuits/transistor/active-constant-current-source.php

Skill Enhance Course –III (B): PCB Designing

Credit :02 Periods: 45 (Theory + Lab)	Maximum Marks: 50 C.A. (Internal): 25 ESE or Skill Exam : 25

Learning Objectives:

1. To equip students with circuit drawing.
2. To know various steps involved in PCB production.
3. To know and handling of various tools and software used for PCB designing.

Utility of the Course :

On completion of this course, students can -

1. work as PCB Designer for a given circuit.
2. assemble, solder, de-solder on PCB.
3. start his own business as PCB manufacturer or supplier.

Prerequisites:

1. Any B.Sc. TY student from any science discipline.
2. TY students having knowledge of electronic circuits and components.

UNIT-I: PCB Designing   **(15 Lectures)**

Introduction to PCB: Evolution & Classification, Manufacturing of PCB: Single sided and double sided, Layout planning and design: Reading drawings and diagrams, General PCB design considerations, Conductor patterns, Component placement Rules.

UNIT-II Soldering Methods   **(15 Lectures)**

What is soldering, theory of soldering, Soldering variables, Soldering material, Soldering and Brazing, Soldering tools, Other hand soldering tools, Hand soldering: Requirements & steps, Health and safety Aspects, De-soldering techniques, Etching techniques: Immersion etching, drilling: drill bit geometry and its importance.

Hands-on Exercises: **(15 Lectures)**

1. Drilling and Soldering Practice.
2. Layout printing on copper clad.
3. Designing of PCB through etching.
   Preparing PCB for
   i.   Half Wave Rectifier
   ii.   Full wave Rectifier
   iii.   Capacitor filter
   iv.   Single stage CE amplifier
   v.   NAND gate using 7400

vi. NOR gate using 7402
vii. Basic gates using NAND gate

Recommended Books:

1.Printed circuit boards: design, fabrication, assembly and testing- R.S.Khandpur

2.Electronic Product Design- Er.S.D.Mehta,Volume I,S. Chand Publications

Paper-XIV: Communication Electronics-II

Credit :02 Periods: 45	Maximum Marks: 50 C.A. (Internal): 10 ESE : 40

Learning objectives:

1. To study basics of Radio Receivers.
2. To understand the basics about the Microwaves.
3. To learn the RADAR systems
4. To Study the concepts in Mobile communication
5. To understand the optical fibres and study the optical fibre communication systems.

Unit I: Radio Receivers   **(10 periods)**

Introduction, Basic block diagram of communication receiver, Tuned Radio Frequency (TRF) Receiver, Super Heterodyne Receiver, Characteristics of Radio receivers, Sensitivity, Selectivity, Fidelity, Image frequency and its rejection, Double spotting. (Numerical Problems)

Unit II: Microwaves & Radar Systems   **(15 periods)**

Introduction to microwave properties and applications of microwaves, Basic principles of radar system, Block diagram of basic pulsed radar system, Radar range equation, Moving target indication, CW Doppler radar. (Numerical Problems)

Unit III: Introduction to Mobile Communication   **(5 Periods)**

Historical perspectives, Cellular Systems, Third Generation (3G) Systems, Fourth-Generation (4G) Systems.

Unit IV: Introduction to Optical Fibres   **(15 periods)**

Fibre Optics, Structure of Optical Fibres, Classification of Optical Fibres, Propagation of Light, Refraction and Snell's law, Total Internal Reflection, Light Propagation through an Optical Fibre, Acceptance Angle and Numerical Aperture, Dispersion, Intermodal Dispersion, Fibre Characteristics, Fibre Losses, Calculation of Losses, Choice of Wavelength, Fibre Optic Communications, Applications of Fibre Optic Communication, Advantages of Optic Fibres, Disadvantages of Optic Fibres.(Numerical Problems)

References:

1. Electronic Communications, Dennis Roddy and John Coolen (Fourth Edition), PHI Publication.

2. Electronic Communication Systems, George Kennedy, (Third Edition), McGraw Hill International Edition.

3. Microwave Engineering-Sanjeeva and Gupta

4. Optical Fibres and Fibre Optic Communication Systems, S.K. Sarkar, S.Chand and Company Ltd., New Delhi.

5. Optical Fiber Communications: Principles & Practice – John M Senior, III edition PHI

6. Communication Engineering, J.S. Katre, Technova Educational Publications, Pune.

7. Basic Electronics (Solid State) [Multicolour Illustrative Edition] B.L. Theraja (S. Chand &Co. Ltd.)

8. Mobile Satellite Communication Networks: Ray E. Sherrif& Y. Fun Hu (Wiley India)

9. Wireless & Cellular Telecommunications: -Wiliam C. Y. Lee (3/e, McGraw Hill)

10. Wireless Communications, Andrea Goldsmith, Cambridge University Press, 2015.

11. Web Reference: 1G, 2G, 3G, 4G, 5G –by Simon Johansen (http://its-wiki.no/images/c/c8/From_1G_to_5G_Simon.pdf)

Paper XV (A) Power Electronics – II

Credit :02 Periods: 45	Maximum Marks: 50 C.A. (Internal): 10 ESE : 40

Learning Objectives:

1) To understand the operation of single phase half controlled and fully controlled converters.
2) To understand working of choppers and inverters.
3) To construct & study working of some power control circuits used in industry.

UNIT – I : Phase controlled Converters   (17 periods)

Introduction, control techniques, phase angle control, extinction angle control, pulse width modulation control, Single-phase fullwave controlled rectifier (Two-quadrant Converters) :Mid-point converters (M-2 Connection) with resistive lead, with inductive load, effect of freewheeling diode, Bridge configuration (B-2 connection) with resistive load, with inductive load (R-L load) Single-Phase half controlled Bridge rectifier: Half controlled bridge rectifier with resistive load (symmetrical configuration), Half controlled Bridge rectifier with R-L load. (Symmetrical configuration) [Numerical]

UNIT - II : Thyristor Control Circuits   (10 periods)

Introduction, phase - control circuits for regulating temperature, remote temperature controller, Illumination control using DIAC & TRIAC, Light activated turnoff circuit using DIAC, TRIAC and LDR, OFF at dark circuit, emergency light using SCR, Automatic water level indicator using SCR

UNIT – III : Choppers   (10 periods)

Introduction, Basic chopper classification, Basic chopper operation: Principle of step down chopper (buck converter), principle of step up chopper, Control Strategies : Time Ratio control (TRC) current limit control. [Numerical]

UNIT - IV : Inverters :   (8 Periods)

Introduction, classification of Inverters, Series Inverters: Basic series inverter, modified series inverter, parallel inverter [Numerical]

References:

1) Power Electronics, M.D. Singh & K.B. Khanchandani (2nd Edition), Mc Graw Hill - education.
2) Power Electronics, Muhammad H. Rashid (4th edition), Pearson.
3) Power Electronics (Revised edition), K. Haribabu, Scitech Publication.
4) Industrial Electronics & Control, S.K. Bhattacharya, S. Chatterjee, TTTI, Chandigarh
5) Power electronics, P.C. Sen, Mc Graw Hill – education

Paper-XV (B) Microcontroller 8051 Programming and Interfacing

Credit :02 Periods: 45	Maximum Marks: 50 C.A. (Internal): 10 ESE : 40

Learning Objectives:

1. To study I/O Port programming of 8051.
2. To know Timer/Counter programming of 8051.
3. To study Serial Port programming of 8051.
4. To study interrupt programming of 8051.
5. To acquire basic knowledge of interfacing various peripheral devices to 8051.

Unit-I: **I/O Port Programming and Timer Programming**   (15 Lectures)

I/O Port Programming: 8051 I/O Programming, I/O Bit Manipulation Programming, Programming Examples, Timer Programming: Programming 8051 Timers, Counter programming, Programming Examples.

Unit-II: **Serial Port Programming**   (08 Lectures)

Basics of Serial Communication, 8051 Connection to RS232, 8051 Serial Port Programming, Programming Examples

Unit-III: **Interrupt Programming**   (10 Lectures)

8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupt, Interrupt priority in 8051, Programming Examples.

Unit-IV: **Interfacing**   (12 Lectures)

Interfacing of Switches, Relays, LEDs, LCDs, Stepper Motor, DAC 0808, ADC 0808, External Memory and IC8255 with Microcontroller 8051.

Reference Books:

1. The 8051 Microcontroller - Kenneth Ayala – Cengage Learning India Private Limited - (3/e)
2. Microprocessors and Microcontrollers - U. S. Shah - Tech-Max Publications, Pune (Revised 2/e)
3. 8051 Microcontroller: Hardware, Software and Applications
   V. Udayshankara and M. S. Mulikarjun Swamy – McGraw Hill
4. The 8051 Microcontroller and Embedded Systems Using Assembly and C
   -M. A. Mazidi, J. G. Mazidi and R. D. McKinlay – Pearson – (2/e)

Skill Enhance Course –IV(A): Digital Logic Design (DLD)

Credit :02 Periods: 45 (Theory + Lab)	Maximum Marks: 50 C.A. (Internal): 25 ESE or Skill Exam : 25

Learning Objectives:

1. To know fundamentals of Digital Logic Design.
2. To study designing of a given combinational logic circuit.
3. To study designing of a given sequential logic circuit.
4. To get fundamental knowledge of PLDs.

Unit-I: **Combinational and Sequential Logic Design** (18 Lectures)

Combinational Logic Design:

Overview of Logic Gates and Boolean Algebra, Forms of logic representation: SOP form, POS form, Truth table, Minterm form, Maxterm form, Logic diagram and their inter-conversions, Methods Logic Implementation: AOI, NAND, and NOR and their inter-conversions, Techniques of Minimization of Logic Expressions: K-Map Technique, Quine-McCluskey method, Exercises of Combinational logic Design.

Sequential Logic Design:

Overview of Flip flops, Counters and Shift registers, Exercises of Sequential logic Design

Unit-II: **Programmable Logic Devices (PLDs)** (12 Lectures)

Introduction, Simple PLDs (SPLDs), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Generic Array Logic (GAL), Complex PLDs (CPLDs), Field Programmable Gate Arrays (FPGAs)

Hands-on Exercises: (15 Lectures)

1. Conversion of one form of logic into other forms
2. Conversion of AOI implementation into NAND implementation
3. Conversion of AOI implementation into NOR implementation
4. Minimization of a logic expression using K-Map techniques
5. Minimization of a logic expression using Quine-McCluskey method
6. Designing and AOI implementation of at least four combinational logic circuits
7. Designing and implementation of at least four sequential logic circuits

Reference Books:

1. Digital Fundamentals-   Floyd & Jain-   Pearson-   (8/e)
2. Modern Digital Electronics-   R P Jain-   TMH-   (3/e)
3. Digital Electronics with Practical Approach-   G N Shinde- Shivani
   Publications-   (1/e)

Skill Enhance Course –IV(B): Programming Skill in C

Credit :02 Periods: 45 (Theory + Lab)	Maximum Marks: 50 C.A. (Internal): 25 ESE or Skill Exam : 25

Learning Objectives:

1. To understand fundamentals of C language
2. To study the use of decision making & looping control structure.
3. To Study the functions, arrays, string in C language.
4. To develop software skill by writing programs in 'C' based on some problems.

Utility of the Course :

On completion of this course, students can -

1. Write C program for any given task.
2. Can develop his own software for a given problem, research work etc.

Prerequisites:

1. Any B.Sc. TY student from any science discipline.
2. TY student who is interested in computer programming, software development.

Unit –I Fundamentals of C   **(15 periods)**

Introduction, Character set, 'C' Tokens, Keywords & Identifiers, Data types, Constant, Variables, Operators- Arithmetic, logical, relational, assignment, increment, decrement, conditional. Input/Output Statement, Structure of C program. **Decision & looping, control structure:** Statements - If, If-Else statement, Nested If-Else, Switch. Entry and exit controlled loops – While, Do-While and For loop.

Unit –II Arrays and Functions   **(15 periods)**

Introduction to Array, One-dimensional arrays: Declaration & Initialization, Two-dimensional arrays: Declaration & Initialization, **Functions:** Definition of function, function with arguments and without arguments, Strings in 'C', Standard Library string functions: strlen(), strcpy(),strcmp(), strcat().

Hands on Exercises (Practical):   **(15 periods)**

1) Write, Compile and Run a programs in C to enter any two numbers and performs arithmetic operations (+, -, *, /).

2) Write Compile and Run a program in C to find Resistance of a circuit when two resistance are connected in a) series and b) parallel.

3) Write, Compile and Run a programs in C to determine simple interest using formula:

    S.I. = P * N * R/100 (P – Principal amount, N- No. of months, R- Rate of interest)

4) Write Compile and Run a program in C to find given integer number is odd or even.

5) Write Compile and Run a program in C to find factorial of given number.

6) Write Compile and Run a program in C to find summation of set of numbers.

7) Write Compile and Run a program in C to print Fibonacci series as follows:

    0,1,1,2,3,5,8,13,21,34,………….

    (Note: Every number in series is sum of preceding two numbers.)

8) Write Compile and Run programs in C to print an array in reverse order.

9) Write Compile and Run a program in C to find sum of array element.

10) Write Compile and Run a program in C to find maximum or minimum element from array.

Reference Books:

1. C programming by B. Gottfried, Schaum's outline series

2. Programming in ANSI C by E. Balaguruswamy, TATA MCGRAW Hill Publication.

3. Let US C by Yeshwant Kanetkar, BPB Publication.

4. The C-Programming language, Brian Kernighan, & Dennis Ritchie, Pearson Education India.

5. C the Complete Reference, Herbert Schildt, Osborne publication.

Web Resources:

1. www.spoken-tutorial.org

2. www.onlinecourses.nptel.ac.in

3. https://www.programiz.com/c-programming/examples

4. https://www.javatpoint.com/c-programs

5. https://www.tutorialspoint.com/cprogramming/index.htm

Paper-XVI: Practicals Based On P- XII and XIV

Credits: 02   **Marks: 50**

Note:

1. Every student must perform at least Ten experiments
2. Use graphs wherever necessary

List of Experiments:

1. Study of Class–C Amplitude Modulation and Measurement of Efficiency, Percentage
1. Modulation Index
2. Study of Linear Diode Detector and Measurement of Detection Efficiency
3. Study of Frequency Response of Two Stage IF Amplifier
4. Study of Frequency Response of Audio Amplifier.
5. Study of Class B Push–Pull Amplifier using Complimentary Symmetry and Determination of Efficiency
6. Study of RF Mixer using BF 194 Transistor
7. Study of FM Modulation using IC 566
8. Study of FM Demodulator.
9. Study of Pulse Amplitude Modulation
10. Study of Pulse Position Modulation
11. Study of Pulse Width Modulation
12. Study of Pulse Code Modulation
13. Measurement of Numerical Aperture of Optical Fiber
14. Study the Bending Loss of an Optical Fiber
15. Study of the Characteristics of Laser LED
16. Study of Photo-Diode Detector Characteristics (Use Avalanche Photo Diode)
17. Study of Transmission and Reception through Optical Fiber

Paper XVII (A): Practical Based On P-XIII (A) and XV (A)

Credits: 02   **Marks: 50**

Note:

1. Every student must perform at least Ten experiments.
2. Use graphs wherever necessary.

List of Experiments:

1. Uni-junction Transistor Characteristics
2. UJT relaxation oscillator
3. Firing characteristics of SCR.
4. Half wave gate controlled rectifier using one SCR
5. Firing of single SCR using UJT
6. Firing of two SCRs by a UJT.
7. Phase control circuit using SCR
8. Characteristics of DIAC.
9. Firing characteristics of a TRIAC
10. Illumination control using DIAC and TRIAC
11. Light activated turnoff circuit using LDR and SCR
12. Light activated turn off circuit using DIAC-TRIAC and LDR
13. Inverter using SCR and measurement of frequency, output power.
14. Study of simple Chopper circuit/step-up chopper circuit and measurement of on-time, off-time, output voltage.

Every student must perform at least Ten Experiments from the following List

List of Experiments (Assembly Language Programs: ALPs)

1. ALP to add two 8-bit numbers

2. ALP to add two 16-bit numbers

3. ALP to subtract two 8-bit numbers

4. ALP to subtract two 16-bit numbers

5. ALP to multiply two 8-bit numbers

6. ALP to divide two 8-bit numbers

7. ALP to determine 1's complement of an 8-bit number

8. ALP to determine 1's complement of a 16-bit number

9. ALP to determine 2's complement of an 8-bit number

10. ALP to determine 2's complement of a 16-bit number

11. ALP to logically AND two 8-bit numbers

12. ALP to logically OR two 8-bit numbers

13. ALP to logically XOR two 8-bit numbers

14. ALP to convert an 8-bit Binary number to Gray

15. ALP to convert an 8-bit Gray number to Binary

16. ALP to find smallest of two 8-bit numbers

17. ALP to find largest of two 8-bit numbers

18. ALP to unpack an unpacked BCD number

19. ALP to determine sum of a series of numbers

20. ALP to move a block of data from one area of memory to another area of the memory

21. ALP to create a square wave at $P_{1.0}$

22. ALP to flash an LED connected to $P_{3.1}$ with the time delay of 1 Sec using timer T_1 in Mode-2

23. ALP to interface a Relay and make it ON/OFF repeatedly with the time delay of 1 Sec

24. ALP to Interface 7-segment display unit to 8051 to generate desired character

25. ALP to interface Stepper motor to rotate CW/ACW with given number of steps per revolution

26. ALP to interface DAC 0808 / ADC 0808.

Question Paper Pattern for Practical Corse (Annual Exam)

Practical Paper Nos. P-XVI and P-XVII

Total Marks : 50

I)   **CA (Internal Exam) : 10 marks (Separate Mark List be submitted by college Internal Examiner)**

        (i)   Test exam /Assignment : 05 marks

        (ii)   Record Book / Journal   : 05 marks

II)   **ESE: 40 marks (Awarded at the time of University Annual Practical Exam), Duration 3 Hrs :** Every student is required to perform one complete experiment. The scheme of marks is as follows:

        (i)   Circuit diagram   : 10 marks

        (ii)   Construction of circuit   : 10 marks

        (iii)   Observations /Calculations/

                     Graphs/Result/Conclusion etc.   : 15 marks

        (iv)   Viva-voce   : 05 marks

Question Paper Pattern for B.Sc. Third Year Exam(Semester V and VI), for all theory papers:

Time : 2 Hr   Max Marks: 40

Note: ALL questions are compulsory and carry equal marks

Question 1 - Attempt any FOUR.(each of 2 marks)   8 marks

      i)
      ii)
      iii)
      iv)
      v)
      vi)

(Note: This question will be based on entire syllabus)

Question 2 - Attempt any TWO of the following (each of 4 marks)   8 marks

      a.
      b.
      c.

(Note: This question will be based on Unit I and Unit II, with a minimum of 1 sub-question and a maximum of 2 sub-questions from each unit)

Question 3 - Attempt any ONE of the following (each of 8 marks)   8 marks

      a.
      b.

(Note: This question will be based on Unit I and Unit II, with one sub-question from each unit)

Question 4 - Attempt any TWO of the following (each of 4 marks)   8 marks

      a.
      b.
      c.

(Note: This question will be based on Unit III and Unit IV, with a minimum of 1 sub-question and a maximum of 2 sub-questions from each unit)

Question 5 - Attempt any ONE of the following (each of 8 marks)   8 marks

      a.
      b.

(Note: This questions will be based on Unit III and Unit IV, with one sub-question from each unit)

Swami Ramanand Teerth Marathwada University, Nanded

B. O. S. IN CHEMISTRY
B. SC. THIRD YEAR (CHEMISTRY)
SEMESTER- V & VI
CBCS Course
Effective from JUNE – 2018

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course
Structure Faculty of Science
B. Sc. Third Year Syllabus
Semester Pattern Effective From June 2018
Subject: Chemistry

Semester	Course No	Name of the course	Instruction Hrs/Week	Total Period	CA (Int.)	ESC (Ext.)	Total Marks	Credits
V	DSEC- V (Section A)	Theory Paper-XII Organic+Inorganic Chemistry (P-XII)	03	45	10	40	50	02
	DSEC- V [(Section B) (Elective)	Theory Paper-XIII Physical+Inorganic Chemistry (P-XIII)-B1 OR (Elective Paper) Physical+Inorganic Chemistry (P-XIII) B2	03 / 03	45 / 45	10 / 10	40 / 40	50 / 50	02
	DSECP- IV [DSEC V &VI (Section A)]	Practical's based on P-XII & P-XIV (P-XVI)	04	Practicals 08 / 08	05 / 05	20 / 20	25 / 25	01 / 01
	DSEC- IV (Elective)	Practical's based on (Elective)	02	08	05	20	25	
	DSECP-III SEC III (Any one Skill from optional)	(A) Applied Analytical Chemistry OR (A) Computer Application in Chemistry	02+01=03	45	25	25	50	(02)*
VI	DSEC VI [(Section A) (Elective)	Theory Paper-XIV Organic+Inorganic Chemistry (P-XIV)-A1 OR (Elective Paper) Organic+Inorganic Chemistry (P-XIV)-A2	03 / 03	45 / 45	10 / 10	40 / 40	50 / 50	02
	DSEC VI (Section B)	Theory Paper-XV Physical+Inorganic Chemistry (P-XV)	03	45	10	40	50	02
	DSECP- IV [DSEC V &VI (Section B)]	Practical's based on P-XIII &P-XV (P-XVII)	04	Practicals 08 / 08	05 / 05	20 / 20	25 / 25	01 / 01
	DSEC- IV (Elective)	Practical's based on (Elective)	02	08	05	20	25	
	DSEC IV SEC IV (Any one Skill from optional)	(B) Spectroscopic Techniques and Cosmetic Preparation OR (B) Basic Analytical Chemistry	02+01=03	45	25	25	50	(02)*
	Total credits semester V and VI							12(04)* = 16

DESC: Discipline Subject Elective Chemistry, DESCP: Discipline Subject Elective Chemistry Practical,
ESE: End of Semester Examination, CA: Continuous Assessment, SECC: Skill Enhancement Course Chemistry.
Distribution of Credits: 80% of the total Marks for ESE and 20% for CA.
- CA of Marks 10 : 10 Marks for test. - CA of 25 Marks: 15 Marks for Seminar & 10 Marks for test.
Suggestions: The end examination of Skill Enhancement Course should be conducted on the separate day by calling all the students who have opted Chemistry as SEC.

Marks – 50   Periods – 45

Section – A (Organic Chemistry)

Unit – I Heterocyclic Compounds   06 Periods

      i) Introduction, classification and nomenclature.

      ii) Molecular orbital structures, resonance structures and reactivity of furan, pyrrole, thiophene and pyridine.

      iii) General mechanism of electrophilic substitution reactions of furan, pyrrole, thiophene & pyridine.

[A]   Five-membered heterocycles

(1)   Furan: (Oxole)

      1.1.1 Synthesis from: a) Mucic acid b) Succinaldehyde

      1.1.2 Physical Properties

      1.1.3 Chemical Properties:

   a) Electrophilic Substitution reactions :

     i) Nitration   ii) Sulphonation   iii) Halogenation

     iv) Friedel-Craft's acylation   v) Gattermann-Koch reaction

     vi) Gomberg reaction   vii) Reaction with n-butyl lithium

   b) Reduction

   c) Diel's-Alder reaction

(2)   Pyrrole : (Azole)

      1.2.1 Synthesis from: a) Acetylene   b) Furan   c) Succinimide

      1.2.2 Physical properties

      1.2.3 Chemical properties:

   a) Electrophilic substitution reactions:

     i) Nitration   ii) Sulphonation   iii) Halogenation   iv) Friedel-craft acylation

     v) Gattermann reaction   vi) Reimer-Tiemann reaction vii) Coupling reaction

   b) Reduction

   c) Ring expansion reaction

   d) Acidic character

(3)   Thiophene (Thiole)

      1.3.1 Synthesis from: a) Acetylene   b) n-butane   c) Sodium Succinate

      1.3.2 Physical properties

      1.3.3 Chemical properties

   a) Electrophilic substitution reactions: i) Nitration   ii) Sulphonation iii) Halogenation

     iv) Friedel-Craft acylation v) Chloromethylation   vi) Mercuration vii) Reaction with n-butyl lithium

   b) Reduction

Unit – II : [B] Six-membered heterocyclic compounds   04 periods

(1) Pyridine: (Azine)

2.1.1   Synthesis from: a) Acetylene   b) β -picoline   c) Pentamethylenediamine hydrochloride

2.1.2   Physical properties

2.1.3   Chemical properties:

     a) Electrophilic Substitution reactions: i) Nitration ii) Sulphonation iii) Bromination

     b) Nucleophilic Substitution reactions: (General mechanism)

     i) Amination ii) Reaction with KOH iii) Reaction with n-butyl lithium

     c) Reduction d) Oxidation e) Basic Character

[C] Condensed heterocyclic compounds:

(1) Indole : (Benzopyrrole) Synthesis by : a) Fischer's Indole Synthesis b) Bischler's Indole Synthesis

(2) Quinoline: (Benzopyridine) Synthesis by: a) Skraup Synthesis b) Friedlander Synthesis

Unit – III: Synthetic drugs and dyes   10 Periods
(1) Synthetic   drugs:
    3.1.1   Introduction: qualities of good drug.
    3.1.2   Classification of drugs based on therapeutic action :-
        a) Functional drugs : (Antipyretics, Analgesics, Anaesthetics,
        Antidiabetics, Anti-inflammatory, sedatives, hypnotics, tranquillizers)
        b) Chemotherapeutic agents : (Antimalarials, Antibacterials, Antifungals, Antituberculars,

    3.1.3   Synthesis and uses of the following drugs:
        a) Paludrine   b) Paracetamol   c) Sulphanilamide   d) Aspirin
        e) Benzocaine   f) Isoniazide   g) Sulphadiazine   h) Tolbutamide
(2) Synthetic dyes:
    3.2.1   Introduction, qualities of good dye
    3.2.2   Classification of dyes based on methods of applications
    3.2.3   Colour and chemical constitution: a) Witt's theory   b) Armstrong's theory
    3.2.4   Synthesis and uses of the following dyes:
    a) Alizarin   d) Methylorange
    b) Diamond black-F   e) Congo-Red
    c) Indigo   f) Orange – II

Unit – IV: Alkaloids, Vitamins and Pesticides   10 Periods
 (1) Alkaloids:
    4.1.1   Introduction, occurrence and extraction.
    4.1.2   Classification and general properties.
    4.1.3   Determination of chemical constitution of alkaloids.
    4.1.4   Constitution of the following alkaloids.
     a) Ephedrine : (Synthesis from : 1-Phenyl propane-1, 2-dione)
     b) Nicotine : (Synthesis from : Nicotinonitrile)
(2) Vitamins :
    4.2.1   Introduction and classification.
    4.2.2   Source, structure and deficiency diseases of the following vitamins :
     a) Vitamin – A, D, E and K
     b) Vitamin – B_1, B_2, B_3, B_6, B_{12} and C
(3) Pesticides :
    4.3.1   Introduction and classification :
        (Insecticides, Herbicides, Fungicides and Rodenticides)
    4.3.2   Synthesis and uses of the following pesticides :
     a) DDT b) BHC c) 2, 4 – D d) Methoxychlor e) Carbaryl d) Monochrotophos

Section – B (Inrganic Chemistry)

Unit–V: Coordination Chemistry (Part-I)   10 Periods
    5.1.1   Introduction: addition or   molecular compound, double salt, coordination compound.
        Comparison of double salt and coordination compound.
    5.1.2   Terminology: complex ion, central metal atom, ligand, types of ligands,
        coordination number and coordination sphere.
    5.1.3   Nomenclature: Rules of nomenclature of coordination compounds, and its applications to
        nomenclature of simple and bridging complex compounds.
    5.1.4   Werner's theory of coordination compound, postulates, applications with reference to
        $CoCl_3.6NH_3$, $CoCl_3.5NH_3$, $CoCl_3.4NH_3$, $CoCl_3.3NH_3$.
    5.1.5   Chelating agents and its classification, difference between metal complex and metal chelate
        complex.
    5.1.6   Isomerism: structural isomerism, ionization, hydrate, linkage, coordination isomerism,
        geometrical isomerism, optical isomerism in 4 and 6 coordination complex.
    5.1.7   E. A. N. of metal complexes.

Unit-VI: The Chemistry of Elements in Medicine   05 Periods

    5.2.1   Introduction
    5.2.2   Chelation Therapy
    5.2.3   Cancer Treatment
    5.2.4   Anti-arthritis drugs.
    5.2.5   Imaging agents.

Reference Books:

1) Organic chemistry by S.M.Mukherji, S.P.Singh, R.P.Kapoor (Vol. II & III)
2) Organic Chemistry by Jagdamba Singh, L.D.S.Yadav (Vol. II & III)
3) A text book of organic chemistry by P.L.Soni, H.M.Chawla
4) A text book of organic chemistry by K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi
5) A text book of organic chemistry by ArunBahl and B.S.Bahl
6) Principles of organic chemistry by M.K.Jain
7) Heterocyclic chemistry synthesis, reactions and mechanism by Raj K. Bansal
8) Reaction mechanism and reagents in organic chemistry by G.R.Chatwal
9) Synthetic organic chemistry by G.R.Chatwal
10) Natural products by O.P.Agarwal (Vol. I & II)
11) Spectroscopy of organic compounds by P.S.Kalsi
12) Elementary organic absorption spectroscopy by Y.R.Sharma
13) Absorption spectroscopy of organic molecules by V.M.Parikh
14) Chemistry of pesticides by K.H.Buchel (T.W.)
15) Polymer Science by V.R.Gowarikar, N.V.Viswanathan and JayadevSreedhar
16) Medical Chemistry by Burger
17) Organic Chemistry by Clayden, Greeves, Warren and Wothers
18) Reactions, Rearrangements and reagents by S.N.Sanyl
19) Synthetic organic chemistry by KamleshBansal
20) A text book of synthetic drugs by O.D.Tyagi, M.Yadav
21) Synthetic drugs by G.R.Chatwal
22) Synthetic dyes by G.R.Chatwal
23) Industrial Chemistry by B.K.Sharma
24) Organic Chemistry by Morrison and Boyd
25) Organic Chemistry by Carey
26) Organic Chemistry by L.G.Wade
27) Inorganic chemistry (5th edition) by Shriver Atkins
28) Organic Chemistry by Cram D.J. and Hammond G.S.
29) Organic Chemistry by I.L.Finar
30) Advanced Organic Chemistry by Jerry March
31) Organic Chemistry by Fieser and Fieser
32) Principles of Inorganic Chemistry by Puri, Sharmaand Kalia.
33) Inorganic Chemistry by Gurudeep Raj, Chatwal.
34) Advanced Inorganic Chemistry Vol. II by Satyaprakash, Tuli, Basu and Madan.
35) Inorganic Chemistry by huheey, Keiter and Keiter.
36) Concise Inorganic Chemistry by J.D. Lee.

Objective(s)	To acquire basic knowledge about Heterocyclic Compounds, Synthetic Drugs and Dyes, Alkaloids, Vitamins, Pesticides, Co-ordination Chemistry and the chemistry of elements in Medicine.
Course Outcome(s)	
CO1	Learn the mechanism of Electrophilic Substitution reaction of Heterocyclic Compounds
CO2	Know the characteristics, Classification and synthesis of Drugs and Dyes
CO3	Explaining theories of Color and chemical constitution of Dyes
CO4	Gathering basic knowledge of Alkaloids, Vitamins and Pesticides
CO5	Understand the basic principle and application of coordination complexes
CO6	Know the application of elements in Medicine

Marks – 50   Periods – 45

Section – A (Physical Chemistry)

Unit –I

1.1.1. Spectroscopy-I :   09 Periods

   a) Brief introduction to molecular Spectroscopy. Width and intensity of spectral lines. Factors affecting width and intensity of spectral line.
   b) Rotational spectra :
   Classification of molecules, Rotational spectra of diatomic molecules.(Rigid rotator model) Moment of inertia, energy levels of rigid rotator, selection rule, spacing between spectral lines of diatomic rigid rotator, isotopic effect. Numerical.
   c) Vibrational Spectra:
   Infrared spectrum, simple harmonic oscillator model, energy levels of simple harmonic oscillator, selection rule, pure vibrational spectrum, intensity, determination of force constant, qualitative relation between force constant and bond energies. Numerical on force constant.

Unit –II

1.1.2. Spectroscopy-I I: 05 Periods
  a) Raman spectra :
   Raman effect,Concept of polarazability, classical and quantum theory of Raman scattering, rotational Raman spectrum of a diatomic molecule. Experimental Raman Spectroscopy.
  b) Electronic spectra :
   Concept of potential energy curve, Franck-Condon Principle, Types of electronic transistions.

Unit III

1.1.3. Chemical Kinetics: 08 Periods
  a) Introduction, Third order reaction with equal concentration of all reactants, characteristics of third order reaction.
  b) Kinetics of complex reaction : i) Opposing reaction ii) Consecutive reaction
  c) Kinetics of Photochemical reaction : i) Hydrogen –chlorine
   reaction ii) Decomposition of HI iii) Dimerization of anthracene.

Unit IV

1.1.4. Distribution Law: 08 Periods
   a) Introduction, Nernst Distribution law, Solubility and distribution law, Limitations of law.
   b) Association and dissociation of solute in solvent.
   c) Henry's law.
   d)Determination of equilibrium constant from distribution coefficient.
   e) Extraction of solvent.
   f) Liquid -liquid chromatography.
   g) Applications of distribution law.
   h) Numerical on distribution law

Section B (Inorganic Chemistry)

Unit V: 09 Periods

1.1.5 Organometallic compounds
      a) Definition
      b) Nomenclature and classification of organometallic compounds
      c) Preparation, properties, bonding and application of alkyl and aryls of Li , Al, Sn, Ti.

Unit VI:

1.1.6 Metal carbonyls   06 Periods
      a. Definition, types 1) MononIuclear carbonyl, characteristics and examples;
                      2) Polynuclear carbonyl, characteristics and examples.
      b. Preparation properties and structure of nickel tetra carbonyl.
      c. Nature of metal carbon bond in metal carbonyl and their evidences.
      d. Structure of $Fe_2(CO)_9$, $Fe_3(CO)_{12}$, $Ir_4(CO)_{12}$, $Co_2(CO)_8$.

6

Reference Books:

1. Physical Chemistry by G. M. Barrow (Tata Mc-Graw Hill publishing Co., Ltd.)
2. Elements of Physical Chemistry by S. Glasstone& D. Lewis (D.vannostrand co. inc.)
3. Physical Chemistry by W. J. Moore (Orient Longman).
4. Principles of Physical Chemistry by S. H. Maron and C. F. Prutton.
5. University General Chemistry by C. N. R. Rao (Mc-Millan).
6. Elements of Physical Chemistry by P. W. Atkins. (Oxford University Press).
7. Physical Chemistry by R. A. Alberty (Wiley Eastern Ltd.).
8. Physical Chemistry through problems by S. K. Dogra, D. Dogra(Wiley Eastern Ltd)
9. Principles of Physical Chemistry by Puri, Sharma and Pathania (Vishal Publication Jallandher, Delhi)
10. Physical Chemistry by A. J. Mee. ELBS & Heinemann Educational Books Ltd.
11. Essentials of Physical Chemistry by ArunBhal, B. S. Bahl and G. D. Tuli. (S. Chand)
12. Chemical Kinetics by K. J. Laidler (Tata Mc-Graw Hill Publishing Co. Ltd).
13. Text Book of Physical Chemistry by Soni-Dharmarha.
14. A Text Book Physical Chemistry by S. Glasstone, (Mac Millan.)
15. Advanced Physical Chemistry by D.N.Bajpai. (S.Chand)
16. Advanced Physical Chemistry by Gurdeep Raj. (Goel publishing house, Meerut).
17. Principles of Inorganic Chemistry by Puri, Sharma and Kalia.
18. Inorganic Chemistry by Gurudeep Raj, Chatwal.
19. Advanced Inorganic Chemistry Vol. II by Satyaprakash, Tuli, Basu and Madan.
20. Inorganic Chemistry by huheey, Keiter and Keiter.
21. Inorganic Chemistry by J.D. Lee.
22. Instrumental methods of chemical analysis-Chatwal Anand
23. Instrumental methods of chemical analysis-B. K. Sharma.

Objective(s)	To enable the students to acquire basic knowledge in Spectroscopy, Chemical Kinetics, Distribution law, Organometallic Compunds and Metal Carbonyls.
Course Outcome(s)	
CO1	Understand the concepts of molecular Spectroscopy and its applications
CO2	Analyze Rotational, Vibrational and Raman, Spectra
CO3	Interpret the theoretical and experimental methods of chemical kinetics
CO4	Know the theory and application of Distribution law
CO5	Explain the Nomenclature, classification and application of Organometallic Compounds
CO6	Illustrate the classification and application of Metal Carbonyls

Paper No. : P-XIII
DSEC-V (Section-B)
(B2)
Physical + Inorganic Chemistry

Periods: 45   Mark: 50

Unit I: <u>SOLTIONS OF NON ELECTROLYTES-I</u>   07 Periods
    1.1. Solutions of liquids in liquids-(only   binary liquids)
    1.2. Raoult's law.
    1.3. Vapour pressure of ideal solutions.
    1.4. Total vapour pressure in terms of mole fraction.
    1.5. Activity of a component in an ideal solutions.
    1.6. Chemical potential of an ideal and non ideal solution.

Unit II: <u>SOLTIONS OF NON ELECTROLYTES-II</u>   07 Periods
    1.1 Gibb's Duhem-Margules equation and ideal solution.
    1.2 Temperature dependence of vapour pressure of solution.
    1.3 Thermodynamics of ideal solution.
    1.4 Free energy change of mixing, enthalpy change of mixing, entropy change of mixing,
       Volume change of mixing.

Unit III: <u>COLLIGATIVE PROPERTIES :</u>   06 Periods
    1.1   Osmotic pressure
    1.2   Relative lowering of vapor pressure
    1.3   Elevation in boiling point.
    1.4   Depression in freezing points and relation of these properties with molecular weight.
    1.5   Numericals on depression in freezing point and Elevation in boiling point.

Unit IV: <u>POLAROGRAPHY:</u>   10 Periods
    1.1   Principle and theory of poloragraphy.
    1.2   Ilkovic equation and its significance
    1.3   Half wave potential and its determination.
    1.4   Construction and working of dropping mercury electrode.
    1.5   Advantages and disadvantages and DME.
    1.6   Applications of polarography : Estimation of organic and inorganic substances, analysis of mixture
        of compounds, determination of diffusion coefficient, determination of stability constant of metal –
        ion complex.

Section B (Inorganic Chemistry)

Unit IV: <u>Isopoly and Hetéropoly acids and anions.</u>   10 Periods

    1.1   Introduction.
    1.2   Polymerisation of CrO_4^{-2}. Anion.
    1.3   Isopoly anions and isopoly acids of $Mo6^+$ and $W6^+$
    1.4   Hetéopoly anions and Hetéopoly acids.
    1.5   1:12(Tetrahedral Heteroatom) Polyanions.
    1.6   2:18(Tetrahedral Heteroatom) Polyanions.
    1.7   1:6 (Octahedral Heteroatom) Polyanions.
    1.8   1:12(Icosahedral Heteroatom) Polyanions Important Reaction of Isopoly anions
        and   Heteropolyanions.

Unit V: <u>Concept of Isolobality and Isolobality analogies.</u>   05 Periods

    1.1 Introduction.
    1.2 Isolobality organometallic fragments and main group fragments.
    1.3 The Isolobality fragments, upon polymerization.
    1.4 The structure of $Ir (CO)_{12}$ and P_4 fragments.
    1.5 The structure of $Os(CO)_4$ and CH_2 fragments

Reference Books:
1) Principles of physical chemistry –Puri ,Sharma, pathania (VPC) 45th Edition.
2) Elements of physical chemistry –P.W.Atkins(oxford University Press)
3) Text book of physical chemistry –Soni, Darmarha
4) Advanced physical chemistry –Gurudeep Raj (Goel Publishing House)
5) Instrumental methods of chemical analysis – Chatwal Anand
6) Instrumental methods of chemical analysis – B.K.Sharma.
7) Principles of Inorganic Chemistry. Puri,sharma and Kalia.

Objective(s)	Creating awareness among students about the importance of Solution of Non Electrolytes, Colligative Properties, Polarography, Isopoly and Heteropoly acids and Anions, Concept of Isolobality and Isolobality analogies is the prime aim of the course.
Course Outcome(s)	
CO1	Know the importance of Solutions of Non Electrolytes
CO2	Understand the basic principle of Colligative properties
CO3	Study the theory and application of Polarography
CO4	Analyze the application of Isopoly and Heteropoly acids and anions
CO5	Introduction and application of Isolobality and Isolobality analogies

Periods – 120	Laboratory Course – IV (CH-305)	Mark 50

Note : At least Sixteen experiments to be completed : (Twelve from Section A and four from Section B)

Section – A (Organic Chemistry)

01. Organic qualitative analysis: (Seven mixtures)

Separation of organic binary mixture containing two solid components (Using $NaHCO_3$, NaOH and HCl) and analysis of (both/one) components with preparation one derivative of each.
At least one mixture from each of the following types should be given:

a) Acid + Phenol   b) Acid + Base
c) Acid + Neutral   d) Phenol + Base
e) Phenol + Neutral   f) Base + Neutral
g) Neutral+Neutral

Following compounds should be used for preparation of mixtures:

A] Acids : Salicylic acid, Phenyl acetic acid, o-Chlorobenzoic acid, Succinic acid, phthalic acid, cinnamic acid, Benzoic acid and m-cholorobenzoic acid.

B] Phenols :α -naphthol, β -naphthol, resorcinol, p-nitro phenol, m-nitro phenol and hydroquinone, C]

Bases : o-nitroaniline, m-nitroaniline, p-nitroaniline, p-anisidine, diphenylamine, p-toluidine and p-chloroaniline

D] Neutrals : Acetanilide, Anthracene, Benzamide, Benzophenone, Biphenyl, Naphthalene, m-Dinitrobenzene, p-Dichloro benzene and Thiourea.

02. Organic Preparation : (Any five)

[Weight of crude product, crude % yield, recrystallisation of crude product and its melting point expected]

a) Acetylation : Preparation of Aspirin from salicylic acid

OR

Preparation of β -naphthyl acetate from β -naphthol

b) Electrophilic substitution :

Preparation of p-nitroacetanilide from acetanilide (Nitration)

Preparation of 2, 4, 6 – Tribromoaniline from aniline (Bromination)

OR

Preparation of p-bromo acetanilide from acetanilide (Bromination)

c) Diazotisation : Preparation of Methylorange from sulphanilic acid (Coupling)

OR

e) Osazone formation : Preparation of Glucosazone from Glucose

f) Amide Formation : Preparation of Benzamide from benzoic acid

g) Hydrolysis : Preparation of p-nitroaniline from p-nitroacetanilide

h) Reduction : Preparation of m-nitroaniline from m-Dinitrobenzene

i) Oxidation : Preparation of Benzoic acid from Toluene

j) Polymerisation : Preparation of phenol formaldehyde resin

3. Only demonstrations :

a) Extraction of clove oil from crushed cloves by steam distillation.

b) Separation of a mixture of methyl orange and methylene blue by column chromatography

c) Separation of a mixture of amino acids by ascending paper chromatography.

d) Separation of various pigments in the extract of spinach leaves by TLC.

Section – B (Inorganic Chemistry)

1. Gravimetric estimation of Iron as Fe_2O_3.
2. Gravimetric estimation of Ba as $BaSO_4$
3. Gravimetric estimation of Nickel as $Ni(DMG)_2$.
4. Gravimetric estimation of Aluminium as $Al(Oxinate)_3$.
5. Gravimetric estimation of zinc as ZnO
6. Gravimetric estimation of Chloride as AgCl

Swami Ramanand Teerth Marathwada University Nanded
B.Sc. III Chemistry Practical Paper (Elective)
Practical
Physical + Inorganic Chemistry (XVII)

Section A : Physical Chemistry   Marks 50

(Instrumental & Non Instrumental any 12)

1) To study the variation of Viscosity of Liquid Nitrobenzene with temperature.
2) To study the effect of surfactant on surface of water by using Stalagnometer.
3) Determination of solubility of an inorganic salt in water at different temperature and hence determine the solubility curve.
4) Determination of partition coefficient of iodine between water and CCl_4.
5) To investigate the absorption of acetic acid from aqueous solution by activated Charcoal and examine the validity of Freundlich and Langmuir's isotherm.
6) Investigate the reaction kinetics between potassium persulphate and potassium iodide by Colorimetric measurement.
7) Determine the relative strength of given two acids by polarimetric measurement.
8) Determine the half wave potential of metal ion by polarography.
9) To estimate the amount of Cd^{++} ion in an unknown solution by polarography.
10) To plot the current voltage curve for.05 M sulphuric acid using platinum electrode
11) To study the polarographic waves produced by dissolved oxygen.
12) Determination of formula and stability constant of metal ion complex by polorography.
13) Determine the acid and basic dissociation constant of amino acid and hence determine isoelectric point of acid conductometrically.
14) To determine the solubility of sparingly soluble salt at different temperature. Section A : Inorganic Chemistry

Separation and estimation of any one metal ion from binary mixture. (any 04)

1. Ni^{++} and Cu^{++}
2. Cu^{++} and Fe^{++}
3. Ba^{++} and Mg^{++}
4. Fe^{++} and Zn^{++}
05. Cu^{++} and Ba^{++}

Periods – 45   Skill Enhancement Course (A)   02 Credits

Computer Application in Chemistry

1. Use of Softwares: 15 Periods
   ISIS draw, Chem draw and Chem sketch.
    For drawing the structures, elemental (CHN) analysis, determination of molecular mass, IUPAC name and prediction of spectral data NMR and MASS.
2. Biological activity and Toxicity evaluation of organic compounds using software: 15 Periods
   Evaluation of toxicity risk assessment of organic compounds using online software.
   Prediction of different biological activities using online software.
3. Use of Excel in Chemistry: 15 Periods
   a) Functions and formulas : Sum, mean, average, power etc. Understanding formulas, the cell and the formula bar, the formula in action, copying formulas, copying and pasting a formula and complex formula.
   b) Excel chart and data analysis:
      Visual representation of the data through excel graph, plotting and X-Y data set, create calibration curve, format the view graph, add trendline, equation of line and R-square value,determine the slope of a line, scale adjustment, examples, renaming the chart and worksheet, common charting errors, add a chart title.Add regrations and equation to graph, regration analysis, run the regration and interpreting regration results.

OR
APPLIED ANALYTICAL CHEMISTRY

Unit-I Introduction to Quality Assurance and Quality Control: 15 Periods
   1.1 Definitions of the terms: Quality policy, Quality Management, Quality system, Quality Control, Quality Assurance and Quality.
   1.2 Validation of the Method: Validation of instrument, Validation of analytical method.
Unit – II Analysis of Soil: 10 Periods
   Methods of soil sampling, Determination of: i) Bulk density   (ii) Specific gravity
   (iii) Water holding capacity   (iv) Moisture content   (v) Loss on ignition
   (vi) Soil pH.
   Chemical Analysis of Soil: Determination of   i) Total nitrogen   (ii) Nitrate Nitrogen
   (iii) Organic matter.
   Determination of potassium and sodium.
Unit – III Analysis of fuels: 10 Periods
   Definition and classification of fuels, solid fuels, liquid fuels and gaseous fuels. Calorific value of fuels, Gross and Net calorific value, Determination of calorific value by Bomb Calorimeter.

Unit – IV   10 Periods
   1. Analysis of soil:
      (i) Determination of pH of soil.
      (ii) Total soluble salt
      (iii) Estimation of calcium, magnesium, phosphate, nitrate

Reference Books:
1. An introduction to analytical chemistry, S. A. Iqbal, M. Satake, Y. Mido and M. S. Shethi.

2. College analytical chemistry: Joshi, Baliga and Shetty, Himalaya Publishing house.

3. Qualitative analysis: Day and Underwood.
4. Qualitative inorganic analysis: A. I. Vogel.
5. Principles of analytical chemistry: Pandit and Soman.
6. Anayltical chemistry, G. D. Christian, J. Wiley eastern press Ltd.
7. Analytical chemistry: Alka Gupta.
8. Basic concepts of analytical chemistry: S. M. Khopkar.
9. Advanced practical organic chemistry: Vishnoi.
10. list of websites for software and book for UG/PG syllabus:
    I) http://www.acdlabs.com/resources/freeware/chemsketch/

III) Excel for Chemistry Excel in analytical chemistry by Robert de Levie – Book
http://chemed.chem.purdue.edu/genchem/lab/datareports/excel/excel.html

Objective(s)	To train the students for the use of Software, Excel ,analysis of Soil and Fuel
Course Outcome(s)	
CO1	Able to know the use of software and Excel in Chemistry
CO2	Grasp the concept of Quality Assurance and Quality Control
CO3	Illustrate the Physical and Chemical analysis of Soil and fuel
CO4	Be able to evaluate Biological activity and toxicity of oganic compounds using softwares

B. Sc. Third Year: Semester-VI
(DSEC-VI, Section A)
(A1)
Organic & Inorganic Chemistry
Paper-XIV

Marks – 50   Periods – 45

Section – A (Organic Chemistry)

Unit – I Spectroscopic Methods: 08 Periods

i) Introduction, Electromagnetic radiations; Characteristics of EMR :- a) Wave length b) Wave number
c) Frequency d) Energy of EMR
ii) Electromagnetic spectrum; Meaning of Spectroscopy, types of Spectroscopy and advantages
of Spectroscopic methods.
(A) U. V. Spectroscopy:
1.1.1 Introduction.
1.1.2 Absorption of U.V.radiations : Beer-Lambert Law and Molar Absorption.
1.1.3 Types of Electronic Transitions.
1.1.4 Terms used in U.V.Spectroscopy : Chromophore, Auxochrome,Bathochromic.
Shift, Hypsochromic Shift, Hypochromic and Hyperchromic effects.
1.1.5 Effect of conjugation on position of U.V. and Visible bands.
1.1.6 Calculation of λ max by Woodward – Fieser rules for conjugated dienes and enones.
1.1.7 Spectral problems based on U.V.
(B) I.R. Spectroscopy:
1.2.1 Introduction
1.2.2 Principle of IR Spectroscopy.
1.2.3 Fundamental Modes and types of Vibrations. Hooke's Law.
1.2.4 Conditions for absorption of IR-radiations.
1.2.5 IR Spectrum : Functional group region and Fingerprint region.
1.2.6 Characteristic absorption of various functional groups.
1.2.7 Interpretation of IR spectra of following organic compounds :
a) Ethane   b) Ethene   c) Ethyne   d) Benzene   e) 1-propanol   f) 2-propanol
g) t-butyl alcohol h) Phenol   i) Acetone   j) Acetophenone   k) Acetaldehyde
l) Benzaldehyde   m) Benzoic acid   n) Methylbenzoate   o) Phenylcyanide

Unit – II:

(A) NMR – Spectroscopy: 08 Periods
2.1 Introduction
2.2 Principle of NMR Spectroscopy
2.3 Magnetic and non-magnetic nuclei
2.4 PMR-Spectroscopy :- Spinning nuclei, magnetic moment and magnetic field, precessional
motion, energy states for proton in magnetic field (Orientations) and nuclear resonance.
2.5 Equivalent and non-equivalent protons
2.6 Number of absorption singals in the following compounds :
a) Acetone   b) Cyclobutane   c) Methanol   d) Ethylbenzene   e) Ethyamine
f) Mesitylene   g) Diethylether
2.7 Shielding and deshielding effects : (Example of Acetylene and Benzene)
2.8 Chemical shift, measurement of chemical shift by delta scale and tau scale
2.9 TMS as reference, Advantages of TMS.
2.10 Peak area (integration) & spin-spin Splitting (n+1) rule
2.11 Definition of coupling constant : (J-values) of first order coupling
2.12 Interpretation of PMR Spectra of following compounds : a) Ethyl bromide   b) Ethyl alcohol
c) Acetaldehyde d) 1,1,2-tribromo ethane e) Ethyl acetate f) Toluene
g) Acetophenone h) Ethylamine   i) Acetic acid   j) Benzoic acid

(B) Problems pertaining to the structure elucidation of simple organic compounds
using PMR- Spectrosopic data (Supporting IR and UV data to be given)   04 Periods
ORGANIC COMPOUNDS :

a) n-propyl alcohol	b) Iso-Propyl alcohol	c) ter.butyl alcohol	d) Acetic acid
e) Ethylamine	f) Ethyl cyanide	g) Ethyl methyl ketone	h) Ethyl acetate
i) Ethyl benzene	j) Phenyl acetaldehyde	k) Phenol	l) Ethyl methyl ether
m) Ethylene glycol	n) Propionamide	o) Propionaldehyde	

Unit – III: Amino acids and Peptides   06 Periods

(A) Amino Acids:

3.1.1 Introduction & classification (acidic, basic and netural).
3.1.2 Dipolar nature of amino acids : Zwitter ion, iso electric point.
3.1.3 Methods of Preparation of α -amino acids :
a) From α -halo acids   b) By Gabriel's Phthalimide Synthesis   c) By Strecker's Synthesis
3.1.4 Chemical Properties of α -amino acids :
a) Reactions due to –NH_2 group   b) Reactions due to –COOH group
c) Reactions due to both –NH_2 and –COOH groups
3.1.5 Reagents used for identification of amino acids

(B) Peptides:

3.2.1 Introduction, classification and nomenclature
3.2.2 N-terminus and c-terminus protecting agents
3.2.3 Synthesis of peptides from amino acids : (di- & tri-)
a) By protecting – NH_2 group (Using carbobenzoxyl chloride)
b) By protecting – COOH group (Using benzyl alcohol)
3.2.4 Use of DCC (Dicyclohexyl Carbodiimide) as reagent for peptide bond formation

Unit – IV: Molecular Rearrangements 04 Periods 4.2.1 Introduction, classification of rearrangements: On the basis of migratory group (a)Electrophilic rearrangement (ex. Pinacole – Pinacolone rearrangement)

(b) Nucleophilic rearrangement (ex. Favroskii rearrangement)
(c)Free Radical rearrangement (ex. PhotoFries rearrangement)
(d)Aromatic rearrangement (ex Stevens rearrangement)

Section – B (Inorganic Chemistry)

Unit-V: Coordination theory (Part-II)   10 Periods

5.1.1) Valence bond theory of coordination compounds: Postulates, inner orbital and outer orbital complexes of coordination number 4 and 6. Limitations of VBT.
5.1.2) Crystal field theory: Shape of d-orbital's, postulates, splitting of d-orbital in octahedral complexes, tetrahedral complexes, tetragonal and square planarcomplex.
Definition of CFSE, calculations of CFSE for octahedral and tetrahedralcomplexes.
5.1.3) Factors affecting 10 Dq or magnitude of crystal field splitting : Nature of ligand, oxidation state of metal ion, size of d orbital, geometry of complexes.
5.1.4) Applications of CFT.
5.1.5) John teller effect in octahedral complexes of Cu++.
5.1.6) Limitations of CFT.

Unit- VI: Electronic Spectra of Transition Metal complexes: 05 Periods

5.2.1) Types of electronic transition
5.2.2) Selection rule for d-d transistion
5.2.3) Spectroscopic ground state and spectro-chemical series
5.2.4) Orgel energy level diagram for d^1 and d^9 states
5.2.5) Discussion of electronic spectrum of [Ti $(H_2O)_6]^{3+}$ complex ion

Reference Books:
1) Organic chemistry by S.M.Mukherji, S.P.Singh, R.P.Kapoor (Vol. II & III)

2) Organic Chemistry by Jagdamba Singh, L.D.S.Yadav (Vol. II & III)

3) A text book of organic chemistry by P.L.Soni, H.M.Chawla

4) A text book of organic chemistry by K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi

5) A text book of organic chemistry by Arun Bahl and B.S.Bahl

6) Principles of organic chemistry by M.K.Jain

7) Heterocyclic chemistry synthesis, reactions and mechanism by Raj K. Bansal

8) Reaction mechanism and reagents in organic chemistry by G.R.Chatwal

9) Synthetic organic chemistry by G.R.Chatwal

10) Natural products by O.P.Agarwal (Vol. I & II)

11) Spectroscopy of organic compounds by P.S.Kalsi

12) Elementary organic absorption spectroscopy by Y.R.Sharma

13) Absorption spectroscopy of organic molecules by V.M.Parikh

14) Chemistry of pesticides by K.H.Buchel (T.W.)

15) Polymer Science by V.R.Gowarikar, N.V.Viswanathan and Jayadev Sreedhar

16) Medical Chemistry by Burger

17) Organic Chemistry by Clayden, Greeves, Warren and Wothers

18) Reactions, Rearrangements and reagents by S.N.Sanyl

19) Synthetic organic chemistry by Kamlesh Bansal

20) A text book of synthetic drugs by O.D.Tyagi, M.Yadav

21) Synthetic drugs by G.R.Chatwal

22) Synthetic dyes by G.R.Chatwal

23) Industrial Chemistry by B.K.Sharma

24) Organic Chemistry by Morrison and Boyd

25) Organic Chemistry by Carey

26) Organic Chemistry by L.G.Wade

27) Organic Chemistry by Cram D.J. and Hammond G.S.

28) Organic Chemistry by I.L.Finar

29) Advanced Organic Chemistry by Jerry March

30) Organic Chemistry by Fieser and Fieser

31) Principles of Inorganic Chemistry by Puri, Sharmaand Kalia.

32) Inorganic Chemistry by Gurudeep Raj, Chatwal.

33) Advanced Inorganic Chemistry Vol. II by Satyaprakash, Tuli, Basu and Madan.

34) Inorganic Chemistry by huheey, Keiter and Keiter.

35) Concise Inorganic Chemistry by J.D. Lee.

Objective(s)	To familiarize the students with the concept and principle of Spectroscopy, Amino Acids , Peptides, Molecular Rearranements, Co-ordination theory and Electronic Spectra of transition Metal Complexes
Course Outcome(s)	
CO1	To learn the basic principle and terms used in UV, IR & NMR Spectroscopy
CO2	Acquire the fundamental knowledge of classification and Synthesis of Amino Acid and Peptides
CO3	Describe the types of Rearrangement
CO4	Postulates and limitations of VBT and CFT
CO5	Calculation of CFSE for Tetrahedral and Octahedral Complexes
CO6	Explain the types of electronic transition and selection rule
CO7	Apply spectroscopic techniques in analyzing the structure of simple organic Molecules

Periods: 45

1. **Sugar and Alcohol Industry**   09
   1.1   Manufacturing of raw cane sugar.
   1.2   Refining of raw sugar.
   1.3   White sugar.
   1.4   Byproducts of sugar industry.
   1.5   Manufacturing of ethyl alcohol from molasses.
   1.6   Rectified spirit, denatured spirit absolute alcohol and powdered alcohol.
   1.7   Byproducts of alcohol industry.
2. **Textile Chemistry**   08
   2.1.1   Introduction and classification of fibers
   2.1.2   Sizing:
        a)   Object of sizing, sizing ingredients and their functions.
        b)   General idea of properties of starch, softness, synthetic adhesives.
   2.1.3   Bleaching:
        a)   Brief study of outline of the process of bleaching cotton and synthetic material.
        b)   General idea of processes like singeing, desizing, scouring.
   2.1.4   Dyeing: Study of dyeing, dyeing of cellusosic material and synthetic fibres with dyes like direct, vat, reactive and dispersed dyes.

3. **Agro chemistry**   07
   3.1.1   General idea of agrochemicals including pyrethroides.
   3.1.2   Synthesis and uses of following agro-chemicals.
   a)   Indole-3-acetic acid
   b)   Ethophan
   c)   Monochrotophos.
   3.1.3   Fertilizers: Introduction and advantages of nitrogenous fertilizers, phosphatic fertilizers, potassic fertilizer and complex fertilizers.

4. **Green Chemistry**   06
   4.1.1   Introduction: Twelve principles of green chemistry.
   4.1.2   Zeolites: Friedel-Craft alkylation and acylation, oxidation of benzene to phenol and benzoquinone, reduction of benzoquinone to hydroquinone.
   4.1.3   Biocatalytic reactions: hydroxylation and oxidation using enzymes.
   4.1.4   Introduction to microwave assisted reactions.

Section (B) Inorganic Chemistry

5. **Inroganic Polymers**   09
   5.1.1   Introduction
   5.1.2   Basic concepts and definition
            i) Polymer   ii) Monomer   iii) Polymerization   iv) copolymer
            v) Degree of polymerization
   5.1.3   Classification of polymers on basis of :   i) Origin   ii) Composition iii) Properties
            iv) Uses
   51.4   Comparison between organic and inorganic polymers
   5.1.5   Polymer backbone
   5.1.6   Homoatomic polymers containing-phosphorus
   5.1.7   Heteroatomic polymers i) Silicones   ii) Phosphonitrilic compounds
            iii) Fluorocarbons.
6. **Nanotechnology**   06
   6.1.1   Introduction.
   6.1.2   Properties of nanoparticles.
   6.1.3   Application of nanoparticles.

Periods: 45

7. Sugar and Alcohol Industry   09
    7.1   Manufacturing of raw cane sugar.
    7.2   Refining of raw sugar.
    7.3   White sugar.
    7.4   Byproducts of sugar industry.
    7.5   Manufacturing of ethyl alcohol from molasses.
    7.6   Rectified spirit, denatured spirit absolute alcohol and powdered alcohol.
    7.7   Byproducts of alcohol industry.

8. Textile Chemistry   08
    8.1.1   Introduction and classification of fibers
    8.1.2   Sizing:
      c)   Object of sizing, sizing ingredients and their functions.
      d)   General idea of properties of starch, softness, synthetic adhesives.
    8.1.3   Bleaching:
      c)   Brief study of outline of the process of bleaching cotton and synthetic material.
      d)   General idea of processes like singeing, desizing, scouring.
    8.1.4   Dyeing: Study of dyeing, dyeing of cellusosic material and synthetic fibres with dyes like direct, vat, reactive and dispersed dyes.

9. Agro chemistry   07
    9.1.1   General idea of agrochemicals including pyrethroides.
    9.1.2   Synthesis and uses of following agro-chemicals.
      d)   Indole-3-acetic acid
      e)   Ethophan
      f)   Monochrotophos.
    9.1.3   Fertilizers: Introduction and advantages of nitrogenous fertilizers, phosphatic fertilizers, potassic fertilizer and complex fertilizers.

10. Green Chemistry   06
    10.1.1   Introduction: Twelve principles of green chemistry.
    10.1.2   Zeolites: Friedel-Craft alkylation and acylation, oxidation of benzene to phenol and benzoquinone, reduction of benzoquinone to hydroquinone.
    10.1.3   Biocatalytic reactions: hydroxylation and oxidation using enzymes.
    10.1.4   Introduction to microwave assisted reactions.

Section (B) Inorganic Chemistry

11. Inroganic Polymers   09
    11.1.1   Introduction
    11.1.2   Basic concepts and definition
      i) Polymer   ii) Monomer   iii) Polymerization   iv) copolymer
      v) Degree of polymerization
    5.1.3   Classification of polymers on basis of :   i) Origin   ii) Composition iii) Properties
      iv) Uses
    51.4   Comparison between organic and inorganic polymers
    5.1.5   Polymer backbone
    5.1.6   Homoatomic polymers containing-phosphorus
    5.1.7   Heteroatomic polymers i) Silicones   ii) Phosphonitrilic compounds
      iii) Fluorocarbons.

12. Nanotechnology   06
    12.1.1   Introduction.
    12.1.2   Properties of nanoparticles.
    12.1.3   Application of nanoparticles.

Reference books:

1. Basic concept of analytical chemistry by S. M. Khopkar, Wiley estern ltd. Bombay.
2. Industrial chemistry by R. K. Das, Asia publication Mumbai.
3. Rigegels hand book of industrial chemistry by J. A. Kent, Van. Nostrard, London.
4. Chemistry process industries by shreve and Brinic- Ostim, Magraw Hill New York.
5. Biotechnology and applied microbiology by Alani and Moo-young.
6. Immobilize Biocatalysis by Joy Wleser
7. Introduction to polymer chemistry by Reymano B. Seymour.
8. Advances in green chemistry: chemical synthesis using microwave irradiation by R. S. Varma.
9. Green chemistry: Environment friendly alternatives: by Rashmi Sanghi and M. M. shrivastav (Eds) © 2003 Narosa publishing house New Delhi India.
10. Textile Science by J. T. Marsh
11. Book of textile by A. J. Hall.
12. Sizing by D. B. Ajagaonakar
13. Bleaching by V. A. Sheni.
14. Dyeing by V. A. Sheni.
15. Chemicals for crop improvement and pest management by Green, Hartly and Weste
16. Chemistry of pesticides by K. H. Buchel (T.W.)
17. Principles of inorganic chemistry by Puri, Sharma and Kalia.
18. Text Book of inorganic chemistry by K. N. Upadhyanaya Vikas publishing House New Delhi.
19. Progress in inorganic polymer by Laport and Leigh
20. Nanomaterials and nanostructures by Laura Castle, April Feter Dominant publisher 2007
21. Nanoscale materials in chemistry by K. J. Kalbunde (Wiley intersciences)
22. Introduction to Nanoscience and nanotechnology by K. K. Chatopadhya. A. N. Banerjee, PHI learning Pvt. Ltd., New Delhi.
23. Introduction to Nanotechnology by Charles P. Poole (Jr.), Frank J. Owen & Wiley students Etd., 2008.
24. Nanotechnology: future technology with futures, BPB publication, New Delhi.

Objective(s)	The aim of this paper is to expose the students with the knowledge in Sugar and Alcohol Industry, Textile Chemistry, Agro Chemistry, Green Chemistry, Inorganic Polymers and Nanotechnology
Course Outcome(s)	
CO1	Understand the Basic concept of Sugar and Alcohol Industry
CO2	Synthesis and uses of Agro Chemicals
CO3	To enable the students to understand the classification of Fibers
CO4	To learn the basic concept and classification of Inorganic Polymers
CO5	Able to understand the theory of green chemistry
CO6	Ability to apply green chemical laboratory techniques
CO7	To stimulate the learner in understanding the basic concepts and applications of nanotechnology

Practical paper elective (Semester- Vth & VIth)
DSECP-IV
DSEC V & VIth (Section-A)
Organic + Inorganic Chemistry
Paper No. : P-XVI

Periods – 120	Laboratory Course – IV (CH-305)	Mark 50

Note : At least Sixteen experiments to be completed : (Twelve from Section A and four from Section B)

Section – A (Organic Chemistry)

01. Organic qualitative analysis: (Seven mixtures)

Separation of organic binary mixture containing two solid components (Using Water NaHCO$_3$, NaOH and HCl) and analysis single components with preparation of derivative.

02. Synthesis of organic compounds : (Any four)

[Weight and percent yield of crude product , recrystallisation of crude product and its melting point expected]

    a)   Benzoylation of Phenol   b)   Benzoylation of Aniline

    c)   Preparation of o-nitro aniline from M-dinitro benzene from acetanilide (Partial Reduction)

    d)   Preparation of iodoform from ethyl alcohol   e)   Preparation of iodoform from Acetone

    f)   Preparation of Benzamide from benzoic acid

3.   Only demonstrations :

    a)   Separation of fluorescein and methylene blue
    b)   Separation of leaf pigments from spinach leaves
    c)   Resolution of racemic mixture of (+) mandelic acid

Section – B (Inorganic Chemistry)

    1.   Preparation of sodium trioxalator ferrate (III), Na$_3$[Fe(C$_2$O$_4$)$_3$].
    2.   Preparation of cis-and trans-bisoxalato diaqua chromate (III) ion.
    3.   Preparation of copper tetraammine complex. [(Cu(NH$_3$)$_4$]SO$_4$.

Reference Books :
1) Practical organic chemistry by A.I.Vogel
2) Advanced practical organic chemistry by O.P.Agarwal
3) Advanced practical organic chemistry by N.K.Vishnoi
4) Hand book of organic qualitative analysis by H.T.Clarke
5) Experimental practical organic chemistry by P.R.Singh, D.S.Gupta
6) A laboratory Hand book of organic qualitative analysis by V.S.Kulkarni
7) Hand book of organic qualitative analysis by F.G.Mann, B.C.Sunders
8) A text book of Practical Chemistry for B.Sc. by V.V. Nadkarni, A.N. Kothare and Y.V. Lawande.
9) Advanced practical Inorganic Chemistry by O.P. Agarwal.

Objective(s)	To train the students in laboratory works
Course Outcome(s) :- By considering the scope of chemistry in different pharmaceuticals to make trained man power in synthetic chemistry and analysis .	

Marks – 50   Periods – 45

Section – A (Physical Chemistry)

Unit –I Electrochemistry: 12 Periods

i)   Introduction, concept of electrode potential , single electrode potential, standard electrode potential , oxidization and reduction potential

ii)   Electrochemical cells , electrolytic and Galvanic cells , reversible and irreversible cells, conventional representation of electrochemical cells.

iii)   EMF of cell , SHE.

iv)   Reference electrodes , indicator electrodes , calomel electrodes,

v)   Relation between EMF and ΔG , ΔH , ΔS

vi)   Nernst equation, application of Nernst equation to oxidation half cell and reduction half cell.

vii)   Electrolyte concentration cell, Concentration cell with and without transport.

viii) Application of EMF measurement in determination of pH by using i) Quinhydrone electrode b) Glass electrode.

ix)   Numerical on Nernst Equation.

Unit II : Thermodynamics I :   07 Periods

a)   Introduction

b)   Work function and free energy function(G): Helmholtz Function (A) or work function, Change of work function (A) at constant temperature , Gibbs' free energy function, relation between G and A, change of G at constant temperature, variation of work function with temperature and volume, variation of free energy function with temperature and pressure. The Gibb's-Helmholtz equation.

c)   The Nernst heat theorem. Third law of thermodynamics.

d)   Thermodynamics of open system: partial molar properties; concept of chemical potential, partial molar free energy. Gibb's-Duhem equation. Variation of chemical potential with temperature and pressure. Chemical potential in case of a system of ideal gases.

Unit-III: Thermodynamics II: 05 Periods

a)   Thermodynamic derivation of law of mass action. Relation between ΔG^0 and K_P, relation between K_P, K_C AND K_X.

b)   Vant-Hoff's reaction isochore. Integrated form of Vant-Hoff's equation.

c)   Clausius-Clapeyron equation and its applications.

d)   Numerical on Integrated form of Vant-Hoff's equation.

Unit-IV: Magneto chemistry and magnetic properties of substance: 06 Periods

a)   Introduction, Magnetic susceptibility, Specific susceptibility, unit of measurement.

b)   Types of substances: Paramagnetic, diamagnetic and ferromagnetic.

c)   Effect of temperature on Paramagnetic, diamagnetic, ferromagnetic substances.

d)   Measurement of magnetic susceptibility: Gouy's method.

Section B (Inorganic Chemistry)

Unit IV : Bioinorganic Chemistry   05 Periods
    5.1.1)   Essential and trace elements in biological processes
    5.1.2)   Metalloporphyrin with special reference to hemoglobin and myoglobin
    5.1.3)   Biological role of alkali and alkaline earth metal ions
    5.1.4)   Nitrogen fixation
Unit V : Metal cluster   10 Periods
    5.2.1)   Boranes
    5.2.2)   Carboranes
    5.2.3)   Metalloboranes
    5.2.4)   Metallocarboranes

Reference Books:

1. Physical Chemistry by G. M. Barrow (Tata Mc-Graw Hill publishing Co., Ltd.)

2. Elements of Physical Chemistry by S. Glasstone & D. Lewis (D.van nostrand co. inc.)

3. Physical Chemistry by W. J. Moore (Orient Longman).

4. Principles of Physical Chemistry by S. H. Maron and C. F. Prutton.

5. University General Chemistry by C. N. R. Rao (Mc-Millan).

6. Elements of Physical Chemistry by P. W. Atkins. (Oxford University Press).

7. Physical Chemistry by R. A. Alberty (Wiley Eastern Ltd.).

8. Physical Chemistry through problems by S. K. Dogra, D. Dogra(Wiley Eastern Ltd)

9. Principles of Physical Chemistry by Puri, Sharma and Pathania (Vishal Publication Jallandher, Delhi)

10. Physical Chemistry by A. J. Mee. ELBS & Heinemann Educational Books Ltd.

11. Essentials of Physical Chemistry by Arun Bhal, B. S. Bahl and G. D. Tuli. (S. Chand)

12. Kinetics by K. J. Laidler (Tata Mc-Graw Hill Publishing Co. Ltd).

13. Text Book of Physical Chemistry by Soni-Dharmarha.

14. A Text Book Physical Chemistry by S. Glasstone, (Mac Millan.)

15. Advanced Physical Chemistry by D.N.Bajpai. (S.Chand)

16. Advanced Physical Chemistry by Gurdeep Raj. (Goel publishing house, Meerut).

17. Principles of Inorganic Chemistry by Puri, Sharma and Kalia.

18. Inorganic Chemistry by Gurudeep Raj, Chatwal.

19. Advanced Inorganic Chemistry Vol. II by Satyaprakash, Tuli, Basu and Madan.

20. Inorganic Chemistry by huheey, Keiter and Keiter.

21. Concise Inorganic Chemistry by J.D. Lee.

Objective(s)	To familiarize the students with the concept and principle Electrochemistry, Thermodynamics, Magnetochemistry,Bioinorganic Chemistry and Metal Clusters
Course Outcome(s)	
CO1	Basic concepts of electrochemistry and its applications
CO2	Understanding the Nernst heat theorem and the Thermodynamics open system
CO3	Know the Vant-Hoff's Reaction Osochore and numerical on it
CO4	Explain the types of magnetic substances and effect of temperature on it
CO5	Biological role of alkali and alkaline earth metal ions
CO6	Describe the structures and functions of Metal Cluster

DSECP-V
DSEC Vth & VIth (Section-B)
Physical + Inorganic Chemistry
Paper No. : P-XVII

Periods – 120   Laboratory Course – V (CH-306)   Mark 50

Note : At least Sixteen experiments to be completed : (Twelve from Section A and four from Section B)

Section – A (Physical Chemistry)

Instrumental

1. Determine the normality and strength of oxalic acid conductometrically using standard solution of strong base (NaOH/KOH).
2. Determine the concentration of KCl solution by titrating it with standard solution of AgNO$_3$ conductometrically.
3. Determine the equivalent conductance of a strong electrolyte at several concentrations and hence verify the Onsager's equation.
4. Determine the normality and strength of acids in mixture [strong acidm(HCl/HNO$_3$) and weak acid (CH3COOH/HCOOH)] potentiomrtrically using standard solution of strong base(NaOH/KOH).
5. Determine the dissociation constant of a weak acid (CH$_3$COOH/HCOOH) potentiometrically using standard solution of strong base (NaOH/KOH).
6. Determination of empirical formula of a complex between Fe+3 and 5-sulphosalicylic acid by Job's method colorimetrically.
7. Determination of dissociation constant of an organic acid (CH$_3$COOH) using various buffers (CH$_3$COOH + CH$_3$COONa) pH metrically.
8. To study inversion of cane sugar by polarimetrically.

Non-Instrumental

1. Determine the rate constant of the reaction between potassium persulphate and potassium iodide having equal concentrations of reacting species (a=b).
2. Determine energy of activation of hydrolysis of an ester by acid/base.
3. Investigate the reaction between bromic acid and hdroiodic acid.
4. Determine molecular weight of non volatile solute by Rast method / Beckomann's freezing point method.
5. Determine enthalpy change of neutralization of a strong acid by a strong base.
6. Determine interfacial tension between immiscible liquids, benzene and water by stalagmometer.
7. Determine molecular weight of a polymer by viscosity measurement.
8. Separation of mixture of o- and p-nitro anilines on an alumina column.

Section – B (Inorganic Chemistry)

1. Inorganic preparations and estimation of metal ion.
a) [Cu(NH3)$_4$]SO$_4$
b) [Ni(NH3)$_6$]Cl$_2$
c) CoCl$_3$.4NH$_3$
d) Sodium trioxalato
ferrate e) Hg[Co(SCN)$_4$].
f) Mohr's salt, [FeSO$_4$(NH$_4$)$_2$SO$_4$].6H$_2$O

Reference Books :

1. Experimental Physical Chemistryby A. Findlay., Longman.
2. Advanced Practical Physical Chemistry by J.B. Yadav.
3. Experiments in Physical Chemistry by R.C. Das and B. Behra, Tata Mc Graw Hill.
4. Advanced experimental Chemistry Vol. I. Physical by J.N. Gurtu and R. Kapoor., S. Chand & Co.
5. Experiments in Physical Chemistry by J.C. Ghosh, Bharati Bhavan.
6. Practical book of Physical Chemistry by Nadkarni, Kothari & Lawande., Bombay Popular Prakashan.
7. Systematic Experimental Physical Chemistry by S.W. Rajbhoj, Chondhekar, Anjali Prakashan.
8. Practical Physical Chemistry by B.D. Khosla & V.C. Garg., R. Chand & Sons.
9. Experiments in Chemistry by D.V. Jagirdar.
10. Practical Chemistry, Physical – Inorganic – Organic and Viva – voce by Balwant Raii Satia., Allied Publishers Pvt. Ltd.
11. College Practical Chemistry by H.N. Patel, S.R. Jakali, H.P. Subhedar, Miss. S.P. Turakhia, Himalaya Publishing Hose, Mumbai.
12. College Practical Chemistry by Patel, Jakali, Mohandas, Israney, Turakhia, Himalaya Publishing Hose, Mumbai.
13. A text book of Practical Chemistry for B.Sc. by V.V. Nadkarni, A.N. Kothare and Y.V. Lawande.
14. Advanced practical Inorganic Chemistry by O.P. Agarwal

DSECP-IV
DSEC V_{th} & VI_{th} (Section-B)

Periods – 45   Skill Enhancement Course (B)   02 Credits

Spectroscopic Techniques and Cosmetic Preparation

1. Instruments in spectroscopy.   15 Periods
   Instrumentation: Study of UV, IR, NMR and Mass spectroscopy.
2. Determination of structures of organic compounds by using UV, IR, NMR and Mass spectra: 15 Periods
   Hydrocarbons, unsaturated hydrocarbons, alcohols, amines, aldehydes, ketones, carboxylic acids and esters, acid halides, amides and anhydrides.
3. Preparation of cosmetics   15 Periods
   i) Preparation of talcum powder
   ii) Preparation of shampoo
   iii) Preparation of face cream
   iv) Preparation of nail polish and nail polish

remover Reference Books:

1) Spectroscopy of Organic compounds by P. S. Kalsi.
2) Organic Spectroscopy principle and application by Jag Mohan.
3) Spectroscopy by Pavia, Kriz, Vy vyan.
4) Elementary Organic Spectroscopy by Y.R.Sharma
5) Organic Structure analysis by Phillips Crews, Jaime Roderiguez Marcel Jaspars
6) Industrial Chemistry Vol-I, E.Stochi , Ellis Harwood Ltd. UK
7) Engineering Chemistry, P. C. Jain, Dhanpal Rai & Son's Delhi.
8) Industrial Chemistry by Sharma B. K. and Gaur H., Geol Publishing House Meerat 1996.

<div align="center">OR</div>

BASIC ANALYTICAL CHEMISTRY:

Unit-I   : Preliminary Operations in Quantitative Analysis :   15 Periods
   Introduction, sampling: definitions, purpose of sampling, theory of sampling, types of sampling, sampling of solids, liquids and gases. Preparation of laboratory samples: crushing and grinding of laboratory samples; moisture in samples and drying, determination of water in sample, decomposition and dissolution of samples, some general considerations.

Unit – II: Principles and Methods of Analysis of Saponifiable Oils and Fats: 15 Periods
   Definition, Classification, Nomenclature & Fatty acid composition of oils and fats. Analysis by physical and chemical methods- Density, Specific gravity, colour, acid value, iodine value, Saponification value

1.   Determination of Iodine value of an oil sample.
2.   Determination of specific gravity of an oil sample.
3.   Determination of acid value of an oil sample.
4.   Determination of saponification value of an oil

sample. Reference Books:
1.   Analytical chemistry: an introduction: D. A. Skoog, D. M. West and F. J. Holler, Saunders College publishers, 6th edition.
2.   An introduction to analytical chemistry, S. A. Iqbal, M. Satake, Y. Mido and M. S. Shethi.
3.   College analytical chemistry: Joshi, Baliga and Shetty, Himalaya Publishing house.
4.   Quantitative Analysis-R.A Day and A.L Underwood.
5.   Analytical Chemistry-Theory and Practice UN Dash, Sultan Chand and Sons, New Delhi, 2005.
6.   Qualitative inorganic analysis: A. I. Vogel.
7.   Principles of analytical chemistry: Pandit and Soman.
8.   Anayltical chemistry, G. D. Christian, J. Wiley eastern press Ltd.
9.   Analytical chemistry: Alka Gupta.
10.   Basic concepts of analytical chemistry: S. M. Khopkar.
11.   Advanced practical organic chemistry: Vishnoi.

Objective(s)	This course aims to give clear understanding of the basic concept of Spectroscopic Technique, cosmetics preparation and basic analytical chemistry
Course Outcome(s)	
CO1	Be able to determine the structure by using Spectra
CO2	To train the students for the preparation of various cosmetics
CO3	Know the classification and Fatty acid composition of Oils and Fats
CO4	Analysis of Oils and Fats by physical and chemical method

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science & Technology
Under Graduate (UG) Programmes
COMPUTER SCIENCE (OPTIONAL) - CURRICULUM
(W. E. F. Academic Year 2018-2019)
CLASS: B. Sc. Third Year
OUTLINE

Semester pattern	Section and course code	Paper No. & Title	Periods /Week	Marks for		Total Credits (Marks)
				External Marks: ESE (Theory)	Internal: CA & SECCS	
Semester-V	Section-A DECC	**Theory Paper No.XII** Software Engineering	**03**	40	10	Credits: 02 (Marks:50)
	Section-B DECC (Elective)	**Theory Paper No. XIII[A]** Visual Programming **OR** **Theory Paper No. XIII[B]** Cloud Computing	**03**	40	10	Credits: 02 (Marks:50)
	Section-A SECCS-III	**Skill Enhancement Course-III:** Data Mining **OR** Multimedia and Applications	**03**	25	25	Credits: 02 (Marks:50)
Semester-VI	Section-A DECC	**Theory Paper-XIV** Relational Database Management Systems & PL/SQL	**03**	40	10	Credits: 02 (Marks:50)
	Section-B DECC (Elective)	**Theory Paper No. XV[A]** Computer System Security **OR** **Theory Paper No. XV[B]** E-Commerce	**03**	40	10	Credits: 02 (Marks:50)
	Section-B SECCS-IV	**Skill Enhancement Course-IV:** Office Automation Tools **OR** Android Programming	**03**	25	25	Credits: 02 (Marks:50)
Practical	Section-A CCCSP	**Paper No. XVI Laboratory Course Work-IV:** Practical based on theory papers-**XII & XIII**	**04**	50	--	Credits: 02 (Marks:50)
	Section-B CCCSP	**Paper No. XVII Laboratory Course Work-V:** Project Work	**04**	50	NA	Credits: 02 (Marks:50)
	ESE Marks:260	**SECCS+CA Marks:100+40=140**	**Credits:16 Marks:400**	NA	NA	NA
	ESE Marks:260	**SECCS+CA Marks:100+40=140**	**Credits:16 Marks:400**	NA	NA	NA
		Total		**ESE Marks:260**	**SECCS+CA Marks:100+40 =140**	**Credits:16 Marks:400**

DECC: Discipline Elective Core Course, **CCCSP**: Core Course Computer Science Practical, **SECCS**- Skill Enhancement Course Computer Science, **ESE**: End Semester Examination, **CA**: Continuous Assessment

Note: A practical group / batch for practical papers is recommended to have 10-15 students as per the UGC Guidelines under CBCS (Choice Based Credit System) – May 2015

Chairman, BOS in Computer Science

Outline and Salient Feature:

B. Sc. Third year Computer Science syllabus is crafted to serve the need of Choice Based Credit System. This is a new perspective for academic content delivery where students can pick electives as per their desire. This syllabi structure is reframed with aim to familiarize and practically train students in the field of Computer Science. The course structure is specifically bringing discipline elective (DECC) and skilled enhanced courses together there by providing additional domain knowledge in the field. Some DECC courses like Software Engineering; Visual Programming and Cloud Computing are concerned with basics of software developments and essential things to undertake professional software project management. Through a wide range of electives, students keep pace with the latest trends in computing technology. Furthermore, the curriculum devotes sufficient practical experience to help students integrate and practise principles and techniques learned in the classroom and develop the necessary maturity and soft skills essential for a successful career in information technology.

Utility:

1. A sound technical foundation in computer science and the ability to creatively apply computer and related technologies to practical problems

2. Knowledge in specialized areas with awareness of multi-disciplinary issues,

3. Apply relevant logic, analytics, mathematics and engineering methods to computing;

4. Use computer programming for problem solving

5. Identify problems, analyze requirements, formulate design and implement solutions that meet realistic constraints, such as costs, operational, social, cultural, ethical, health and safety by conversancy with software engineering methods and tools for developing quality software solutions;

6. Develop projects effectively and independently, apply specialized knowledge in selected area(s) of Computer Science;

Prerequisite:

The course is offered for a student registered for third year of undergraduate programme in Computer Science, under the faculty of Science and Technology. The prerequisite includes S.Y in concerned program along with good knowledge of software and hardware.

Chairman, BOS in Computer Science

Software Engineering

Silent Features: Software engineering is art of software designing. It aims to prepare detailed plans and designs as per customer's demands, carry out testing, develop intuitive user interfaces, and integrate all these activities into a system.

Learning Objectives:

- Understand Software Engineering Process.
- Understand Requirements and components of Software Engineering.
- Understand software design and software testing fundamentals.

Utility of the course: Confidence of becoming a Software developer in order to get placement as well as in research activities

Prerequisite: Knowledge of Software

Unit 01: The Nature of Software & Software Engineering

The Nature of Software, The Changing Nature of Software, Defining the Discipline, Software engineering process, Software engineering practice, Software Myths

Unit 02: Software Process Structure & Models

A Generic process model, defining a framework activity, Process patterns, Process assessment & improvement, Prescriptive process models, Personal & team process models

Unit 03: Agility development & Human Aspects

Introduction to Agility, Agility & Cost of Change, Agility principles, Extreme programming, Characteristics of Software engineer, Psychology of Software engineering, Software team structures.

Unit 04: Understanding Requirements & Design Concepts

Requirement Engineering ,Building the analysis model, Requirement Analysis, Design within the context of software engineering, The design process, Design model, Software Architecture, Element of quality assurance, Software testing fundamentals

Reference Books:

1. Software Engineering A practitioner's approach By Rogers S. Pressman, 8th Ed.(McGraw Hill)
2. Software Engineering A practitioner's approach By Rogers S. Pressman, 7th Ed.(McGraw Hill)
3. Software Engineering Principles and practices By Waman S. Jawadekar (Tata McGraw Hill)

Visual Programming

Silent Features: Visual Basics is a Graphical User Interface language. We can design various forms and reports by drag and drop models. It is very convenient platform of modern software designing.

Learning Objectives:

- To learn Graphical User Interface Language.
- To develop an application using GUI Language.
- Implement VB programs to solve simple problems.

Utility of the course: Confidence of becoming a Software developer in order to get placement as well as in research activities

Prerequisite: Knowledge of programming

Unit 01: Getting Started with VB

The IDE, The Elements of user interface, Designing user interface, Programming an Application Visual Development and Event Driven Programming.

Unit 02: Visual Basic The language

Variable, Constants, operators, data types, arrays, collections, Procedures, control flow & loop statements.

Unit 03: Working with forms

Form types, Appearance of forms, Form properties, Designing menu structure, Building dynamic forms at run time, Introduction to MDI forms.

Unit 04: Basic Active X controls

Command button, control-properties, Text Box control- properties, List Box & Combo Box control - properties, combo Box control-properties, Scroll Bar control-properties, Slider control-properties, Understanding Visual data manager.

Reference Books:

1. Mastering Visual Basic 6 by Evangelos Perroutosos (BPB Publications)
2. Gary Cornell - Visual Basic 6 from the Ground up - Tata McGraw Hill
3. Noel Jerke - Visual Basic 6 (The Complete Reference) - Tata McGraw Hill

Chairman, BOS in Computer Science

Cloud Computing

Silent Features: It is most demanding area in IT industry. Every organization now days, trying to migrate to cloud computing from different perspectives. It is associated with architectural modelling and service providing. Other areas like resource pooling, cost economics, elasticity of organisation also use clouds. Thus it has become extremely important to understand the key defining features of cloud computing.

Learning Objectives:

- To Study basics of cloud computing, and comprehend the terminology, tools and technologies associated with today's top cloud platforms.

- To provide the programmer's perspective of working of Cloud Computing.

- Implement Simple Cloud programs to solve simple problems.

Utility of the course: Awareness of existing demanding trends for Clouds and Virtualizations in the IT industry in order to get placement as well as in research

Prerequisite: Knowledge about Computer Hardware and Networking.

Unit 01: Enterprise Computing: A Retrospective

Introduction, Mainframe architecture, Client-server architecture, 3-tier architectures with TP monitors

Unit 02: The Internet as a Platform

Internet technology and web-enabled applications, Web application servers, Internet of services

Unit 03: Software as a Service & Cloud Computing

Emergence of Software as a Service (SaaS), Successful SaaS architectures, Dev 2.0 platforms, Cloud computing, Dev 2.0 in the cloud for enterprises

Unit 04: Cloud Computing Platforms

Infrastructure as a service (IaaS): Amazon EC2, Platform as a service (PaaS): Google App Engine, Microsoft Azure, Introduction to Web Services, AJAX & Mashups: user interface services

Reference Books:

1. Enterprise Cloud Computing: Technology, Architecture, Application By Gautam Shroff
2. Cloud Computing: A Practical Approach by Anthony T. Velte Toby J. Velte publication McGraw Hill

Data Mining

Silent Features: Data mining is basically concerned with the analysis of data using software techniques. Data mining is the process of detecting hidden facts and interrelations in large data which otherwise invisible directly.

Objectives:

- To create awareness about self-employment and motivate the students to go for self-employment by becoming Data Analytics.
- To familiarize the students to the practical world of business data processing and decision making.

Utility of the course: Awareness of existing demanding trends in IT industry in order to get placement as well as in research.

Prerequisite: Knowledge of database management system is essential.

Unit 01: Introduction

Introduction: Data mining as a subject, what is Data mining, Definition, DBMS Vs Data mining, DM techniques, Issues and challenges in DM, DM application areas?

Unit 02: Data warehousing

Data warehousing: Introduction, Definition, OLAP operation, warehouse schema, Data warehouse architecture, metadata, data ware house usage

Unit 03: Data pre-processing

Data pre-processing, Data cleaning, Data integration, Data transformation, Data reduction.

Unit 04: An application

Understanding basic techniques in Classification, Prediction, Clustering and Association Rules

Reference Books:

1.   Data mining Techniques by Arun K Pujari.
2.   Data mining concepts and techniques 2nded. By Jawei Han & Micheline Kamber.
3.   Data mining- Introductory and Advanced Topics, Margaret H Dunham,
     Pearson Education

Chairman, BOS in Computer Science

Skill Enhancement Course-III (SECCS-III)
Multimedia and Applications

Silent Features: Multimedia is combination of text, graphics, sound, animation, and video that is delivered interactively to the user by electronic or digitally manipulated means. Animation is one of the applications of multimedia. This course formally introduces various elements of multimedia to students. This course focuses on topics in multimedia information representation and relevant signal processing aspects, multimedia networking and communications, and multimedia standards especially on the audio, image and video compression. All of these topics are important in multimedia industries.

Objectives: The objective of this course is to provide students with a basic understanding of multimedia systems. With such background equipment, students would be able to evaluate more advanced or future multimedia systems. This course will also stimulate students' interest in the course and further motivate them towards developing their career in the area of multimedia and internet applications.

Utility of the course: Develop projects effectively and independently, apply specialized knowledge in selected area(s) of Computer Science

Prerequisite: Knowledge of software is essential.

Unit 01: Introduction to multimedia

Introduction to multimedia, elements of multimedia, multimedia and hypermedia, characteristics of multimedia, hardware and software requirement, uses of multimedia, WWW, multimedia software tools.

Unit 02: Text

Text: Introduction, types of text, Unicode standard, insertion of text, text compression, text file formats, image file format (bmp, jpg, png).

Unit 03: Introduction to graphics

Introduction to graphics, advantages and uses of graphics, Audio-introduction, Components of audio system, digital audio processing, and Audio file formats.

Unit 04: Video-introduction

Video-introduction, Motion Video, Analog Video Camera, Digital Video, Digital Video Processing, Storage formats, video file format.

Reference Books:

1. Principles of multimedia 2nd edition by Ranjan Parekh, Tata McGraw-Hill
2. Fundamentals of multimedia by Ze-Nian Li and mark S. Drew
3. Introduction to Multimedia and its Application by Ramesh Jain

Chairman, BOS in Computer Science

Laboratory Course Work- IV

Paper No. XVI
Practical Based on theory papers – XII & XIII

Objective: Give hands on training to the students and make them acquainted with various Real time Applications implemented currently in the Industry.

- At least 20 practical sessions based on paper no XII and XIII.

Chairman, BOS in Computer Science

Relational Database Management Systems & PL/SQL

Silent Features: The Relational model is a fundamental DBMS model. RDBMS alone can give good placement to students in IT industry. RDBMS comes in the form of a package. We simply need to learn "how to use and manage it". There is huge scope to RDBMS. The RDBMS is critical whenever you are managing large amounts of data. Virtually RDBMS comes in picture anywhere where large amounts of complex data are generated or analyzed like Banks, Government Records/Depositories, etc.

Learning Objectives:

- To learn Relational Database Management system and database languages.

- To learn Relational Algebra and Calculus.

- To study Integrity Constraints and PL/SQL

- To develop an application using PL/SQL.

Utility of the course: To get a good job in DBMS, students must have good knowledge of RDBMS, any 4 GL, Networking Concepts, Operating System Concepts and Web related issues. The ORACLE / MAINFRAME are the popular DBMS technologies students should learn and master. The students are also encouraged to appear for OCP / OCA – DBA certification examinations.

Prerequisite: Knowledge of DBMS

Unit 01: Introduction

Introduction to DBMS, Applications of DBMS, Data Models, Database Architecture, Database Users & Administrators, Entity, Attributes & Entity Set, Database Languages, DDL,DML,DCL.

Unit 02: Relational Algebra and Calculus:

Introduction to Selection, Projection, Union, and Joins, introduction to SQL, Basic SQL Query and Examples of SQL Queries: select, where, from, Introduction to views, Aggregate Operators Group by & Order by Clause.

Unit 03: Integrity Constraints

Introduction, Domain Constraint, Primary Key, Unique Key, Foreign Key

Unit 04: Introduction to PL/SQL

Introduction, Architecture of PL/SQL, Data types, operators, Decision making and looping statements, Simple PL/SQL programs, Introduction to Triggers.

Reference Books:

1. SQL, PL/SQL the programming language of ORACLE 4ᵗʰ Edition, Ivan Bayross
2. An Introduction to Database Systems, Bipin C Desai , Galgotia Publication

Chairman, BOS in Computer Science

Paper No. XV [A]

Computer System Security

Silent Features: Computer security has become a major concern for all users and manufacturers around the world. The security deals with procedures and algorithms to avoid attacks or to bring down the attacks. Knowledge of computer security is extreme need of time.

Learning Objectives:

- The Course shall introduce the Computer System Security Concepts and its use in the Information Technology industry.

- It also elaborates on various types of attacks and their mitigation.

Utility of the course: Awareness of existing demanding trends in IT industry in order to get placement as well as in research

Prerequisite: Knowledge of Networking is essentials.

Unit 01: Security Polices, Standards & Guidelines

Different Types of polices standards & guidelines, Common Elements, Policy Standards & Guide development, Policy Creation, Regulatory Considerations.

Unit 02: Security Attacks, Services & Mechanisms

Security Attacks, Services & Mechanisms, Security Services, A model for network security.

Unit 03: Conventional Encryption

Conventional Encryption Techniques, Stegnography, Classical Encryption techniques.

Unit 04: Intruders, Viruses, Worms & Firewall

Intruders, Viruses & Related Threats, Introduction to Firewalls, Firewall design principles, Trusted Systems, Introduction to Antivirus.

References Books:

1. Security Architecture Design, Deployment & Operations by Cistopher M king, Curtis E. Dalton, T. Ertem Osmanoglu
2. Cryptography & Network Security Principles & Practice (Second Edition)

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<center>**Paper No. XV [B]**</center>

<center>**E-Commerce**</center>

Silent Features: E-commerce is a new revolution in the traditional market place where people buy from internet. Online purchase from Amazon, Snapdeal, Flipkart, etc comes under e-commerce. This course introduces common terminology related with e-commerce and their work association.

Learning Objectives:

- To learn Electronic Commerce market place and Internet.
- Understand Electronic Data Interchange.

Utility of the course: Job opportunities in BPO, E-commerce companies, Logistics companies, E-commerce framework consultant

Prerequisite: Knowledge of Internet is essentials.

Unit 01: Electronic Commerce

Introduction, E-Commerce types, Value Added Networks, Electronic commerce over the Internet.

Unit 02: Intranet

Introduction to Intranet, Intranet services, Intranet Implementation.

Unit 03: Internet

Internet-Introduction, Internet Engineering Task Force, Internet Architecture Board, Internet Communication Protocols, Internet Search Tools: Telnet, FTP, World Wide Web. Gopher, HTTP, Concerns about Internet.

Unit 04: Electronic Data Interchange

EDI introduction, Cost & Benefits of EDI, Components of EDI Systems: EDI Standards, EDI Software's, EDI Communication Networks, EAN system, EAN/COM, Article numbering system, Bar-coding, Serial Shipping Container Code & EAN label.

References Books:

1. E-commerce (The cutting Edge of Business) by Kamlesh K. bajaj and Debjani Nag. Ist & IInd Edition (Tata McGraw Hill publication.)

Chairman, BOS in Computer Science

Skill Enhancement Course-IV (SECCS-IV)

Office Automation Tools

Silent Features: Office automation refers to the integration of office functions usually related to managing information. Now days all offices have been computerised. This course would enable the students in crafting professional word documents; excel spread sheets, power point presentations using the Microsoft suite of office tools.

Objectives:

- Seek Jobs in emerging BPO/IT Support Sector.
- To familiarize the students in preparation of documents and presentations with office automation tools. Broadly, b learning the course, the students will be able to perform documentation , to perform accounting operations and to perform presentation skills

Utility of the course: Awareness of existing demanding trends in IT industry in order to get placement as well as in research.

Prerequisite: Knowledge of basic computer software is essential.

Unit 01: Introduction to MS Office

Introduction to MS Office, Characteristics of office automation system, Goals of office automation.

Unit 02: Introduction to MS Word

Introduction to MS Word, Opening screen of word, Creating document, Typing text, Formatting text, Editing text, Line Spacing, Borders and shading, Inserting headers and footers, Creating tables, inserting graphics, Drawing objects.

Unit 03: Introduction to MS Excel

MS Excel, Opening screen of Excel, Functions in excel, Creating worksheets, Printing Worksheets,   Creating and printing charts.

Unit 04: Introduction to PowerPoint

PowerPoint Basic Terminology, Creating presentations, Auto content wizard, Using blank presentation option, Using design template option, Adding slides, Deleting slides, Importing images, drawing in PowerPoint, numbering a slide, saving presentation, printing presentation.

Reference Books:

1. PC Software Made Simple by R.K Taxali

2. Office 2010 course complete book, Prof. Satish Jain, Kratika, M.Geetha, BPB Publication

Chairman, BOS in Computer Science

Skill Enhancement Course-IV (SECCS-IV)

Android Programming

Silent Features: Android is a powerful Operating System supporting a large number of applications in Smart Phones. Android programming course teaches students how to develop applications for the Android operating system. This course is designed for students who are new to programming, and want to learn how to develop Android apps. They will learn how to create an Android project anlong with Android architecture and the key principles underlying its design.

Objectives:

- This course shall build a platform for students to start their own enterprise

- To gain an understanding of the processes that are involved in an Android developed application

- To become familiar with Android development tools and user interface.

- Ability to build two simple apps that you can share with your friends

Utility of the course:

- Awareness of existing demanding trends in IT industry in order to get placement & research.

- Understand the Android OS architecture.

- Install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.

- Understand the Android application architecture, including the roles of the task stack, activities, & services.

- Build user interfaces with fragments, views, form widgets, text input, lists, tables, and more.

Prerequisite: Basic of Operating System covered last year semester.

Unit 01: Introduction

History of Android, Introduction to Android Operating System, Android Development tools, Android Architecture.

Unit 02: Overview of Object Oriented Programming Using Java

OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract Class, Threads, Overloading and Overriding, Java Virtual Machine.

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Unit 03: Development Tools

Installing Virtual Machine for Android Ice-cream Sandwich/Jellybean, configuring the installed tools, creating a android project- Hello word, run on emulator, Deploy it on USB-connected android device.

Unit 04: User Interface Design

Form widgets, Text fields, Layouts, Button control, toggle buttons, spinners, Images, Menu and dialog.

Reference Books:

1. Android application development for java programmers by James C. Sheusi, publisher Cengage Learning, 2013.

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Laboratory Course Work- V

Paper No. XVII

Objective: Give hands on training to the students and make them acquainted with various Real time Applications implemented currently in the Industry.

Project Work

- Maximum a group of 03 students are allowed to work on a project.

- Project Synopsis should be submitted by the students to their concern faculty and a declaration should be submitted by the students regarding the originality of work.

- Project report should prepared by the students & it should be certified by concern faculty & head of the department.

- Students should submit one hardcopy of report with CD to the department.

Distribution of marks for project is as

Project Work:	30
Project Viva:	10
Project Report:	10
Total Marks:	**50**

Chairman, BOS in Computer Science

Swami Ramanand Teerth Marathwada University, Nanded.

B. Sc. Third Year (Mathematics)

Syllabus

CBCS Pattern

Effective from June-2018

Scheme of B. Sc. Mathematics Programme (Science Faculty) Under CBCS pattern

Semester	Courses Opted	Course Name	Credits
I	Core Course Section A	Paper-I: Differential Calculus	02
	Core Course Section B	Paper-II: Algebra and Trigonometry	02
	Core Course Practical	Practical Based on Mathematical Software	02
	Total Semester-I		**06**
II	Core Course Section A	Paper-III: Integral Calculus	02
	Core Course Section B	Paper-IV: Geometry	02
	Core Course Practical	Paper-V: Practical Based on Mathematical Software	02
	Total Semester-II		**06**
	Total Semester-I & II		**12**
III	Core Course Section A	Paper-VI: Real Analysis-I	02
	Core Course Section B	Paper-VII: Group Theory	02
	Core Course Section C	Paper-VIII: Ordinary Differential Equations	02
	Skill Enhancement Course	SEC-I: Choose any one	02
	Total Semester-III		**08**
IV	Core Course Section A	Paper-IX: Real Analysis-II	02
	Core Course Section B	Paper-X: Ring Theory	02
	Core Course Section C	Paper-XI: Partial Differential Equations	02
	Skill Enhancement Course	SEC-II: Choose any one	02
	Total Semester-IV		**08**
	Total Semester-III & IV		**16**
V	Discipline Specific Elective Course Section A	Paper-XII: Metric Spaces	02
	Discipline Specific Elective Course Section B	Paper-XIII: Linear Algebra	02
	Discipline Specific Elective Course Section C	Paper-XIV: Choose any one A) Operation Research B) Mechanics-I C) Complex Analysis	02
	Skill Enhancement Course	SEC-III: Choose any one	02
	Total Semester-V		**08**
VI	Discipline Specific Elective Course Section A	Paper-XV: Numerical Analysis	02
	Discipline Specific Elective Course Section B	Paper-XVI: Integral Transforms	02
	Discipline Specific Elective Course Section C	Paper-XVII: Choose any one A) Topology B) Mechanics-II C) Elementary Number theory	02
	Skill Enhancement Course	SEC-IV: Choose any one	02
	Total Semester-VI		**08**
	Total Semester-V & VI		**16**
	Total Course Credits		**44**

Detailed Structure of B. Sc. Mathematics (Faculty of Science) Syllabus under CBCS Pattern

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc I Year

Effective From 2016-17

Semester	Section and Paper Code	Period per week	Paper No. and Title of the papers	Marks of Semester	Internal C.A.	Total Marks	Credits
I	CCM-1 Section A	4	Paper- I Differential Calculus	40	10	50	2
	CCM-1 Section B	4	Paper-II Algebra & Trigonometry	40	10	50	2
II	CCM-2 Section A	4	Paper –III Integral Calculus	40	10	50	2
	CCM-2 Section B	4	Paper- IV Geometry	40	10	50	2
	CCMP-I	2	Paper -V Practical on MATLAB	80	20 (R.B.=10 I.E.=10)	100	4
Total Credits							12

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc II Year

Effective From 2017-18

Semester	Section And Paper Code	Period per week	Paper No. and Title of the papers	External Marks	Internal C.A.	Total Marks	Credits
III	CCM-3 Section A	5	Paper –VI Real Analysis -I	40	10	50	2
	CCM-3 Section B	5	Paper – VII Group Theory	40	10	50	2
	CCM-3 Section C	5	Paper –VIII Ordinary Differential Equations	40	10	50	2
	SECM-I	3 Theory-1, Practical-2	one Skill can be chosen	25	25	50	2
IV	CCM-4 Section A	5	Paper-IX Real Analysis–II	40	10	50	2
	CCM-4 Section B	5	Paper –X Ring Theory	40	10	50	2
	CCM-4 Section C	5	Paper XI Partial Differential Equation	40	10	50	2
	SECM-II	3 Theory-1, Practical-2	one Skill can be chosen	25	25	50	2
			Total Credits				16

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc III Year

Effective From 2018-19

Semester	Section Paper-Code	Period /Week	Title Of The Paper	External Exam	Internal Exam	Total Marks	Credits
V	DSEM-5 Section-A	5	Paper-XII Metric Space	40	10	50	2
	DSEM-5 Section-B	5	Paper-XIII Linear Algebra	40	10	50	2
	DSEM-5 Section-C	5	Choose Any One Of The Following Paper-XIV (A) Operations Research (B) Mechanics-I (C) Complex Analysis	40	10	50	2
	SECM-III	3	Choose Any One Of the Skill	25	25	50	2
VI	DSEM-6 Section-A	5	Paper-XV Numerical Analysis	40	10	50	2
	DSEM-6 Section-B	5	Paper-XVI Integral Transformation	40	10	50	2
	DSEM-6 Section-C	5	Choose Any One Of The Following Paper-XVII (A) Topology (B) Mechanics-II (C) Elementary Number Theory	40	10	50	2
	SECM-IV	3	Choose Any One Of the Skill	25	25	50	2
Total Credit							16

Swami Ramanand Teerth Marathwada University, Nanded.
B. Sc. Third Year Syllabus (Mathematics)
CBCS Effective from June 2018

Outlining the salient features:

1)   Utility of Syllabus:

i)   Students can verify the convergence of sequences, completeness compactness and connectedness of given metric spaces.

ii) Students will be able to find dimensions of various vector spaces and by using determinant concept students can solve the linear equations in two, three unknowns.

iii) Students can obtain the solutions of LPP using various methods.

iv) Students can obtain equilibrium of forces and resultant force of forces.

v)   Students will be able to check the Analyticity of functions

vi) Students can obtain Numerical solutions of differential equations by using numerical techniques.

vii) Students can solve differential equations using Laplace transformations.

2)   Learning Objectives of Syllabus:

i)   To maintain updated curriculum.

ii) To take care of fast paced development in the knowledge of mathematics.

iii) To meet the needs and requirements of the society and to enhance the quality and standards of Mathematics Education.

iv) To provide multidisciplinary profile and to allow a flexible cafeteria like approach including initiating new papers to cater to frontier developments in the subject like Mathematics.

v)   To create confidence in others, for equipping themselves with that part of Mathematics which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.

vi) Strengthening the understanding of the students and substantiating the conceptual framework of Mathematics for furthering their potential and capabilities in the subject.

vii) Introducing advanced theories in the subject in an orderly manner with a clearly defined path of interdependence.

viii) Introducing the specializations in different areas of Mathematics and at the same time emphasizing the underlying interconnections in different branches of Mathematics.

ix) Generating more interest in the subject and motivating students for self learning beyond the realm of syllabi and examinations.

x) Inculcating the spirit of inquiry among the students and preparing them to take up the research in Mathematics.

xi) Exhibiting the wide range of applications of Mathematics and preparing students to apply their knowledge in diverse

3. Prerequisite:
Basic Set theory, Convergence of sequence and series, Basic Group theory and Ring theory, Fields, Linear equations, Vectors and Scalars, Number System, Differentiation and Integration.

B.Sc. T.Y. Semester-V
DSEM-5, Section-A
Paper XII: Metric Spaces

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**
.

Unit I: **Definitions and examples**:
Definition of Metric Space, Examples of Metric Space, Diameter of a nonempty Set.
Open and Closed sets:
Open and Closed Spheres, Neighbourhood of a Point, Open Sets, Limit Points, Closed Sets, Subspaces, Closure of a Set.

Unit II: **Convergence and Completeness**:
Definition, Cauchy Sequence, Cantor's Intersection Theorem, Baire's Category Theorem.
Continuity and Uniform Continuity:
Definitions, Examples, Theorems on Continuity and Uniform Continuity, Banach Fixed Point Theorem.

Unit III: **Compactness:**
Definitions and Theorems on Compactness, Heine-Borel Theorem, Compactness and Finite Intersection Property, Relative Compactness, Є-Nets and Totally Bounded Sets, Lebesgue Number for Covers.
Connectedness:
Separated Sets, Definition and Theorems on Connectedness.

Text Book: S.C. Malik and Savita Arora, "Mathematical Analysis", New Edge International (P) Limited Publisher, New Delhi (Fourth Edition).

Scope:

Unit I : Chapter 19:- Art. 1, 2, 2.1, 2.2, 2.3 (Theorem 1 only), 2.4, 2.5, 2.6, 2.7.
Unit II : Chapter 19:- Art. 3, 4 (Theorem 16 statement only), 4.1.
Unit III: Chapter 19:- Art. 5 (Theorem 21statement only), 5.1, 5.2(Theorems 26 to 33 Statements only) , Art. 6. (up to Theor em 39 and Example 45).

Reference Books:
1. Somasundaram & Chaudhary "A First Course in Mathematical Analysis", Narosa Pub. House New Delhi.
2. R. Goldberg, "Methods of Real Analysis", Oxford & IBH Pub. Co.PVT Ltd Shantinarayan & M.D. Raisinghania, "Elements of Real Analysis", S. Chand. Co. Ltd.
3. E. T. Copson "Metric Spaces", Cambridge University Press. Universal Book Co. New Delhi.
4. T. M. Apostol "Mathematical Analysis", Narosa Pub. House New Delhi.
5. T. M. Karade, "Lecturers on Analysis", Sonu Nilu Pub. Nagpur.

B.Sc. T.Y. Semester-V
DSEM-5, Section-B
Paper XIII: Linear Algebra.

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Vector spaces:**
Elementary Basic Concepts of Vector Spaces, Linear Independence and Bases, Dual Spaces.

Unit II: Inner Product Spaces, Fields: Extension Fields (Definitions only).

Unit III: **Linear Transformation:**
The Algebra of Linear Transformations, Characteristic Roots, Matrices.

Text Book: I.N. Herstein, "Topics in Algebra", (2nd Edition), John Wiley and Sons.

Scope:

Unit I : Chap. 4: Art. 4.1, 4.2, 4.3
Unit II : Chap. 4: Art. 4.4. Chap. 5: Art. 5.1(Definitions only)
Unit III: Chap. 6: Art. 6.1, 6.2, 6.3.

References:
1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, "First Course in Linear Algebra", New Age International-1983.
2. V. Krishnamurty , P Mainara, J.L. Arrora, "An Introduction to linear Algebra", Affiliated East west Press Pvt. Ltd.
3. Smith, "Linear Algebra", Springer-Verlag, New York.
4. K B Datta, "Matrix and Linear Algebra", Prentice Hall of India Pvt. Ltd New Delhi, 2000.
5. Stephen H. Friedberg, "Elementary Matrix Algebra", Second Edition, Prentice Hall
6. V. K. Khanna, S. K. Bhambri, "A Course in Abstract Algebra", S. Chand Publications.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (A): Operation Research

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Linear Programming problem:**
Mathematical Formulation: Introduction, Linear Programming Problem, Mathematical Formulation of the Problem, Illustration on Mathematical Formulation of LPPs.
Graphical Solution and Extension: Introduction, Graphical Solution Method, Some Exceptional Cases, General Linear Programming Problem, Canonical and Standard Forms of L.P.P.

Unit II: **Linear Programming Problem:**
Simplex Method: Introduction, Fundamental Properties of Solution, Computational   Procedure, Use of Artificial Variables, Degeneracy in Linear Programming, Solution of Simultaneous Linear Equations, Inverting a Matrix using Simplex Method, Applications of Simplex Method.

Unit III: **Transportation Problem:** Introduction, LP Formulation of Transportation Problem, Existence of Solution in Transportation Problem.
Assignment Problem: Introduction, Mathematical Formulation of the Problem, Solution Methods of Assignment Method, Special cases in Assignment Problem, A typical Assignment Problem.

Text Book: Kanti Swarup, P.K. Gupta and Man Mohan, "Operations Research", Fourteenth Thoroughly Revised Edition, Sultan Chand & Sons. Educational Publishers, New Delhi.

Scope:

Unit I : Chapter-2: Articles 2.1to 2.4 (complete), Chapter- 3: Art. 3.1 to 3.5.
Unit II : Chapter-4: Articles 4.1 to 4.8.(Complete).
Unit III: Chapter-10: Articles 10.1, 10.2, 10.3, Chapter-11: Articles 11.1 to 11.5.

References:
1. Hiller and Lieberman "Introduction to Operation Research", Tata Mc Graw Hill.
2. Hamdy A. Taha "Operation Research an Introduction", Eight Edition Pearson Prentice Hall, Pearson Education Inc.
3. Er. Prem Kumar Gupta, Dr. D. S. Hira "Problems in Operations Research Principles and solutions)", S. Chand & Company, Ram Nagar, New Delhi.
4. R. K. Gupta, "Operation Research", Krishana Prakashan Media Ltd.
5. J. K. Sharma, "Operation Research: Theory and Applications", Second Edn. 2006, Macmilan India Ltd.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (B): Mechanics-I (Statics)

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Forces Acting on a Particle:**
Definitions, Law of Parallelogram of Forces, Magnitude and Direction of the Resultant, Deductions, Resultant of Forces, Components and Resolved parts, Algebraic Sum of the Resolved Parts, Magnitude and Direction of the Resultant of any number of Forces, Resultant of Parallel Forces.

Unit II: **Equilibrium of Forces Acting on a Particle:**
Triangle law of Forces, Converse of the Triangle Law of Forces, Polygon of Forces, Lami's Theorem, Conditions of Equilibrium of Forces acting on a Particle.

Unit III: **Forces Acting on a Rigid Body:**
Introduction, Moment of a Force, Sum of the Vector Moment of a System of Forces, Sum of the Vector Moments of to like Parallel Forces, Couples, Two Couples acting in one Plane upon a Rigid Body, Equivalent Couples, Vector Moment of the Resultant Couple of two Couples acting upon o Rigid Body, System of Forces acting upon a Rigid Body, Conditions of Equilibrium of Forces, Conditions of Equilibrium of Coplanar Forces.

Text Book: V. Tulsani, T. W. Warhekar, N.N. Saste , "Mechanics and Differential Geometry", S. Chand and Co. (pvt.) Ltd. New Delhi, Second Edition.
Scope:

Unit I**:** Chapter 1: Art. 1.1 to 1.17.
Unit II: Chapter 2: Art. 2.1 to 2.5.
Unit III: Chapter 3: Art. 3.1 to 3.12.

References:
1. B.R. Thakur and G.P. Shrivastav, "Mechanics", Ram Prasad and Sons, Agra-3, New Edition, New Delhi.
2. Shanti Narayan, "Mechanics" S. Chand and Co.
3. S. L. Loney, "An elementary Treatise on Dynamics Particle and Rigid Bodies", A.I.T.B.S. Publishers and Distributers 2003, New Delhi.
4. S. L. Loney, "An elementary Treatise on Statics", A.I.T.B.S. Publishers and Distributers 2004, New Delhi.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (C): Complex Analysis

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Complex Numbers:** Sum and Products, Basic Algebraic Properties, Further Properties, Vectors and Moduli, Complex Conjugates, Exponential Form, Products and Powers in Exponential Form, Arguments of Products and Quotients, Roots of Complex Numbers, Examples, Regions in the Complex Plane.

Unit II: **Analytic Functions:** Function of Complex Variables, Limits, Theorems on Limits, Limits Involving the Point at Infinity, Continuity, Derivatives, Differentiation Formulae, Cauchy-Riemann Equations, Sufficient Conditions for Differentiability, Polar Coordinates, Analytic Functions, Harmonic Functions.

Unit III: **Elementary Functions:** The Exponential Functions, The Logarithmic Function, Branches and Derivatives of Logarithms, Some Identities Involving Logarithms, Complex Exponents, Trigonometric Functions, Hyperbolic Functions.

Text Book: J. W. Brown and R. V. Churchill, "Complex Variables and Applications", International Students Edition 2009, 7th Edition.

Scope:

          Unit I**:** Chapter 1: Art. 1 to 10.
          Unit II: Chapter 2: Art. 11, 14 to 25.
          Unit III: Chapter 3: Art. 28 to 34.

References:
1. S. Punnusamy, " Complex Analysis", Narosa Publishing House, 2nd Edition.
2. S. Lang, "Complex Analysis", Springer Verlag.
3. A. R. Shastri, "An Introduction to Complex Analysis", MacMillan.

B.Sc. T.Y. Semester-V
SECM-III

No. of periods: 45   **Max. Marks: 50**   **Credits: 2**

Choose any one of following skill.

SEC-III (A) **Financial Mathematics**
The measurement of interest: Introduction, The accumulation and amount functions, The effective rate of interest, Simple interest, Compound interest, Present value, The effective rate of discount, Nominal rates of interest and discount, Forces of interest and discount, Varying interest, Summary of results**.**

References:
1. Kellison Stephen G., The Theory of Interest, 3rd Edition. McGraw-Hill International Edition (2009).
2. UK Institute of Actuaries core leading for the subject CT1-Financial Mathematics.
3. Elliott R.J. and Kopp P.E. Mathematics of Financial Markets. Springer.1999

SEC-III (B) **Working with Partial Differential Equations using Mathematical Software like Matlab, Mapple, Scilab and other software**
.

References:
1.   Getting Started With MATLAB 7 - Rudra Pratap, Oxford University Press, (Indian Eden) www.oup.com
2. Satish Annigeri, "An Introduction to Scilab" December 2009.
3. Sandeep Nagar, "Introduction to Scilab For Engineers and Scientists", APRESS.
4. Introduction to Scilab – Michaël Baudin, Consortium Scilab, 2010
5. The Scilab Consortium. Scilab. http://www.scilab.org.
6. Sylvestre Ledru. Different execution modes of Scilab. http://wiki.scilab.org/Different_execution_modes_of_Scilab.
7.   Atlas - automatically tuned linear algebra software. http://math-atlas.sourceforge.net.
8.   Cecill and free software. http://www.cecill.info.
9.   Intel. Intel math kernel library. http://software.intel.com/en-us/intel-mkl/.
10.   Flexdock project. Flexdock project home. https://flexdock.dev.java.net/.

B.Sc. T.Y. Semester-VI
DSEM-6, Section A
Paper XV: Numerical Analysis

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Differences, Operators, Interpolation with Equal Intervals:**
Introduction, Differences, Factorial Notation, The Operator E, Properties of E
and Δ , The Operators D and ∇, Interpolation, Extrapolation, Interpolation with
Equal Intervals, Newton- Gregory Formula for Forward and Backward
Interpolation, Equidistant Terms with one or more Missing Terms. Interpolation
for Unequal Intervals of the arguments, Divided Differences with Unequal
Intervals, Divided Differences, when Two or More Arguments are Same,
Properties of Divided Differences (Theorems 1, 2 only)

Unit II: Properties of Divided Differences (Theorems 3, 4 only), Newton's, Formula for
Unequal Intervals, Lagrange's Formula for Unequal Intervals, Central Differences
($\nabla, \delta, \sigma, \mu$), Interpolation Formulae: Gauss, Bessel and Stirling's.

Unit III: **Numerical Differentiation**: Introduction, Approximate Expressions for the
Derivative of a Function, Unsymmetrical Expressions for Third Order
Derivatives.
Numerical Quadrature: Introduction, General Quadrature Formula, Trapezoidal,
Simpson's One-third and Three-eight Rules. Weddle's Rule.
Numerical Solution of O.D.E.: Introduction, Equation of First order, Euler's
Method, Euler's Modified Method, Picard's method, Talyor's Series Method.

Text Book: H.C. Saxena, "Finite Differences and Numerical Analysis", S. Chand & Co.
reprint 2001.
Scope:

Chap. 1: Art. 1.1 to 1.3, 1.5.1,1.5.2,1.5.3, 1.6, 1.6.1, 1.6.2, 1.7 1.7.1, 1.8, 1.8.1 to
1.8.3.
Chap. 2: A rt. 2.1, 2.2, 2.3, 2.4.1.
Chap. 3: 3.1, 3.2, 3.3, 3.4, 3.5.
Chap. 5: Art. 5.1, 5. 2. 5.3.
Chap. 6: Art. 6.1, 6.2, 6.3.1, 6.3.2, 6.3.3, 6.3.4
Chap. 15: Art. 15.1, 15.2.1, 15.2.2, 15.2.3, 15.2.4(a).

References:
1. S.S. Sastry, "Introductory Methods of Numerical Analysis" Prentice-Hall of India
Private Ltd. (Second Edition) 1997.
2. E.V. Krishnamurthi & Sen, "Numerical Algorithm", Affiliate East, West press
Private Limited 1986.
3. M.K. Jain, SRK Iyengar, R.K. Jain, "Numerical Methods for Scientific and
Engineering Computations", New Age International Limited Pub.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-B
Paper XVI: Integral Transforms

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Laplace Transforms:**
Introduction, Laplace Transform, Important Formulae, Properties of Laplace Transforms, Laplace Transforms of the Derivative of $f(t)$, Laplace Transforms of Derivative of Order n, Laplace Transform of Integral of $f(t)$, Laplace Transform of $t \bullet f(t)$ (Multiplication by t), Laplace Transform of $\frac{1}{t} \cdot f(t)$ (Division by t), Unit Step Function. Second Shifting Theorem, Convolution Theorem, Evaluation of Integrals, Formulae of Laplace Transform, Properties of Laplace Transforms.

Unit II: **Inverse Laplace Transforms:**
Inverse Laplace Transforms, Important Formulae, Multiplication by S, Division by S, First Shifting Property, Second Shifting Property, Inverse Laplace Transform of Derivatives, Inverse Laplace Transform of Integrals Partial Fraction Methods, Inverse Laplace Transform by Convolution, Solution of Differential Equation by Laplace Transforms, Solution of Simultaneous Differential Equations by Laplace Transforms.

Unit III: **Fourier Transforms:**
Introduction, Integral Transforms, Fourier Integral, Theorems, Fourier Sine and Cosine Integrals, Fourier Complex Integral, Fourier transforms, Fourier Sine and Cosine Transforms, Properties of Fourier Transforms.

Text Book: H.K. Dass, "Advanced Engineering Mathematics", S. Chand and Co.

Scope: Unit I :   Art. 13.1 to 13.19
Unit II :   Art. 13.20 to 13.31
Unit III: Art. 14.1 to 14.8

References:
1. Grove A . C., "An Introduction to Laplace Transforms and Z- Transforms", Prentice Hall 1991.
2. Doetsch G., "Introduction to Theory and Application of Laplace Transforms", Springer Verlag, 1990.
3. Murray Spigel, "Schaum Outline of Laplace Transforms", Schaum Outline Series Mc-Graw Hill 2012.
4. Joel. L. Schiff, "The Laplace Transforms: Theory and Applications", Springer, 2008.
5. Fourier and Laplace Transform By R.J. Becrends H.G., Morsche . J.C. Vande Berg and E.M. Vande Vrie, Cambridge Press 2003.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (A): Topology

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Set Theory and Logic:**
Fundamental Concepts, Functions, Relations, The Integers and the Real Numbers, Cartesian Product, Finite Sets, Well-ordering Theorem,
Topological Spaces and Continuous Functions:
Topological Spaces, Basis for Topology.

Unit II: **Topological Spaces and Continuous Functions:**
The Order Topology, The Product Topology, The Subspace Topology.

Unit III: **Topological Spaces and Continuous Functions:**
Closed Sets and Limit Points, Closure and Interior of a Set, Limit Points, Continuity of a Function, Definitions of Product Topology
Connectedness and Compactness:
Connected and Compact Spaces (Definitions only).

Text Book: R. Munkres, "Topology: A First Course", Prentice Hall of India.

Scope:

Unit I : Chap. 1: Art. 1.1 to 1.6, Art. 1.7 (Statements of Theorems), Art. 1.10
          Chap. 2: Art. 2.1, 2.2.
Unit II : Chap. 2: Art. 2.3, 2.4, 2.5.
Unit III: Chap. 2: Art. 2.6, 2.7, 2.8 (Definitions), Chap. 3: Art. 3.1(Theorems without proof 1.5, 1.6), 3.5 (Definitions and Examples).

References:

1. John Horvath, "Topological Vector Spaces & Distribution", Addison-Wesely, Publishing Company 1966.
2. F. Treves, "Topological Vector spaces, Distribution, Kernel", Academic Press, Inc., New York, 1967.
3. G. Kothe, "Topological Vector spaces", Vol.1, Springer, New York, 1969.
4. R. Larsen, "Functional Analysis", Marcel Dekker, Inc., New York, 1973.
5. Walter Rudein, "Functional Analysis", TMH edition, 1974.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (B): Mechanics-II (Dynamics)

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Kinematics and Dynamics of a Particle in Two Dimensions:**
Introduction, Definitions, Expressions for Velocity and Acceleration, Components of Velocity and Acceleration, Tangent and Unit Vector along the Tangent, Curvature and Principal normal, Tangential and Normal Components of Velocity and Acceleration, Angular Speed and Angular Velocity, Angular Acceleration, Radial and Transverse directions, Radial and Transverse Components of Velocity and Acceleration.

Unit II: **Kinetics of a Particle:**
Introduction, Newton's Laws of Motion, Deductions from Newton's Laws of Motion, Matter, Mass, Weight, Linear Momentum, Moment of Momentum or Angular Momentum, Impulsive Force and its Impulse, Conservation of Linear Momentum, Impact of two bodies, Work, Power,Energy, Scalar Point Function and Scalar Field, Vector Point Function and Vector Field, Field of Force, Conservative Field of Force, Potential Function..

Unit III: **Motion of a Projectile and Motion in Resisting Medium:**
Rectilinear Motion, Motion under gravity, Motion of Projectile and Derivation of Equation of its trajectory, Cartesian Equation of the path of Projectile, Vertex and Latus rectum of the Parabola, Velocity of a Particle in terms of its height, Range on an inclined Plane, Projectile to pass through a given Point, Relation $t_1 t_2 = 2R/g$.

Text Book: Tulsani, Warhekar, N. N. Saste, Mechanics and Differential Geometry, S. Chand and Co.

Scope:

Unit I **:** Chap. 1: Art. 1.01 to 1.13.
Unit II : Chap. 2: Art. 2.01 to 2.25.
Unit III: Chap. 3: Art. 3.01 to 3.10 and 3.13, 3.14.

References:

1. B.R. Thakur and G.P. Shrivastav, "Mechanics", Ram Prasad and Sons, Agra-3, New Edition, New Delhi.
2. Shanti Narayan, "Mechanics" S. Chand and Co.
3. S. L. Loney, "An elementary Treatise on Statics", A.I.T.B.S. Publishers and Distributers 2004, New Delhi.
4. J. N. Kapoor and J. D. Gupta , "A text Book of Dynamics", 5th Ed, Ramchand and Co. Delhi
5. M Ray, "A Text Book of Dynamics", S. Chand & Co.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (C): Elementary Number Theory

No. of periods: 60   **Max. Marks: 50**   **Credits: 2**

Unit I: **Preliminaries**: Mathematical Induction, The Binomial Theorem, **Divisibility Theory in Integers**: Division Algorithm, Greatest Common Divisor, Euclidian Algorithm, Diophantine Equation.

Unit II: **Primes and Their Distribution**: The Fundamental Theorem of Arithmetic, The Sieve of Eratosthenes, The Goldbach Conjecture.

Unit III: **The Theory of Congruences**: Basic Properties of Congruence, Binary and Decimal Representations of Integers, Linear Congruences, The Chinese Reminder Theorem.

Text Book: David M. Burton, "Elementary Number Theory", McGraw- Hill Education (India), Private Limited, 7th Edition.

Scope:

Unit I **:** Chap. 1: Art. 1.1, 1.2.
          Chap. 2: Art. 2.2 to 2.5.
Unit II : Chap. 3: Art. 3.1 to 3.3.
Unit III: Chap. 4: Art. 4.2 to 4.4.

References:
1. A. Baker, "A Concise Introduction to the Theory of Numbers", Cambridge University Press, 1984.
2. J. P. Serre, "A Course in Arithmetic- GTM Vol.7", Springer Verlag, 1973.
3. Tom M. Apstol, "Introduction to Analytic Number Theory", Norosa Publishing House, 1980.
4. I. Niven and Zuckerman, "An Introduction to the Theory of Numbers", Wiley, New York, 4th Edition, 1980.
5. Rosen K.H., " Elementary Number theory and its Applications", Pearson Addition Wesely, 5th Edition.

B.Sc. T.Y. Semester-VI
SECM-IV

No. of periods: 45   **Max. Marks: 50**   **Credits: 2**

Choose any one of following skill.

SECM-IV (A) **Insurance Mathematics:**
Basic annuities: Introduction, Annuity-immediate, Annuity-due, Annuity values on any date, Perpetuities, Unknown time, Unknown rate of interest, Varying interest, Annuities not involving compound interest.

References:
1. Kellison Stephen G., The Theory of Interest, 3rd Edition. McGraw-Hill International Edition (2009).
2. UK Institute of Actuaries core leading for the subject CT1-Financial Mathematics.
3. Elliott R.J. and Kopp P.E. Mathematics of Financial Markets. Springer.1999

SECM-IV(B) **Solving problems in Numerical Analysis using Mathematical Software like Matlab, Mapple, Scilab and other software**

References:
1. Getting Started With MATLAB 7 - Rudra Pratap, Oxford University Press, (Indian Eden) www.oup.com
2. Satish Annigeri, "An Introduction to Scilab" December 2009.
3. Sandeep Nagar, "Introduction to Scilab For Engineers and Scientists", APRESS.
4. Introduction to Scilab – Michaël Baudin, Consortium Scilab, 2010
5. The Scilab Consortium. Scilab. http://www.scilab.org.
6. Sylvestre Ledru. Different execution modes of Scilab. http://wiki.scilab.org/Different_execution_modes_of_Scilab.
7. Atlas - automatically tuned linear algebra software. http://math-atlas.sourceforge.net.
8. Cecill and free software. http://www.cecill.info.
9. Intel. Intel math kernel library. http://software.intel.com/en-us/intel-mkl/.
10. Flexdock project. Flexdock project home. https://flexdock.dev.java.net/.

Swami Ramanand Teerth Marathwada University, Nanded

FACULTY OF SCIENCE & TECHNOLOGY

B.Sc. Third Year
Zoology
(Structure and Syllabus)

Choice Based Credit System (CBCS) Course Structure
Semester Pattern Syllabus
Effective from June, 2018

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B.Sc. Third Year (Semester V & Semester VI) Syllabus w.e.f. June, 2018
Semester Pattern; Subject: Zoology

NEWLY DESIGNED CBCS CURRICULA OF B.Sc. THIRD YEAR ZOOLOGY INCLUDING SKILLS

Zoology is a branch of Science which deals with study of the **animal kingdom**. It embodies study of the structure, embryology, evolution, classification, habits, and distribution of all animals, both living and extinct. There are several specializations available to students pursuing this field. There are diverse fields in Zoology like Applied Parasitology, Protozoology, Helminthology, Fishery Science, Entomology, Environmental Biology, Ecology, Animal Physiology, Biochemistry, Embryology, Evolutionary Biology, Genetics, Molecular Cell Biology, Systematics, Ethology, etc. There are many options to choose from depending on individual capabilities and interests.

The University has introduced the Choice Based Credit System (CBCS) in its curricula. Following is a briefing about CBCS as envisaged by the UGC.

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions to begin with. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

DISCIPLINE SPECIFIC ELECTIVE COURSES:

The Discipline Specific Elective Courses (DSEC) offered to students of B.Sc. III Year Zoology are aimed at priming the students for their future careers and/or study in the fields of biological sciences. The students are prepared for pursuing their post-graduate studies. They would also be able to take up entrepreneurship related to biological sciences. Additionally, the students could chose to join public or private sectors like fishery, forestry, wildlife conservation, agricultural research, health services, environmental management and restoration.

THE SALIENT FEATURES:

Ecology & Zoogeography and **Ethology, Biometry & Bioinformatics** are the two compulsory papers in Zoology offered to the B.Sc. III year students in V & VI semesters respectively. The paper in Ecology attempts to elucidate the current state of environment degradation - a serious issue that needs addressing. A good understanding of the dynamic nature of the environment is the core of the first paper. Added to it is also an aspect on the global distribution of different species of animals. The paper on Ethology (or animal behaviour) is the second paper that deals with the different forms of behaviours seen in animals, their methods of learning and their social interactions. An understanding of animal behaviour is of utmost importance to those who deal with study, experimentation, farming or management of animals. The paper also covers fundamental aspects of biostatistics and some topics on bioinformatics.

The elective papers being offered in the last two semesters of the course are **Pisciculture** and **Aquaculture** covering the fields of capture and culture fishery science; **Applied Parasitology – I & II**, dealing with protozoan, helminth and arthropod parasites in human and farm organisms of economic importance; **Entomology – I & II**, dealing with biology, taxonomy, and economic importance of different insect species; **Environmental Biology – I & II**, covering the different aspects of biotic and abiotic components of environment, human influence on the environment and remedial measures at national and international level.

SKILL ENHANCEMENT COURSES

Skill enhancement is a new aspect added to the regular course in the university curriculum. Courses offered in conjunction with the regular papers in the different subjects are designed with the aim of imparting specific skills to the students as they progress through the three years of their degree education. These courses aim at imparting (self) employability skills to the students enabling them to initiate their own entrepreneurship. At the very least, these courses are an attempt to equip the students with skills that would enhance their employability in the relevant farm or agricultural enterprises.

The skill enhancement courses offered under the subject of Zoology are -
 1. Parasites of Public Health Importance
 2. Vermiculture & Vermicomposting
 3. Aquarium keeping
 4. Sericulture

UTILITY OF THE COURSES:

Study of the subjects of Ecology & Zoogeography and Ethology in conjunction with Biometry and Bioinformatics equips the student to take up further study in a wide variety of subjects. It also prepares the student for future research in any of the above or related fields. Such a broad coverage of topics in the final year of the course also helps in widening their perspective of biological sciences. The elective courses offered are related to Fishery Science, Applied Parasitology, Entomology and Environmental Biology. These courses would crystallize the understanding of the specific subjects so that the student could take up specialized post-graduate courses and also pursue research in the relevant field. The students could also explore possibilities in developing themselves in such specialized fields like Fish farming, Fishery management, Parasite control, Parasite related health services, Pest control and management, industries like Sericulture & Apiculture, Environmental Consultancy and Environmental Management services.

A knowledge and understanding of ailments caused by parasites both in man and animals is important in public health management. Intestinal parasites are distributed literally across the globe, with high prevalence in some areas. The prevention and control of these infections are now more feasible than ever before owing to the discovery of safe and efficacious drugs, the improvement and simplification of some diagnostic procedures, and advances in parasite population biology. This course would offer the students with an understanding of the prevention, control and treatment strategies (of these parasites) using the currently available regime of drugs and other chemicals.

Aristotle has said, "Earthworms are intestines of the earth." The importance of earthworms in organic waste management and recycling cannot be under-emphasized. Vermiculture and vermicomposting are the best and environment friendly methods for producing nutrient rich manure for home gardening and agriculture. The course on vermicomposting aims at imparting sufficient understanding and skill to the student for an economically viable activity. Vermiculture is environment friendly since earthworms feed on anything that is biodegradable, vermicomposting can aid in garbage disposal problems. No imported inputs are required, worms are available locally and organic matter for feeding are abundant locally as market wastes, grasses, used papers and farm waste.

The course on Aquarium keeping is an attempt at acquainting the students with the inner workings of fabrication, installation and maintenance of home aquarium. Aquarium keeping is by far the most popular hobby, with small pet shops coming up for sale of a variety of ornamental fish. In common practice, aquarium hobbyists keep glass tanks with different species of fish. Maintaining a fish tank in a healthy state requires knowledge of aquatic ecology, fish biology, species compatibility and their reproductive strategy. Through this course the students would be able take up aquarium keeping as a source of income.

Sericulture is an agro-based industry for production of raw silk both as a cottage and a medium scale industry. India being a predominantly tropical agricultural country has immense scope for

development of sericulture. The course on sericulture could become an attractive opportunity for the students to develop their skill set in this enterprise and start their own industry.

LEARNING OBJECTIVES:

Discipline Specific Elective [DSE] Course Zoology:

The Learning objectives are as follows:

DSEZ-I; Section-A: PAPER-XII- ECOLOGY AND ZOOGEOGRAPHY:

❖ To understand and appreciate the interactions of organisms with their environments and the consequences of these interactions for population, community, and ecosystem dynamics.

❖ To be aware of the current environmental issues with an understanding of the basic ecological concepts involved.

❖ To study the local and geographical distribution and abundance of organisms (habitat niche, community, bio-geography).

❖ To understand the inter-relationship between individuals in population and communities (population ecology).

❖ To study the structural adaptations and functional adjustment of organisms to their physical environment.

❖ To study the conservation and management of natural resources and pollution (applied ecology).

DSEZ-I; Section-B: PAPER-XIII (A)- PISICULTURE:

❖ To exchange and circulate information, ideas and practical experience on all matters relating to fisheries and their management.

❖ To enable students with Fishery specific knowledge for entering PG courses or fishery industries.

❖ To establish and maintain an appropriate Branch and Specialist section structure to meet the local, specialist and overall needs of fisheries interests.

DSEZ-I; Section-B: PAPER-XIII (B)- APPLIED PARASITOLOGY – I

❖ To introduce students to the basic concepts of Applied parasitology.

❖ To expose students to the knowledge of host-parasite relationship.

❖ To give students a broad perspective of epidemiology, transmission, control and treatment of parasitic diseases caused by protozoans and platyhelminthes.

- ❖ To familiarize students with morphologic criteria to differentiate between the most common protozoan and helminth parasites.

DSEZ-I; Section-B: PAPER-XIII (C)- ENTOMOLOGY- I

- ❖ To define general entomology and classifying insects according to their economic importance.

- ❖ To acquaint students with the morphology and anatomy of selected insect species.

- ❖ To introduce students to insect biology.

- ❖ To impart knowledge of insect ecology covering factors like effect of light, temperature, humidity.

DSEZ-I; Section-B: PAPER-XIII (D)- ENVIRONMENTAL BIOLOGY – I

- ❖ To identify the fundamental structure and function of an ecosystem.

- ❖ To compare and contrast different types of ecosystems.

- ❖ To study the Biodiversity and its classifications, identify threats to Biodiversity; know and apply methods to conserve Biodiversity.

DSEZ-II; Section-A: PAPER-XIV- ETHOLOGY, BIOMETRY AND BIOINFORMATICS:

- ❖ To study the behaviour of organism under natural conditions (Ethology).

- ❖ To understand the concepts of Biometry.

- ❖ To get acquainted with and apply the fundamentals of applied statistical methodology.

- ❖ To give students an introduction to the basic practical techniques of bioinformatics.

- ❖ To emphasize the application of bioinformatics and biological databases for problem solving in real-life & research.

- ❖ To familiarize student with the use of a wide variety of internet applications, biological database and to enable them to apply these methods under various situations.

DSEZ-II; Section-B: PAPER-XV (A)- AQUACULTURE:

- ❖ To introduce student to various types of aquaculture and culture methods.

- ❖ To obtain knowledge of fishery science, with a particular emphasis on the biology, assessment, and management of fish and invertebrate fisheries.

- ❖ To create awareness about manmade hazards to aquaculture.

- ❖ To elaborate the role of Larvivorous fishes in relation to public health.

- ❖ To acquire knowledge of Mariculture.

- ❖ To understand and appreciate the role of Government in aquaculture development.

DSEZ-II; Section-B: PAPER-XV (B)- APPLIED PARASITOLOGY – II:

- ❖ To provide a broad-based knowledge and understanding of Parasitology with special emphasis on Parasitic Nematodes and Arthropods.

- ❖ To understand the morphology of nematodes as it relates to their taxonomic position and their ability to cause diseases in plants and animals.

- ❖ To understand and apply the principles of controlling nematode diseases to plants and animals.

- ❖ To describe the basics of arthropods of public health importance.

- ❖ To identify vector - host - pathogen relationships in arthropod-borne diseases.

- ❖ To apply modern tools for surveillance and diagnosis of vector-borne diseases.

- ❖ To provide sufficient knowledge, understanding, and critical judgment appropriate for professional employment in Parasitology or a related discipline.

DSEZ-II; Section-B: PAPER-XV(C)- ENTOMOLOGY- II:

- ❖ To introduce students to the ecology and biology of insects of medical and agricultural importance.

- ❖ To provide students with opportunities to understand insect pest management techniques such as cultural, physical, Biological, chemical, IPM etc.

- ❖ To provide students an adequate knowledge of various types of insecticides and problems associated with their use.

- ❖ To equip students knowledge of practical applications of insecticides and maintenance of pesticide equipment.

DSEZ-II; Section-B: PAPER-XV(D)- ENVIRONMENTAL BIOLOGY – II:

- ❖ To understand pollution status, including its causes and effects on environment.

- ❖ To learn to protect oneself and the environment from the adverse effects of environmental pollution.

- ❖ To use an interdisciplinary approach to analyze environmental issues and problems.

- ❖ To develop a worldview related to an understanding of current environmental issues and how global problems affect us locally.

PRACTICALS:

- ❖ To improve the skills of students in microscopy, whole mount preparation, observations, drawings and laboratory techniques.

- ❖ To acquaint the students with operations of the different laboratory equipment.

- ❖ To equip the student with the necessary skills in standard operating procedures for laboratories and handling of chemicals, reagents and glassware.

- ❖ To instill an understanding of the methods and protocols for handling and maintenance of animals for experiments.

- ❖ To provide basic practical skills and experience in using laboratory techniques in experimentation.

- ❖ To train the students in the analysis of experimental data with statistical and computer aided techniques.

- ❖ To induct the students in the activity of field observation of natural phenomena and organisms through excursion and drafting of reports in a scientific and objective manner.

- ❖ To equip the students with the understanding of taxonomy and other aspects of different organisms so that they become capable of classifying any given organism, at least up to the level of Order.

Skill Enhancement Courses

All the skill enhancement courses included in this curriculum are intended to enable the students to become reasonably self sufficient, thereby increasing their employability. Acquisition of these skills by students will open better opportunities for them in the fields of higher studies and research in addition to increasing their employability.

SECZ –III (E): Parasites of Public Health Importance:

The main learning objectives of this skill course include study of parasites of public health importance. This course is intended to a detailed treatment of parasites with emphasis on almost all major features of Biology of these parasites. The outbreak and spread of these parasitic diseases is found across the globe and that too on a large scale. Due to this, the study of these parasites is of paramount significance, to which this skill set attempts to address.

SECZ –III (F) : Vermiculture and Vermicomposting:

The introduction of this skill in the curriculum is with the objective that the learners should be able to do vermiculture in a systematic way and also be able to get hands on experience in all related activities till vermicomposting. This will increase the awareness and skill availability in the need of the day viz. organic farming.

SECZ –IV (G): Aquarium Keeping:

There has been an increasing trend of keeping ornamental fish among the general public. Proportionately there is increasing demand for aquaria and aquarium fish also. This makes the topic of aquarium keeping a viable subject as a skill. This particular paper of skill is intended to train the students in aquarium keeping starting with the very basic aspects of aquarium fabrication, their setting and maintenance. Economic aspects of aquarium keeping are also covered in this course. Related study like fish identification, preparation of supplementary food of concern fish species is also covered. This skill is more self employability oriented.

SECZ –IV (H): Sericulture:

The skills related to sericulture are included in the curriculum with intention of introducing the students to an important market industry. Sericulture related production has a long history and it is in practice from ancient times. There has been a constant demand of sericulture products. In this view sericulture has high employability potential. For the same reason, this skill set aims to train the students in Mulberry cultivation, silkworm rearing & rearing practices, sericulture economics & marketing.

PREREQUISITES:

The study of the DSECs being offered would be based on previous learning by the student as elaborated below.

Ecology & Zoogeography-

- ❖ Basic knowledge of feeding strategy of animals and plants.

- ❖ Knowledge of interdependence of plants and animals.

- ❖ Awareness about various climatic zones of earth.

- ❖ Understanding of climatic and weather phenomena.

Ethology, Biometry and Bioinformatics-

- ❖ Knowledge of sensory systems in animals.

- ❖ Awareness about nervous systems in animals and their intelligence.

- ❖ A basic sense of behavior and different behaviors.

- ❖ Knowledge of different types of operating systems, general application software.

- ❖ Ability to use internet for searching general information and use of web browser.

Pisciculture & Aquaculture-

- ❖ Understanding of taxonomy of fish.

* ❖ Knowledge of feeding methods and habits of fish.

* ❖ Knowledge of general fish anatomy and morphology.

* ❖ Knowledge of geography of India.

Applied Parasitology-

* ❖ Awareness about morphology and taxonomy of helminthes and arthropods.

* ❖ Awareness of human parasitic diseases.

Entomology-

* ❖ Understanding of general morphology and taxonomy of phylum Arthropoda.

* ❖ Knowledge of the role of insects in agricultural and natural ecosystems.

Environmental Biology-

* ❖ Knowledge about geography of India.

* ❖ Awareness about industrial status of Maharashtra and India.

* ❖ Understanding about feeding strategy of animals and plants.

* ❖ Knowledge about basic chemical processes and various chemicals used by society.

Every paper of the skill offered in this curriculum is sufficiently related with one or the other of the optional papers of the curriculum.

The initiative by this University to remodel the curriculum and to introduce Skill Enhancement courses in respective subjects is in line with the UGC guidelines on CBCS. These changes in the overall structure of the courses are definitely going to benefit the students and also help teachers in their academic development.

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Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure
Faculty of Science& Technology
B. Sc. Third Year (Semester V& Semester VI) Syllabus w.e.f. June, 2018
Semester Pattern; Subject: Zoology

Class/ Semester	Course Number		Name of the Course/ Paper	Instruction Hrs/Week	Total Periods/ Practicals	Marks for		Total Marks	Credits
						Internal (CA)	External (ESE)		
B.Sc. T.Y. Semester V	DSEZ-I	Section -A	PAPER-XII- ECOLOGY AND ZOOGEOGRAPHY	03	45	10	40	50	Credit:02
		Section-B **(Select Any one paper from A/B/C/D)**	PAPER-XIII (A)- PISICULTURE	03	45	10	40	50	Credit:02
			PAPER-XIII (B)- APPLIED PARASITOLOGY - I						
			PAPER-XIII (C)- ENTOMOLOGY- I						
			PAPER-XIII (D)- ENVIRONMENTAL BIOLOGY - I						
	DSEZP-I	[DSEZ I & II] (Section A)	Practical Paper- XVI-ECOLOGY,ZOOGEOGRAPHY ETHOLOGY, BIOMETRY AND BIOINFORMATICS (Practical based on P-XII & XIV)	03	30	10	40	50	Credit:02
	SECZ-III		SEC-III Any one Skill to be chosen out of Two SECZ –III (E) : PARASITES OF PUBLIC HEALTH IMPORTANCE SECZ –III (F) : VERMICULTURE AND VERMICOMPOSTING	03	45	25	25	50	Credit:02
B.Sc. T.Y. Semester VI	DSEZ-II	Section -A	PAPER-XIV- ETHOLOGY,BIOMETRY AND BIOINFORMATICS	03	45	10	40	50	Credit:02
		Section-B **(Select Any one paper from A/B/C/D)**	PAPER-XV (A)- AQUACULTURE	03	45	10	40	50	Credit:02
			PAPER-XV (B)- APPLIED PARASITOLOGY - II						
			PAPER-XV (C)- ENTOMOLOGY- II						
			PAPER-XV (D)- ENVIRONMENTAL BIOLOGY - II						
	DSEZP-II	[DSEZ I & II] (Section B) **{Select Any one paper from A/B/C/D}**	Practical Paper- XVII (A)- PISICULTURE & AQUACULTURE (Practical based on P-XIII(A)& XV (A))	03	30	10	40	50	Credit:02
			Practical Paper- XVII(B)- APPLIED PARASITOLOGY-I & II (Practical based on P-XIII(B)& XV(B))						
			Practical Paper- XVII(C)- ENTOMOLOGY-I & II (Practical based on P-XIII(C)& XV(C))						
			Practical Paper- XVII(D)- ENVIRONMENTAL BIOLOGY –I & II (Practical based on P-XIII(D)& XV(D))						
	SECZ-IV		SEC-IV Any one Skill to be chosen out of Two SECZ –IV (G): AQUARIUM KEEPING SECZ –IV (H): SERICULTURE	03	45	25	25	50	Credit:02
Total Credit for Semester V & VI						110	290	400	**Credit:16**

DSEZ: Discipline Specific Elective Course Zoology, **DSEZP:** Discipline Specific Elective Course Zoology Practical, **CA:** Continuous Assessment;

ESE: End of Semester Examination, **SECZ:** Skill Enhancement Course Zoology

SECZ: **CA-25:** Seminar-15 & Test-10 **ESE-25:** Report Submission-10; Overall Skill Judgment-10 and Presentation-05

ESE for SECs SECZ-III & SECZ-IV and Practical Papers DSEZP-I & DSEZP-II(A/B/C/D) for both semesters V & VI respectively will be at the end of Academic Year in Annual Pattern.

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Semester -V

Paper: DSEZ-I; Section –A

Title of Paper: Paper-XII -Ecology & Zoogeography

Periods : 45	Credits: 02 (Marks: 50)

UNIT – I   12

1. **Ecology-**Introduction and Scope of Ecology
2. **Introduction to Ecosystem**
   - 2.1. Components of an ecosystem
     - a) Abiotic components – Light, Temperature & Water
     - b) Biotic components – Producers, Consumers & Decomposers.
   - 2.2. Types of Ecosystem- **Aquatic**- Pond ecosystem.
                                          Terrestrial- Desert Ecosystem.
   - 2.3. Food Chain, Food Web, Ecological Pyramids.
   - 2.4. Energy Flow in an Ecosystem.

3. **Bio-geochemical Cycles**
   - 3.1. **Gaseous Cycle**- Oxygen Cycle
   - 3.2. **Sedimentary Cycle**- Sulphur Cycle
4. **Spheres of Earth**
   - 4.1. Atmosphere
   - 4.2. Lithosphere
   - 4.3. Hydrosphere
   - 4.4. Biosphere
   - 4.5. Ecological Succession-, Trends, Basic Types, Hydrarch and Xerarch

UNIT – II   11

1. **Population Ecology –**
    Characteristics of Population
   - 1.1 Natality
   - 1.2 Mortality
   - 1.3 Population Dispersal
   - 1.4 Population density
   - 1.5 Age distribution
   - 1.6 Population Growth Form
   - 1.7 Population Equilibrium and Fluctuation

2. Biotic interactions
2.1 Positive interactions – Commensalism, Mutualism
2.2 Negative interactions – Competition, Predation, Parasitism

UNIT – III   11

1. Pollution – Sources, Effects and Control
1.1 Air Pollution
1.2 Water Pollution
1.3 Noise Pollution

2. Energy Resources
2.1 Conventional energy resources and their limitations
    2.1.1 Fossil Fuels
    2.1.2 Nuclear Power
    2.1.3 Hydel Power
2.2 Non-conventional energy resources – Advantages, Limitations & Latest developments
    2.2.1 Solar Energy
    2.2.2 Wind Energy
    2.2.3 Tidal Energy

UNIT – IV   11

1. Adaptations
1.1 Aquatic Adaptations
1.2 Desert Adaptations
1.3 Volant Adaptations
2. Wildlife Conservation and Endangered Species
2.1 Aims & necessity of wildlife conservation
2.2 Wild life and Endangered species of India
2.3 Measures to protect endangered species in India
2.4 Sanctuaries and National parks in India

3. Zoogeographical Realms –
Physical features and fauna of following Realms in Brief.
3.1 Oriental Realm
3.2 Australian Realm

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Semester -V

Paper: DSEZ-I; Section -B
Title of Paper: Paper- XIII (A)-Pisciculture

Periods : 45	Credits: 02 (Marks: 50)

UNIT- I   **11**

1. **Fish Farm Engineering**
   1.1 Topography;   1.2 Soil type;   1.3 Water supply;   1.4 Layout of fish farm
2. **Fish Farm Management**
   2.1 Preparation and Management of Nursery pond
   2.2 Preparation and Management of Rearing pond
   2.3 Preparation and Management of Stocking Pond

UNIT - II   **12**

1. **Biology of Indigenous and Exotic carps.**
2. **Fish seed resources**
   2.1 Natural resources- Riverine resources
   2.2 Artificial resources- Induced breeding by Hypophysation
   a) Historical back ground   d) Chinese hatchery
   b) Technique of Induced breeding   e) Striping method
   c) Bundh breeding
   2.3 Transportation of fish seed and brooders
3. **Capture Fishery**
   Introduction, Capture Fishery Resources in India.
   1. Sardine fishery   2. Mackerel fishery   3.Bombay Duck fishery

UNIT III   **11**

1. **Fishing Methods**
   1.1 Gears - Traps, Gill nets, Cast nets, Drag nets
   1.2 Crafts - Masula, Catamaron, Odum, Vanchi
   1.3 Recent advances in fishing methods - Electrical Fishing, Light Fishing and Fish finder
2. **Fish Diseases**
   2.1 Fish Diseases caused by Pathogens and Parasites- Symptoms and Treatment
   a) **Bacterial-** Dropsy, Furunculosis, Tailrot or Finrot
   b) **Fungal-** Gillrot, Dermatomycoses   c) **Protozoan**- Costiasis, Ichthyophithirius
   d) **Helminth-** Gyrodactylosis, Dactylogyrosis e)**Arthropod**- Lernaeasis, Argulusis
   2.2 Non parasitic diseases-   a) Environmental fish diseases- Acidosis, Alkalosis, Gas bubble
                              b) Nutritional / Dietary diseases

UNIT IV   **11**

1. **Fish Preservation and Processing**
   a) Causes of spoilage of fishes
   b) **Methods of fish preservation –** Chilling, Freezing, Freezing-drying, Smoking,   Drying, Salting and Canning.
2. **Fish By- Products-**Fish Oil (Fish Liver oil and Fish body oil), Fish Meal, Fish Manure, Fish Protein, Isinglass, Fish Glue, Fish Leather, Fish Pearls, Fish Soap, Fish Insulin.

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Semester -V

Paper: DSEZ-I; Section -B
Title of Paper: Paper- XIII (B)-Applied Parasitology-I (Parasitic Protozoa and Platyhelminthes)
Periods : 45   **Credits: 02 (Marks: 50)**

Unit -I –   **11**
1. **Introduction to Parasitology** :
   1.1 Brief introduction of Parasitology, Parasitism, Parasite, Host, Vector, Host parasite relationship.
   1.2 Scope and Branches of Parasitology.
2. **Parasitic Protozoa:** Classification and general organization of parasitic Protozoa
3. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of
   1. *Entamoeba histolytica,*   3. *Trichomonas vaginalis*
   2. *Giardia intestinalis,*

Unit – II   **12**
   Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of
   1. *Trypanosoma gambiense*   4. *Plasmodium vivax*
   2. *Balantidium coli*   5. *Eimeria tenella*
   3. *Sarcocystis cruzi,*

Unit – III   **11**
   Parasitic Platyhelminthes: Trematodes
1. Introduction, Classification, General organization of Trematodes.
2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of-
   i. *Schistosoma haematobium.*
   ii. *Paragonimus westermani.*
   iii. *Gastrodiscoides hominis.*
3. Parasitic adaptations in Trematodes.
4. Larval forms in Trematodes.

Unit – IV   **11**
   Parasitic Platyhelminthes: Cestodes
1. Introduction, Classification, General organization of Cestodes.
2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of-
   i. *Taenia saginata.*
   ii. *Taenia solium*
   iii. *Echinococcus granulosus.*
3. Parasitic adaptations in Cestodes
4. Larval forms in Cestodes

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Semester -V

Paper: DSEZ-I; Section -B
Title of Paper: Paper- XIII (C)- Entomology-I (General Entomology)

Periods : 45	**Credits: 02 (Marks: 50)**

UNIT –I   **06**
Introduction:
   1. Importance and Scope of Entomology
       (Agriculture, Forest, Medical, Forensic and Industrial)
   2. Salient features of class Insecta.
   3. Methods of collection, preservation and study of insects.

UNIT -II   **15**
Type study: Cockroach
   1. Classification, External Morphology including sexual dimorphism.
   2. Digestive system
   3. Respiratory system
   4. Nervous system and Sense organs
   5. Reproductive system

UNIT –III   **12**
Insect Taxonomy
   Salient features with suitable examples of following orders:
   i.   Thysanura
   ii. Orthoptera
   iii. Odonata
   iv. Diptera
   v.   Isoptera
   vi. Hymenoptera
   vii. Lepidoptera
   viii. Coleoptera

UNIT –IV   **12**
Insect Metamorphosis-
   1. General idea about metamorphosis and Types of Metamorphosis
      Ametabola, Hemimetabola, Paurometabola and Holometabola.
   2. Hormonal control of metamorphosis in insects.
   3. Insect Ecology: Effect of light, temperature, humidity and food on insect life.

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Semester -V

Paper: DSEZ-I; Section -B
Title of Paper: Paper- XIII (D)-Environmental Biology - I

Periods : 45	**Credits: 02 (Marks: 50)**

Unit-I   **12**
1. Introduction and Scope of Environmental Biology
    1.1 Atmosphere: Composition, Structure and Importance
    1.2 Hydrosphere: Chemical and Physical properties of water
    1.3 Lithosphere: Structure and Composition, Physical and chemical properties of soil.
        Soil profile and process of soil formation
2. **Biogeochemical Cycles**
    2.1 Hydrological Cycle   2.2 Nitrogen Cycle
    2.3 Carbon Cycle   2.4 Sulphur Cycle

Unit: II   **11**
1. **Ecosystem**
    1.1 Concept and structural components of an Ecosystem
    1.2 Energy flow in an ecosystem
    1.3 Ecological pyramids-
        Pyramid of Numbers, Pyramid of Biomass and Pyramid of Energy.
    1.4 Food chains and Food web
        (a) Food chains-Grazing, Parasitic, Saprophytic or Detritus food chain
        (b) Food web.
2. **Marine Ecosystem-**
    2.1 Zonation in-
        a) Marine habitat
        b) Intertidal habitat

Unit – III   **11**
1. **Biodiversity-** Concept and Characteristics of Biodiversity
    1.1 Role of Biodiversity
    1.2 **Threats to Biodiversity-** Habitat degradation and its loss, Invasion of non native species,
        Species interdependence, Soil Erosion, pollution, Over- Exploitation of Resources,
        Change in the Global Environment.
    1.3 Biodiversity conservation
        i) In-Situ conservation
        ii) Ex-Situ conservation
    1.4 Biodiversity of India

Unit-IV   **11**
1. **Wild life and its conservation-**
    1.1 Aims and Necessity of Wild life Conservation
    1.2 Causes for wild life depletion.
    1.3 Management and Conservation of wild life
    1.4 Sanctuaries and Zoological Parks in India

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Semester- VI

Paper: **DSEZ-II; Section -A**

Title of Paper: Paper- XIV-Ethology, Biometry and Bioinformatics

Periods : 45   **Credits: 02 (Marks: 50)**

UNIT – I Ethology   **09**
1. **Classification of Animal Behavior-**
   1.1. Inborn or stereotyped animal behavior – Taxis and Instincts with examples.
   1.2. Acquired animal behavior – Imprinting, Conditioning, Habituation, Reasoning.
   1.3 Social Behaviour in Insects –Honeybee.

UNIT – II Ethology   **12**
1. **Communication in animals**
   1.1 Auditory Communication
   1.2 Chemical Communication
   1.3 Visual Communication
   1.4 Tactile Communication
2. **Mimicry and Colouration**
   2.1 Types of Mimicry- Protective and Aggressive
   2.2 Types of Colouration- Protective, Aggressive and Warning

UNIT – III Biometry   **12**
1. **Collection and Classification of Data**
   1.1 Methods of collection of data
   1.2 Types of classification of data - Geographical, Chronological, Quantitative, Qualitative, Continuous, Discontinuous.
2. **Measures of Central Tendency**
   Arithmetic Mean, Median and Mode
3. **Graphic Representation of Data**
   1.1 Histogram
   1.2 Pie Diagram
   1.3 Polygon Frequency Curve

UNIT – IV Bioinformatics   **12**
   1.1 Computer and their Applications in Biology
   1.2 Internet and its Uses
   1.3 World Wide Web
   1.4 Search Engines
   1.5 Broad Applications of Bioinformatics
   1.6 Introduction to Biological Database
      a) NCBI   b) Pub Med

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Semester- VI

Paper: **DSEZ-II; Section -B**
Title of Paper: Paper- XV(A)-Aquaculture

Periods : 45	**Credits: 02 (Marks: 50)**

UNIT- I   **11**

1. **Introduction to Aquaculture**
   i) Definition, Scope and importance of aquaculture
   ii) Concepts of extensive aquaculture, intensive aquaculture.
2. **Types of Aquaculture**
   i) Monoculture   ii) Polyculture
   iii) Integrated fish farming –
   a) Paddy cum fish culture   c) Cattle-cum fish farming
   b) Fish-cum pig farming   d) Fish-cum duck farming

UNIT – II   **11**

1. **Culture Methods**   i) Pen culture   ii) Cage culture
2. **Sewage Fed Fish Culture**
   i) Composition of sewage
   ii) Use of sewage for fish culture
   iii) Fish species suitable for sewage fed fish culture
3. **Man Made Hazards and Aquaculture**
   i) Domestic Sewage
   ii) Agricultural Sewage
   iii) Industrial Effluents

UNIT III   **12**

1. **Characteristics of Water**
   i) Physical   ii) Chemical   ii) Biological
2. **Larvivorous Fishes**
   i) Characteristics of Larvicidal Fishes.
   ii) Larvicidal Fishes in India- Exotic species; Indigenous Species
   iii) Role of Larvivorous fishes in relation to Public health
3. **Aquatic weeds and their control**
   i) Types of weeds   ii) Advantages and Disadvantages of weeds
   iii) Weed Control – Manual, Mechanical, Chemical and Biological

UNIT IV   **11**

1. **Culture of Non Fish Organisms**
   1. Fresh water Prawn Culture
   2. Pearl Oyster Culture and Edible Oyster Culture
   3. Mussel Culture
2. **Mariculture**
   i) Introduction   ii) Types of Mariculture
   iii) Fish Species for Mariculture
3. **Government Participation in Aquaculture**
   ICAR, Ministry of Agriculture, Ministry of Commerce, Ministry of Food Processing Industry.

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Semester- VI

Paper: DSEZ-II; Section -B
Title of Paper: Paper- XV (B)Applied Parasitology-II (Parasitic Nematodes and Arthropods)

Periods : 45	Credits: 02 (Marks: 50)

UNIT –I   **12**
Parasitic Nematodes: Animal Nematodes
1. Introduction, Classification, General organization of Animal Nematodes.
2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of-
    1. *Enterobius vermicularis*
    2. *Ancylostoma duodenale.*
    3. *Wuchereria bancrofti.*
3. Larval forms in Animal Nematodes

UNIT – II   **11**
Parasitic Nematodes: Plant Nematodes
1. Introduction, Classification, General organization of Plant Nematodes
2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of-
    1. *Meloidogyne* (Root knot nematode),
    2. *Heterodera* (Cyst nematode)
    3. *Tylenchulus* (Citrus nematode)

UNIT – III   **11**
Parasitic Arthropodes
  1. Systematic Position, Geographical Distribution, Morphology, Life Cycle, diseases and Control Measures of –
    i. Acarina-Ticks & Mites.
    ii. Parasitic Hemiptera -Bed Bug *(Cimex lacturalis)*
2. Parasitic flies-Outline Classification, Morphology, role as vectors of Human diseases and Control Measures of House Fly (*Musca domestica*), Bot Fly (*Dermatobia hominis*)

UNIT – IV   **11**
1. Morphology, pathogenecity and Control Measures of –
    i) *Siphonaptera* ii) *Anopleura* iii) *Mallophaga* iv) *Hymenoptera*
2. Mosquitoes as a vector in the transmission of Malaria, Dengue fever, Elephantiasis, Yellow Fever, Chikungunia and their control measures

3. Chemical and Biological Control of Insets.

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Semester- VI

Paper: DSEZ-II; Section -B
Title of Paper: Paper- XV (C)-Entomology-II (Applied Entomology)

Periods : 45	Credits: 02 (Marks: 50)

UNIT- I 12
1. **Pest**
     1.1 Concept of a Pest
     1.2 Types of Pests: Agricultural, Veterinary and Human Pests and Household Pests
2. **Study of Agriculture Pests (Classification bionomics, control measures of the following)-**
     a) Cotton-Boll worm, red cotton bug
     b) Jawar-stem borer, Midge fly
     c) Sugarcane- Pyrilla
     d) Oil seeds – Ground nut White grub, Safflower-aphid
     e) Fruits- Lemon butter fly, Mango Stem borer, mango stone weevil
     f) Stored grain pest- Rice weevil, Pulse Beetle

UNIT- II 11
1. **Human and Household insect pests (Structure, Binomics and control measures of the following)-**
     a) Housefly
     b) Cockroach
     c) Cricket
     d) Mosquito
     e) Rat flea
     f) Bed bug
     g) Head louse
2. **Study of non-insect animal pests and their control-**
     a) Rat
     b) Pig
     c) Monkey
     d) Birds
     e) Deer

UNIT- III 11
1. **Culture of Beneficial Insect (Gross Study)-**
     a) Sericulture
     b) Apiculture
     c) Lac culture

UNIT- IV 11
1. **Pest Control Methods-**
     a) Chemical control and safe handling of pesticides
     b) Biological control of insect pests
     c) Physical and Mechanical control of insect pests
     d) Integrated pest management of insect pests

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Semester- VI

Paper: DSEZ-II; Section -B

Title of Paper: Paper- XV (D)-Environmental Biology -II

Periods : 45	Credits: 02 (Marks: 50)

UNIT- I   **11**

1. **Introduction to Environmental Pollution-**
   1.1 Origin of Pollution.
   1.2 Pollutants: The Creators of pollution,
   1.3 Types of pollutants- Biodegradable and Non- Biodegradable Pollutants.
   1.4 Kinds of pollution

2. **Water Pollution**
   2.1 Types of Water pollution, Kinds and sources of Water pollutants
   2.2 Sources and Effects of water pollution.
      a) Pollution by Sewage and Domestic Waste, Eutrophication and Algal blooms
      b) Pollution by Heavy Metals; Sources and Effects of Lead and Mercury
   2.3 Assessment and Monitoring of Water pollution.
   2.4 Control of Water pollution.

UNIT- II   **12**

1. **Air Pollution: Types, Sources and Effects of Air Pollutants-**
   1.1 Thermal Power Plants, Industrial Chimney Waste, Automobile Exhausts
   1.2 Sulphate compounds as Air pollutants: Sources and Effects
   1.3 Oxides of Nitrogen as Air pollutants: Sources and Effects
   1.4 Carondioxide and Carbon Monoxide as Pollutant: Sources and effects
   1.5 Acid rains
   1.6 Ozone as a Protector and Destroyer
   1.7 Chlorofluro Carbons (CFCs)
   1.8 Photochemical Smog
2. Control of Air pollution.

UNIT-III   **11**

1. **Radioactive Pollution:** Sources, Effects and Control of Radioactive pollution
2. **Pollution by Solid Wastes:** a) Types and source of Solid wastes
   b) Effects of solid waste pollution
   c) Methods of Solid wastes Disposal.
3. **Noise Pollution:** Sources, Effects and Control of Noise pollution

UNIT-IV   **11**

1. **Pollution Control Legestalation**
   1.1 The Water (Prevention and Control of pollution) Act-1974
   1.2 The Air (Prevention and Control of pollution) Act-1981
   1.3 The Environment (Protection) Act- 1986
   1.4 Environmental Education in India (Concept and role)
   1.4 Water Resources: Infiltration, Gallflies and Wells
   1.5 Water Treatment Methods: Sedimentation Tank, Aerobic Treatment, Trickling Filters, Anaerobic Treatments, Imhoff Tanks

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Zoology
Practical Syllabus

Paper: DSEZP-I (Based on DSEZ-I; Section-A& DSEZ-II; Section-A)
Title of Paper: Paper- XVI -Ecology, Zoo-geography, Ethology, Biometry and Bioinformatics

Periods : 15+15   **Credits: 02 (Marks: 50)**

Ecology
1. Estimation of Dissolved O_2 from Water Sample.
2. Estimation of Dissolved CO_2 from Water Sample.
3. Estimation of Population Density from Water Sample/ Terrestrial area.
4. Determination and study of Atmospheric Humidity.
5. Study of positive and negative interactions (biotic interaction) in animals.
6. Estimation of Chlorides, Salinity, Hardness from given water sample for Water quality status
7. Ecological Adaptations (Any two examples from each to be studied)
    a) Volant Adaptations.
    b) Aquatic Animals (from fresh water and marine environment).
    c) Desert Animals.
8. Report on a Field Visit to Zoo Park/National Park/Biodiversity Park/Wild Life Sanctuary to study management, behavior and enumeration of wild animals.

Zoogeography
1. Museum study of Vertebrate Endangered Species or Threatened Wild Animals on the Basis of charts/ models/ photographs (Any Five).
2. Identification of Zoogeographical Realms from the Map and Identify Specific Fauna of Respective Regions.

Ethology
1. To study the Positive and Negative Phototropism with suitable examples.
2. To study the Positive and Negative Chemotactic Response with suitable examples.
3. Study of Colouration of animals with suitable examples.

Biometry
1. Problems Based on Mean, Mode, Median.
2. Classification of Data- i) Histogram, ii) Pie-Diagram, iii) Polygon Frequency Curve.

Bioinformatics
1. To perform online search on Biological information/Literature
2. How to access the biological data from NCBI and Pub Med
3. BLAST- Sequence Search & alignment.

Note: All animal based practical's should be conducted with the help of Models, Charts and Computer Aided Techniques.

REFERENCE BOOKS BASED ON PAPER: DSEZ-I& II (SECTION A), PAPER: DSEZP-I
Paper XII & XIV; XVI

1) Animal Ecology- R.K.Gupta and B.S. Malik, Pragati Prakashan, Meerut
2) Cell Biology,Genetics, Molecular Biology, Evolution and Ecology- P.S. Verma and
   V.K.agrawal, S. Chand and Co. Ltd. New DelhiPublication
3) Animal Behaviour- M.P. Arora, Himalaya publication.
4) Animal Behaviour- Vinod Kumar, Himalaya publication.
5) Principles of Ecology-Odum, Sunder Publication.
6) Introduction to Bioinformatics- S. Sundara Rajan, R. Balaji, Himalaya Publication.
7) Biostatistics- S.P. Gupta
8) Economic Zoology, Biostatistics and Animal Behaviour- Shukla, Mathur, Prasad, Upadhyay.
9) Animal Behaviour, Concept, Process and Method (Wadsworth)- Drickamer & Vessey.
10) Biology of Animal Behaviour- Grier
11) Introduction to Ethology (Plenum Press)- Immelmann
12) The Foundation of Ethology – Lorenz
13) An Introduction to Animal Behaviour- Manning
14) Animal Behaviour in Laboratory and Fields- Prince and Stoker
15) Ecology, Individuals, Populations and Communities-Begonm, J. L.
    (BlackWell Science, Oxford, UK)
16) Ecological Concept- Cherrett J. M. (BlackWell Science, Oxford, UK)
17) Fundamental of Ecological modeling-Jorgensen S.E. (Elsevier, New York)
18) Animal Behaviour- A synthesis of ethology and comparative Psychology- Hinde R.A.
    (Mcgraw-Hill New York)
19) Bioinformation- A Biologist Guide to Biocomputing & Internet- Brown,
    S.M. Eaton Publication New York
20) Fundamental Concept of Bioinformation- Krane & Raymer, Persons Education, 2003
21) Introduction to Bioinformation – Attwood & Parry- Smith, Persons Education, 2003
22) Zoogeography- Darlington
23) Practical Methods in Ecology- Peter Henderson

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PRACTICAL QUESTION PAPER
SUBJECT: ZOOLOGY

PAPER- DSEZP-I: (Based on DSEZ-I; Section-A& DSEZ-II; Section-A)
TITLE OF PAPER - Ecology, Zoo-geography, Ethology, Biometry and Bioinformatics (P-XVI)

Centre:	**Date:**
Batch No.:	**Session:**
Marks: 40	**Time: 04 Hrs**

Q.1 Estimation of Dissolved O_2 / CO_2 from Water Sample. *Or*   **10**

Estimation of Population Density from Water Sample/ Terrestrial area. *Or*

Determination and study of Atmospheric Humidity. *Or*
Identify and comment on Biotic Interactions of Animals. (Two examples of Positive interaction and Three examples of Negative interaction)

Q.2 Estimation of Chlorides& Salinity/ Hardness from given water sample for Water quality status   **08**

OR

Identify and describe. (Any Two examples of Endangered species and Two example from Ecological Adaptation). *Or*

Identification of Zoogeographical Realms (Any Two) from the Map and Identify Specific Fauna of Respective Regions

Q.3 To study the Positive and Negative Phototropism with suitable examples *Or*   **10**

To study the Positive and Negative Chemotactic Response with suitable examples *Or*

Study of Colouration of animals with suitable examples

Q.4 Give the diagrammatic representation of data with Histogram or Pie-Diagram or Frequency Polygon Curve. *Or*   **08**
Solve any two problems based on Problems Based on Mean, Mode, Median.

OR

To perform online search on Biological information/Literature. *Or*
Determine sequence of protein or DNA from the provided file. *Or*
Any problem or activity based on bioinformatics.

Q.5 Viva-Voce   **04**

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = Total 10 Marks.
    a) Submission of Record book & Submission of Report on a Field Visit = 05 Marks And
    b) Internal Test on Practicals=05 Marks.
  2. Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS) Course Structure
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018

Zoology
Practical Syllabus

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Pisciculture andAquaculture {XVII (A)}

Periods : 15+15	**Credits: 02 (Marks: 50)**

1. Diagrammatic presentation or Layout Plan for a Typical Fish Farm.
2. Demonstratation or dissection of brain, pituitary gland, reproductive system and digestive system of any locally available bony fish.
3. Examination and Analysis of Stomach Content of Fishes (Carnivorous and Herbivorous).
4. To study the Habit and Habitat of some Indigenous and exotic culturable freshwater fishes.
5. To Study spawn, fry, Semi-fingerlings and fingerlings of Indian major carps and exotic carps.
6. To study the Habit and Habitat of some Marine water fishes for Capture Fishery (any five).
7. Preparation and identification of fishing Craft/Gear model (Using locally available material).
8. Study of Fish Diseases caused by Pathogens and Parasites (Bacterial, Fungal, Protozoan, Helminth, Arthropod etc.).
9. Study of fish Preservation Methods (e.g. Salting, Drying, Pickling, Smoking, etc.).
10. Preparation and Study of fish by-product (Fish pickle, Fish chips, decorative/utility article using fish body parts or whole fish).
11. Identification, classification and description of Fish species for Monoculture, Polyculture, Integrated fish farming and Sewage fed fish culture.
12. Estimation of O_2 content, NPK, Ca, Na in Sewage Water sample.
13. Estimation of pH, Hardness (Magnesium and Calcium) and Turbidity in water Sample.
14. Identification of Phytoplankton and Zooplanktons (any five).
15. To study the Habit and Habitat of important Larvicidal fishes (any five).
16. Identification of Common Aquatic Weeds of Freshwater Fish Ponds
17. Control of the Common Aquatic Weeds of freshwater.
18. Identification and study of Non Fish Organisms (any three).
19. Identification, classification and description of Fish species for Mariculture
20. Visit to Fish Breeding Farm/ Fish Industry and Submission of report.

Note: All animal based practical's should be conducted with the help of Models, Charts and Computer Aided Techniques.

REFERENCE BOOKS BASED ON PAPER: DSEZ-I& II (SECTION B) PAPER: DSEZP-II
Paper XIII-A & XV-A; XVII (A)

1. Fish and fisheries of India- V.G. Jhingran, Hindusthan Publishing Company.
2. Fish and Fisheries – K. Pandey and J.P.Shukla, Rastogi Publications, Meerut.
3. Fisheries and Aquaculture- Ravi Shankar Piska, Lahari Publications, Hyderabad.
4. Concepts of Aquaculture- Ravi Shankar Piska, Lahari Publications, Hyderabad.
5. Fresh water fish pond culture and management – Marilyn Chakroff. Pace crops scientific publishers – Jodhapur.
6. World fish farming cultivation and Economics- E. E. Brown Pvt. Pub. Co. U. S. A. 1983.
7. Aquaculture – Bardach J. E. J. H. Ryther and W.O. Meharney Wiley – Ind. Sci., New York.
8. Aquaculture- R. J. Reay – Arnold- Heive Mann Publishers, India,
9. An Introduction to fishes – S. S. Khanna, Central Book Dept., Allahabad
10. A Manual of fresh water aquaculture – R. Sonthanam, N. Sukumaran & P. Niligajan
11. A text book of Fishery Science and Indian fisheries –C. B. C. Shrivastav Kitalb Mahal, Nagpur.
12. Principles of Ecology- P.S. Verma, V.K. Agrawal- S.Chand Publication.
13. Prawn and Prawn Fisheries of India- Kurian C. V. and Substian.
14. Fish Biology and Indian Fisheries- R. P. Parihar, Central Publishing House, Allahabad.
15. Encyclopedia of Fishes and Fisheries of India- Pandey A. K. and Sandhu.
16. Fisheries in India- Misra S.B.
17. Fisheries Global Perspective – Cherunilam.
18. Fish Processing and Preservation- Charls L. Cutting, Agro Botanical Publisheres (India)
19. Fish and fish products – Winton A. L.
20. Pond & Fish culture - Hall C. B.
21. Fishery Management – Agrawal.
22. Costal Aquaculture in India- Santhanam R.
23. Marine Fisheries of India- VirbhadraRao and Bal.
24. Introduction to fish technology- Regenstein.
25. Fresh water fish culture- Wankhede and Deshmukh.
26. Aquaculture Development- Amitabh Patel, S. N. Pathak.
27. A Text book of Aquaculture- Rao K. R. S. S., Reddy M.S., Discovery Publication, Delhi.
28. A Text Book of Pisciculture & Aquarium Keeping- H. S. Jagtap, S. N. Mukherjee & V. K. Garad., Daya Publishing House, New Delhi.
29. Practical Manual of Pisciculture and Aquarium Keeping- H. S. Jagtap, S. N. Mukherjee & S. S. Nanware, Daya Publishing House, New Delhi.
30. General and Applied Ichthyology (Fish and Fisheries)- S.K.Gupta and P.C.Gupta.S.Chand & Compony Ltd., New Delhi.
31. Manual of Experimental Ichthyology-Gahlawat, Gupta,Yadava, Jain, Sihag, Sabhlok, Daya Publishing House, Delhi
32. Modern Experimental Zoology-Gupta and Chaturvedi. Raj Publishing House, Jaipur.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018
PRACTICAL QUESTION PAPER

SUBJECT: ZOOLOGY

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Pisciculture and Aquaculture {XVII (A)}

Centre:	**Date:**
Batch No.:	**Session:**
Marks: 40	**Time: 04 Hrs**

Q.1 Diagrammatic presentation or Layout Plan for a Typical Fish Farm **10**

<div align="center">OR</div>

Dissect out/Demonstrate Brain/ Pituitary Gland/ Digestive System/ Reproductive System of any locally available bony fish

<div align="center">OR</div>

Examination and Analysis of Stomach Content of Carnivorous/ Herbivorous Fish

<div align="center">OR</div>

Identify, Classify and Describe Indigenous & exotic culturable freshwater fishes (Any Two), spawn/ fry/fingerlings of Indian major carp or exotic carp (Any One) and Marine water fishes for Capture Fishery (Any Two).

Q.2 Identification and description of Fishing Craft/Gear model (using locally available material). **08**

<div align="center">OR</div>

Identify and describe Fish Diseases caused by Pathogens and Parasites (Bacterial/Fungal, Protozoan, Helminth, Arthropod etc.) One from Each.

<div align="center">OR</div>

Study of fish preservation methods (Salting, Drying, Pickling, Smoking, etc.)

<div align="center">OR</div>

Preparation and Study of fish by-product (Fish pickle/Fish chips/ decorative/ utility article using fish body parts or whole fish)

Q.3 Identification, classification and description of Fish species for Integrated fish farming (Any Three) and Sewage fed fish culture (Any Two). **10**

<div align="center">OR</div>

Estimation of O_2 content/ NPK in Sewage Water sample.

Q.4 Estimation of pH/ Hardness (Magnesium and Calcium)/ Turbidity in water sample **08**

<div align="center">OR</div>

Identify and Describe Phytoplankton/ Zooplanktons, Larvicidal Fish/Aquatic Weeds, Non Fish Organism and Fish Species for Mariculture (One from Each)

Q.5 Viva-Voce **04**

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = Total 10 Marks.
   a) **Submission of Record book & Submission of Report on a Field Visit = 05 Marks And**
   b) **Internal Test on Practicals=05 Marks.**
   2. **Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018

Zoology
Practical Syllabus

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Applied Parasitology {XVII (B)}

Periods : 15+15   Credits: 02 (Marks: 50)

1 **Identification, classification and description of Protozoan Parasites through permanent slides/photomicrographs-**

i.	*Entamoeba histolytica,*	v.	*Balantidium coli*
ii.	*Giardia intestinalis,*	vi.	*Sarcocystis cruzi,*
iii.	*Trichomonas vaginalis*	vii.	*Plasmodium sp.*
iv.	*Trypanosoma gambiense*	viii.	*Eimeria tenella*

2 **Collection, staining, identification and description of Parasitic protozoa from Blood sample or rectal contents of suitable animals –**

i.	*Cilliates,*	iii.	Malarial parasites,
ii.	Flagellates,	iv.	Coccidian Parasites

3 **Identification, classification and description of Parasitic platyhelminths through permanent slides/photomicrographs or specimens -**

i.	*Schistosoma haematobium*	v.	*Taenia saginata,*
ii.	*Fasciola hepatica*	vi.	*Taenia solium*
iii.	*Paragonimus westermani.*	vii.	*Echinococcus granulosus*
iv.	*Gastrodiscoides hominis*	viii.	*Diphyllobothrium lattum*

2. Collection, Preservation, Staining, Mounting, identification and description of Trematodes and Cestodes from locally available different hosts (Gills & intestines).

3. **Identification, classification and description of Parasitic Nematodes (Animals & Plants) through permanent slides/photomicrographs or specimens –**

i.	*Enterobius vermicularis*	v.	*Meloidogyne* (Root knot nematode),
ii.	*Ancylostoma duodenale.*	vi.	*Heterodera* (Cyst nematode)
iii.	*Ascaris lumbricoides*	vii.	*Tylenchulus* (Citrus nematode)
iv.	*Wuchereria bancrofti.*	viii.	*Anguina* (Seed Gall- nematode)

6. **Collection, Preservation, Mounting, identification and description of Animal Nematodes from locally available different hosts (intestines).**

7. **Collection, Preservation, Mounting, identification and description of Plant Nematodes from soil samples.**

8. **Study of following arthropods through permanent slides/ photographs:**
    Aedes, Culex, Anopheles, *Pediculus humanus, Xenopsylla cheopis, Cimex lectularius Phlebotomus argentipes, Musca domestica.*

9 **Collection, preservation, Preparation of permanent slides and description of mouth-parts of -** House fly   ii. Mosquito   iii. Bed bug   iv. Head louse

10. **Submission of a brief report on parasites of vertebrates.**

Note: All animal based practical's should be conducted with the help of Models, Charts and Computer Aided Techniques.

REFERENCE BOOKS BASED ON PAPER: DSEZ-I& II (SECTION B) PAPER: DSEZP-II
Paper XIII-B & XV-B; XVII (B)

1. Introduction to Parasitology- Chandler and Reid.
2. Parasitology – K. D. Chatterjee.
3. Essentials of Parasitology- Gerald D. Schmidt, 4th Edition, Universal Book Stall, New Delhi, 1990, Reprint.
4. An Introduction to Parasitology- Bernard E. Mathews, Cambridge University, Press, 1998.
5. Textbook of Parasitology- Kochhar S. K., Dominant Publishers and Distributors, New Delhi, 2004
6. Animal Nematodes from Indian Mammals- H. S. Nama, G. B. Shinde and B. V. Jadhav
7. Applied Parasitology- A Practical Manual – C. J. Hiware, B. V. Jadhav, A. D. Mohekar, Mangaldeep Publication, Jaipur.
8. Parasitis Insects-B. D. Patnaik, Dominant Publishers and Distributors, New Delhi, 2001
9. Handbook of Entomology-T.V. R. Ayyar
10. Useful and Destructive Insects- Metacalf and Flint
11. Protozoology- Kudo
12. Biology of Protozoa- Sleials
13. Clinical Parasitology- Faust
14. Medical Helminthology- Watson
15. Indian Insect Life- Lefrey
16. General Parasitology- Cheng
17. Bench Aids for the diagnosis of Malaria- WHO, 1985.
18. Human Parasitology- Burton J. Bogistch, Clint E. Carter, Thomas N. Oeltmann. 2005. Third Edition, Elsevier Academic press.
19. Malaria: Principles and Practice of Malariology. Vol. I and II,- Warnsdorfer W.H. and Sri. Mc Gregor, I. 1998. Churchill Livingstone, New York.
20. Parasitology (Medical Zoology)- H.S.Singh and P.Rastogi. Rastogi Publications. Meerut
21. Medical Parasitology- N.C. Dey and T.K.Dey. Allied Agency, Kolkatta.
22. A Modern Text Book of Parasitology- Dr.A.N.Latey, Narendra Prakashan, Pune
23. Medical Zoology-R.C.Sobti,Shoban Lal Nagin Chand & Co., Jalandhar.

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Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018
PRACTICAL QUESTION PAPER

SUBJECT: ZOOLOGY

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Applied Parasitology {XVII (B)}

Centre:	**Date:**
Batch No.:	**Session:**
Marks: 40	**Time: 04 Hrs**

Q.1 Collect, Prepare a permanent slide, identify and describe Ciliates/ Flagellate/ Malarial Parasites/ Coccidian parasites from Blood sample/ rectal contents of suitable animals **10**

OR

Collect, Prepare a permanent slide, identify and describe Trematodes/ Cestodes from locally available Host (Gill/ Intestine)

Q.2 Identify, classify and describe Parasitic Protozoa (Two), Platyhelminths (One Trematode and One Cestode) by using permanent slides/photomicrographs/ or specimens. **08**

Q.3 Collect, Prepare a permanent slide, identify and describe Animal Nematodes from locally available Host Intestine/ Plant Nematodes from soil samples. **10**

OR

Prepare a permanent slides of mouth parts from the given specimen and identify by giving reasons

Q.4 Identify, classify and describe Parasitic Nematodes (One Animal Nematode and One Plant Nematode) and Arthropods (Two) by using permanent slides/photomicrographs/ or specimens. **08**

Q.5 Viva-Voce **04**

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = Total 10 Marks.
    a)   **Submission of Record book & Submission of brief report on parasites of vertebrates = 05 Marks &**
    b)   **Internal Test on Practicals=05 Marks.**
  2. Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS) Course Structure
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B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018

Zoology
Practical Syllabus

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Entomology {XVII (C)}

Periods : 15+15	Credits: 02 (Marks: 50)

1. Study of Methods of collection, preservation and identification of insects.
2. Mounting of mouthparts of insect: Biting and Chewing, piercing and sucking, siphoning and sponging type.
3. External morphology of Cockroach, Sexual dimorphism.
4. Dissection (Cockroach): Digestive System, Respiratory, Nervous System and Reproductive System.
5. Museum Study of Insect Orders: (At least Two specimens from each Insect order)
   - a. Thysanura
   - b. Orthoptera
   - c. Odonata
   - d. Hymemptera
   - e. Lepidoptra
   - f. Coleoptera
   - g. Diptera
   - h. Isoptera
6. Preparation and identification of permanent slide and study of developmental stages of Cockroach.
7. Collection, Identification and preservation of agricultural insect pests from local area (Minimum 10).
8. Collection, Preservation and Study of House hold and medically important Pests: Rat flea, Housefly, Head louse, Mosquito, Crickets.
9. Study of non insect animal pests:
   - a. Rat
   - b. Birds
   - c. Monkey
   - d. Pig
   - e. Deer
   - f. Ticks and Mites
10. Collection and submission of major crop insect pests from local area (Minimum 10).
11. Preparation and identification of permanent slides and study the Life Cycle (developmental stages) of Silk moth, Honeybee, Lac insects.
12. To study Equipments used in Sericulture, Apiculture, Lac culture.
13. Study of Vertebrates important for biological control against insect pests - Guppy fish, Frog, Gecko, Wood pecker, Bat, Scaly anteater etc.
14. Demonstration of use of different equipments such as drills, sprayers, dusters for insect control.
15. Study tour: At least two visits to the crop fields, Agricultural Research Institutes and submission of Study tour report along with photographic documentation of Entomology related issues.

Note: All animal based practical's should be conducted with the help of Models, Charts and Computer Aided Techniques.

REFERENCE BOOKS BASED ON PAPER: DSEZ-I& II (SECTION B) PAPER: DSEZP-II
Paper XIII-C & XV-C; XVII (C)

1. K. K. Nayar, TnantKirshnanand B.W. David- General and applied Entomology.
2. C. L. Metcalf and W. P. fling- Destructive and useful inset.
3. Hemsingpruthi: A Text Book of Agricultural Entomology
4. Wigglesworth: Principles of insect physiology.
5. ESSIG: College entomology.
6. M. S. Mani: A text book of General Entomology.
7. Government of Maharashtra: Crop pests and how to fight them.
8. Oldoyd, N.: A collection, preserving and studying insects.
9. Roger P. and Anderson: Forest and Shade tree Entomology.
10. D. B. Tembhare: Modern Entomology
11. R. E. Fradt: Fundamentals of Applied Entomology.
12. K. C. V. Smith: Insects and other Arthropods of Medical
13. D. N. Ray and A. W. A Brown: Entomology Medical and Veterinary
14. Chandler A. C. and Read C.P. -Introduction of Parasitology.
15. P. Debatch: Biological control of natural enemies.
16. Apple J. L. and Smith R.F.: Integrated Pest Management.
17. Cheny: General Parasitology.
18. Corbet J.R.: The biochemical mode of action of Pesticides.
19. Champman R. F.: Insects – Structure and Function.
20. O. W. Richards and R. G. Davies: Imms Text Book of Entomology
21. Bursell E.: An introduction to insect physiology.
22. Rockstein M Vol. (I-VI): The Physiology of Insects.
23. Shrivastave K. P. Vol (I-III): A Text Book of Applied Entomology
24. Hohanson O. A.: Ebryology of Insects and Myriopods.
25. Ross H. A.: A Text Book of Entomology.
26. Srivastava K.P.: A Text Book of Applied Entomology – II
27. Alaka Prakash- Laboratory manual of entomology.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS)
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B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018
PRACTICAL QUESTION PAPER

SUBJECT: ZOOLOGY

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of Paper: Entomology {XVII (C)}

Centre:	**Date:**
Batch No.:	**Session:**
Marks: 40	**Time: 04 Hrs**

Q.1 Prepare a slides of Insect from the given Material and identify giving reasons with description/ **10**

Prepare a slides of mouth parts from the given Material and identify with comments.

OR

Dissect/Demonstrate Digestive /Respiratory/ Nervous / Reproductive System of Cockroach.

Q.2 Identify, classify and describe salient features of specimens from orders Viz. Thysanura, Orthoptera, Odonata, Hymemptera, Lepidoptra, Coleoptera, Diptera, Isoptera (any four) **08**

OR

Identification/Preparation of permanent slide of developmental stages of Cockroach.

Q.3 Identify and comment on its importance of agricultural insect pests (Three), Human and House hold Pests (Two) *Or* **10**

Preparation of permanent slides of agricultural insect pests/ Human Pests/ House hold Pests from given material.

OR

Identify and comment on its importance of non insect animal pest and their Control viz. Rat , Bird, Monkey, Pig, Deer

Q.4 To study the Life cycle (developmental stages) of Silk moth/ Honey bee/ Lac insect by using charts/models **08**

OR

Comments on Equipments used in Sericulture/ Apiculture/ Lac culture.

OR

Identification, classification and description of Vertebrates important for biological control (any Two) and Identification and description of equipments for household insect control (any Two)

Q.5 Viva-Voce **04**

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = Total 10 Marks.
   a) **Submission of Record book & Submission of Report on a Field Visit = 05 Marks And**
   b) **Internal Test on Practicals=05 Marks.**
   2. **Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
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Zoology
Practical Syllabus

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Environmental Biology {XVII (D)}

Periods : 15+15	**Credits: 02 (Marks: 50)**

1) Recording of Atmospheric Temperature and

2) Recording of Relative Humidity.

3) Estimation of Dissolved Oxygen Content (DO), free Carbon dioxide (CO_2) in Water sample.

4) To estimate Total Dissolved Solids (TDS), Suspended Solids in Water sample.

5) Qualitative and Quantitative Study of Phytoplankton and Zooplankton in water sample.

6) To estimate pH of Water sample and Soil Sample by pH Meter.

7) To study the physical characteristic (Texture, Colour and Temperature) of the soil

8) To Estimate Organic Matter in soil sample.

9) Detection of NPK in the soil sample.

10) Demonstration of basic equipment needed in wildlife studies use, care and maintenance.
11) Identification of flora, insect and avian fauna.
12) Field Visit to Biodiversity Park/Wild Life Sanctuary/ Zoo Park/National Park/ to study wild animals

13) Effect of Heavy Metals/Pesticide on Oxygen consumption of Crab/Fish any suitable animal.

14) Effects of Pollutant/Pesticide on Heart beats of/ Any Suitable animal.

15) To Study Effects of Hydrogen sulphide gas pollutant on the Plant parts.

16) Estimation of Chlorides & Salinity from Water Sample to Assess the Water Quality.

17) Comparative analysis of air sampling from clean and polluted area using key parameters.

18) Field visit to river/lake and water and wastewater treatment plants.

Note: All animal based practical's should be conducted with the help of Models, Charts and Computer Aided Techniques.

REFERENCE BOOKS (BASED ON PAPER: DSEZ-I& II (SECTION B) PAPER: DSEZP-II Paper XIII-D & XV-D; XVII (D)

1. Odum – **'Ecology'**.

2. P.D. Sharma, **'Ecology and Environment'** Rastogi Publications, Meerut-250002, India.

3. Edward J. Kormondy, **'Concepts of Ecology'**, Himalaya Publications House, Mumbai.

4. Mohan P. Arora, '**Ecology'** Himalaya Publications House, Mumbai.

5. H. Loggen, **'Environmental Pollution'** 2nd Edition, Holt Reinhort Wintson (1978).

6. APHA, **'Standard methods of Examinations of Water and Waste Water'** 20th Edition (2000).

7. J. H. Seinfield , **'Air Pollution; Physical and Chemical Fundamentals'**, Mc Graw Hill, New York (1975).

8. T. N. Tiwari,V. P. Kudesia, **'Noise Pollution and it's Control'**, Pragati Prakashan, New Delhi (1990).

9. G. R. Chatwal, M. C. Mehra, **'Environmeatal Radiation, Thermal Pollution And Control'** Amol Publication, New Delhi (1989).

10. Trivedi P.K. and Goel P.K**. 'Chemical and Biological methods for Water Pollution Studies'** (Published by Environmental Publisher KARAD).

11. Trivedi P.K. and Raj Gurudeep **'Environmental Water and Soil Analysis'.**

12. Published by Akashdeep Publication House New Delhi.

13. P. S. Verma and V.K. Aggrawal :**Environmental Biology**

14. P.D. Sharma : **Environmental Biology**

15. P.D. Sharma : **Toxicology**

16. E. P. Odum : **Fundamentals of Ecology**

17. E. P. Odum : **Fundamentals of Ecology**

18. Ranganalla : **Water and Waste Water Engineering**

19. P. D. Sharma : **Microbiology**

20. P. D. Sharma : **Microbiology**

21. Kndosia : **Water Pollution**

22. M. V. Rao : **Air Pollution**

23. NEERI Nagpur : **Manual on Waste Water Analysis.**

Swami Ramanand Teerth Marathwada University Nanded
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Faculty of Science& Technology
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PRACTICAL QUESTION PAPER

SUBJECT: ZOOLOGY

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Environmental Biology {XVII (D)}

Centre:	Date:
Batch No.:	Session:
Marks: 40	Time: 04 Hrs

Q.1 Recording of Atmospheric Temperature / Relative Humidity **10**

OR

To estimate the amount of Dissolved Oxygen Content (DO)/ free Carbon dioxide (CO_2) *Or*
Total Dissolved Solids (TDS)/ Suspended Solids in Water sample.

Q.2 Qualitative/ Quantitative Study of Phytoplankton/ Zooplankton in water sample. *Or* **08**
To estimate pH of Water sample/Soil Sample by pH Meter.

OR

To study the physical characteristic (Texture, Colour and Temperature) of the soil. *Or*
To Estimate Organic Matter in soil sample/ Detection of NPK in the soil sample.

OR

Comments on Equipments (Two) needed in wildlife studies, Identification and Comment on
insect (One) and avian fauna (One).

Q.3 Effect of Heavy Metals/Pesticide on Oxygen consumption of Crab/Fish any suitable **10**
animal.

OR

Effects of Pollutant/Pesticide on Heart beats of/ Any Suitable animal.

Q.4 To Study Effects of Hydrogen sulphide gas pollutant on the Plant parts. **08**

OR

Estimation of Chlorides & Salinity from Water Sample to Assess the Water Quality.

Q.5 Viva-Voce **04**

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = Total 10 Marks.
  a)   **Submission of Record book & Submission of Report on a Field Visit = 05 Marks And**
  b)   **Internal Test on Practicals=05 Marks.**
 2. Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.

Swami Ramanand Teerth Marathwada University Nanded
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Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PRACTICAL PAPER
CONTINUOUS ASSESSMENT (CA)

SUBJECT: ZOOLOGY

Paper: DSEZP-I: (Based on DSEZ-I; Section-A& DSEZ-II; Section-A)
Title of the Paper: Ecology, Zoo-geography, Ethology, Biometry and Bioinformatics (P-XVI)

Centre: **Date:**

Maximum Marks: 10

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	**Submission of Record book & Submission of Report on a Field Visit**	**05**	
2.	**Internal Test on Practicals**	**05**	
	Total Marks	**10**	

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PRACTICAL PAPER
CONTINUOUS ASSESSMENT (CA)

SUBJECT: ZOOLOGY

Paper: DSEZP-II: (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Pisciculture and Aquaculture {XVII (A)}

Centre:	Date:
	Maximum Marks: 10

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	**Submission of Record book & Submission of Report on a Field Visit**	**05**	
2.	**Internal Test on Practicals**	**05**	
	Total Marks	**10**	

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PRACTICAL PAPER
CONTINUOUS ASSESSMENT (CA)

SUBJECT: ZOOLOGY

Paper: DSEZP-II: (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Applied Parasitology {XVII (B)}

Centre: **Date:**

Maximum Marks: 10

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	**Submission of Record book & Submission of brief report on Parasites of Vertebrates**	**05**	
2.	**Internal Test on Practicals**	**05**	
	Total Marks	**10**	

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PRACTICAL PAPER
CONTINUOUS ASSESSMENT (CA)

SUBJECT: ZOOLOGY

Paper: DSEZP-II: (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Entomology {XVII (C)}

Centre: **Date:**

Maximum Marks: 10

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	**Submission of Record book & Submission of Report on a Field Visit**	**05**	
2.	**Internal Test on Practicals**	**05**	
	Total Marks	**10**	

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PRACTICAL PAPER
CONTINUOUS ASSESSMENT (CA)

SUBJECT: ZOOLOGY

Paper: DSEZP-II: (Based on DSEZ-I; Section-B& DSEZ-II; Section-B)
Title of the Paper: Environmental Biology {XVII (D)}

Centre:	Date:
	Maximum Marks: 10

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	**Submission of Record book & Submission of Report on a Field Visit**	**05**	
2.	**Internal Test on Practicals**	**05**	
	Total Marks	**10**	

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS)
Faculty of Science& Technology
B. Sc. Third Year (Semester V & VI)
PATTERN OF THEORY QUESTION PAPER
w.e.f. Academic Year 2018-2019

SUBJECT: ZOOLOGY
Semester-V/VI

Paper:
Title of Paper:
Time- 2 Hrs   **Marks : 40**

N.B.:- (i) Attempt All Questions.
     (ii) All Questions carry equal Marks.
     (iii) Illustrate your answers with suitable labeled diagrams wherever necessary.

Q. 1 Attempt *Any Four* of the following: (Each of Two Marks) Based on Unit I, II, III, IV   **08**
  a)
  b)
  c)
  d)
  e)
  f)
              (Minimum one and maximum two from each Unit)

Q. 2 Attempt *Any Two* of the following: (Each of Four Marks) (Based on Unit I &Unit II)   **08**
  a)
  b)
  c)
              (Minimum one and maximum two from each Unit)

Q. 3 Attempt *Any One* of the following: (Each of Eight Marks) (Based on Unit I &Unit II)   **08**
  a)
  b)

Q. 4 Attempt *Any Two* of the following: (Each of Four Marks) (Based on Unit III &Unit IV)   **08**
  a)
  b)
  c)
              (Minimum one and maximum two from each Unit)

Q.5 Attempt *Any One* of the following: (Each of Eight Marks) (Based on Unit III &Unit IV)   **08**
  a)
  b)

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science And Technology
B.Sc. THIRD Year, Semester – V
Skill Enhancement Course
SECZ –III (E): PARASITES OF PUBLIC HEALTH IMPORTANCE
Periods: 45   **Credits:02 (Marks:50)**

Unit I   **12**

Brief introduction of Parasitology, Parasitism, Parasite, Host, Vector.
MALARIAL PARASITES.
History, Geographic distribution, Taxonomic position of different Species of malarial parasites. Distinguishing characters of different species of human malarial parasites, Life cycle, Pathogenicity, Prevention and control measures of Malarial parasites.

Practicals:

1. Preparation of stains- JSB I and II, Leishman and Giemsa.

2. Preparation of blood smears (thick and thin) and staining with JSB, Leishman and Giemsa for malaria parasite infection.

3. Dissection and examination of mosquitoes for malaria parasite infection.

4. Identification of various stages of malaria parasites:

(I) *Plasmodium vivax* (II) *P. falciparum* (III) *P. malariae* (IV) *P. ovale*

Unit II   **11**
PARASITIC PLATYHELMINTHES
History, Geographic distribution , Morphology, Life Cycle, Pathogenicity, Prevention and control measures of *Schistosoma haematobium and Taenia solium*

Practicals:

1. Examination of Urine and stool sample for assessment of presence and intensity of *Schistosoma* infection.

2. Collection and preservation of Cestodes from locally available hosts intestines.

3. Staining, Mounting, drawing and identification of Cestode Parasites.

4. Identification, classification and description of Parasitic platyhelminths (*Schistosoma haematobium and Taenia solium*) through permanent slides/photomicrographs or specimens.

Unit III   **11**
LYMPHATIC FILARIAL PARASITES- *Wuchereria bancrofti*.
History, Geographic distribution of lymphatic filariasis, Taxonomic position of Filarial worm (*Wuchereria bancrofti*), Distinguishing characters, Life cycle, Pathogenicity, Prevention and control measures.

Practicals

1. Dissection and examination of mosquitoes for filarial parasite (*Wuchereria bancrofti)* infection.

2. Staining and examination of blood smears for detection of microfilariae.

3. Identification, classification and description of Lymphatic Filarial Parasites- *Wuchereria bancrofti* through permanent slides/photomicrographs or specimens.

Unit-IV   **11**

INSECTS OF MEDICAL IMPORTANCE

Morphology, Medical importance and Control of *Pediculus humanus*, *Xenopsylla cheopis Anopheles, Culex, Aedes.*

Practicals

1.Study of arthropod vectors associated with human diseases: *Pediculus, Xenopsylla, Culex, Anopheles, Aedes.*

2.Study of different kinds of mouth parts of insects

3.Study of following insect vectors through permanent slides/ photographs:

Pediculus humanus, Xenopsylla cheopis, Aedes, Culex, Anopheles

4. Study of different diseases transmitted by insect vectors.

5. Preparation of slide mounts of insects and their mouth parts.

- **Submission of a brief report on parasites of Public health importance.**

REFERENCE BOOKS

1. Introduction to Parasitology- Chandler and Reid.
2. Parasitology – K. D. Chatterjee.
3. Essentials of Parasitology- Gerald D. Schmidt, 4th Edition, Universal Book Stall, New Delhi, 1990.
4. An Introduction to Parasitology- Bernard E. Mathews, Cambridge University, Press, 1998.
5. Textbook of Parasitology- Kochhar S. K., Dominant Publishers and Distributors, New Delhi, 2004
6. Applied Parasitology- A Practical Manual – C. J. Hiware, B. V. Jadhav, A. D. Mohekar, Mangaldeep Publication, Jaipur.
7. Parasitic Insects-B. D. Patnaik, Dominant Publishers and Distributors, New Delhi, 2001
8. Handbook of Entomology-T.V. R. Ayyar
9. Protozoology- Kudo
10. Clinical Parasitology- Faust
11. Medical Helminthology- Watson
12. Indian Insect Life- Lefrey
13. General Parasitology- Cheng
14. Bench Aids for the diagnosis of malaria- WHO, 1985.
15. Human Parasitology- Burton J. Bogistch, Clint E. Carter, Thomas N. Oeltmann. 2005. Third Edition, Elsevier Academic press.
16. Malaria: Principles and Practice of Malariology. Vol. I and II,- Warnsdorfer W.H. and Sri. Mc Gregor, I. 1998. Churchill Livingstone, New York.
17. Parasitology (Medical Zoology)- H.S.Singh and P.Rastogi. Rastogi Publications. Meerut
18. Medical Parasitology- N.C. Dey and T.K.Dey. Allied Agency, Kolkatta.
19. A Modern Text Book of Parasitology- Dr.A.N.Latey, Narendra Prakashan, Pune
20. Medical Zoology-R.C.Sobti,Shoban Lal Nagin Chand & Co., Jalandhar.

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science And Technology
B.Sc. THIRD Year, Semester – V
Skill Enhancement Course
SECZ –III (F) : VERMICULTURE AND VERMICOMPOSTING

Periods: 45   **Credits:02 (Marks:50)**

UNIT – I   11
1. Vermiculture – Definition, History, scope and economic importance.
2. Earthworms-Taxonomic Position and Diversity of different species of earthworms.
3. *Eisenia fetida*- Systematic position, Morphology and Life cycle.

   Practicals:
1. To Study different species of earthworms.
2. To Study morphological features of composting earthworm, *Eisenia Fetida*
3. To study Life cycle of *Eisenia Fetida.*
4. Identification of Earthworm cocoons and vermi casts

UNIT – II   11
1. Common species for Vermiculture; Environmental requirements; culture methods
2. Applications of Vermiculture.
3. Earthworm Pests and Diseases.

   Practicals:
1. Collection and identification of common species of earthworms for vermiculture.
2. Study of Earthworm Pests and diseases.

UNIT – III   12
VERMICOMPOSITING
1. Vermicomposting Materials
2. **Types of vermicomposting:**
a) Small Scale Vermicomposting
b) Large Scale Vermicomposting
3. **Methods of Vermicomposting:** Bed Method, Pit Method.
4. Phases and Steps of Vermicomiposting.
   Practicals:
1. Study of Vermicompost equipments, devices.
2. Preparation of Vermibeds.
3. Demonstration of preparation pit method.
4. Preparation of vermicomposting pits at local area (college or home gardens)

UNIT- IV   **11**
VERMICOMPOSTING

1. Harvesting
2. Nutrient Content of Vermicompost
3. Advantages of Vermicompost
4. Vermiwash, Preperation and Applications
5. Prospects of vermi-culture as self employment venture

Practicals:

1. Collection of vermiwash and use of vermiwash.
2. To study the effect of vermicompost on any plant.
3. Visit to Agricultural Farm/Field to nearby Krishi Vidnyan Kendra to study vermicultures and vermicomposting Units.

REFERENCE BOOKS

1. R.K. Bhatnagar & R.K. Palta- Earthworm Vermiculture and Vermicomposting, Kalyani Publishers, No. 1, Mahalakshmi Street, T. Nagar, Chennai -600 017.
2. P.K. Gupta - Vermi Composting for Sustainable Agriculture. AGROBIOS (India), Agro House, Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342 002.
3. Sathe, T. V.- Vermiculture and Organic Farming. Daya Publishing House
4. Sultan Ahmed Ismail, - The Earthworm Book, Second Revised Edition. Other India Press, Goa, India.
5. Bhatt J.V. & S.R. Khambata (1959)- Role of Earthworms in Agriculture. Indian Council of Agricultural Research, New Delhi.
6. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) - Verms and Vermicomposting. Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, Jyoti Vihar, Orissa.
7. Edwards, C.A. and J.R. Lofty (1977)- Biology of Earthworms. Chapman and Hall Ltd., London.
8. Lee, K.E. (1985)- Earthworms: Their ecology and Relationship with Soils and Land Use Academic Press, Sydney.
9. Kevin, A and K.E.Lee (1989)- Earthworm for Gardeners and Fisherman" (CSIRO, Australia, Division of Soils)
10. Rahudakar V.B. (2004)- Gandul khatashivay Naisargeek Paryay, Atul Book Agency, Pune.
11. Satchel, J.E. (1983)- Earthworm Ecology Chapman Hall, London.
12. Wallwork, J.A. (1983)-Earthworm Biology. Edward Arnold (Publishers) Ltd. London.

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science And Technology
B.Sc. THIRD Year, Semester – VI
Skill Enhancement Course
SECZ –IV (G) : AQUARIUM KEEPING

Periods: 45   **Credits:02 (Marks:50)**

Unit I   11

Introduction to Aquarium Keeping,

Aquarium – Definition, Shape and size

- Types of aquarium- wooden, Steel, fibre glass, plastic acrylic, iron frame, full glass, garden pool etc.

Practicals:
1. To study different types of aquarium
2. Visit to Aquaria

Unit II   12

Construction of aquarium

Design and fabrication

Materials - Aluminum/ Iron angle, Hack sow, blade, drilling machine, Hammer, glass, glass cutter, tape, file, set square, angle cutter, sticky tape, aquarium cement, silicon tube, silicon gun etc.

Practicals:
1. Angle cutting for frame of aquarium.
2. Rivetting of angle to form a side of aquarium.
3. Fixing of glass of one side in the frame of aquarium with the help of bitumen/ aquarium cement / silicon etc.
4. Cutting of glasses of given size

Unit III   11

Setting of Aquarium-

- Selection of place for aquarium, table or stand, cover for aquarium, light, watering, planting, preparation of bed-sand, gravels, rocks, coarals, back glass painting or poster, **Aquarium accessories-** Aerator, air-stone, toys, filtration, hand net, rubber tube and connectors. Thermometer, heater etc.

Practicals:
1. Identification of various aquarium tools
2. Identification of various aquarium accessories

3. Preparation of aquarium bed.
4. Watering of aquarium
5. Planting of aquarium
6. Lighting of aquarium

Unit – IV   **11**
Maintenance
- Water parameters/ test and monitor, cycling of water.
- Cleaning of aquarium, light management
- Food of feeding- live food and dry food/
- Preparation of supplementary food for aquarium fishes.
- Aquarium fishes
- Significance of aquarium.

Practicals:
1. Cleaning of aquarium
2. Identification of aquarium fishes
3. Preparation of supplementary food from grains for aquarium fishes
4. Checking fish health
5. Marketing

REFERENCE BOOKS
1. Guide to keeping and breeding the aquarium fishes (1968). Bombay aquarium Society, Mumbai.
2. Fresh water aquarium, Dawes, J.A., Roberts Royee Ltd. London
3. A Text Book of Pisciculture and Aquarium Keeping- DhananjayJadhav, Mohan Babre.
4. Hand Book of Fish aquarium- Hiware and Sonwane,
5. A Text Book of Pisciculture & Aquarium Keeping- H. S. Jagtap, S. N. Mukherjee & V. K. Garad., Daya Publishing House, New Delhi.
6. Practical Manual of Pisciculture and Aquarium Keeping- H. S. Jagtap, S. N. Mukherjee & S. S. Nanware, Daya Publishing House, New Delhi
7. The complete book of the Fresh water aquarium-Vincent Hargreaves
8. How to maintain your fresh water aquarium-ThomsRiggson
9. The Complete aquarium Book- NilliamT.innes

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Faculty of Science And Technology
B.Sc. THIRD Year, Semester – VI
Skill Enhancement Course
SECZ –IV (H) : SERICULTURE

Periods: 45   **Credits:02 (Marks:50)**

UNIT – I   **11**
Introduction of Sericulture
1.1 History and Scope of Sericulture, Present status of sericulture in India.
1.2 Types of silkworm- Mulberry, Tasar, Eri and Muga silkworm
1.3 Systematic position, Morphology, Life Cycle of Silkworm
1.3 Cultivation of Mulbery- Planting, grafting and Harvesting.
1.4 Mulberry diseases and pest managements.
a) Foliar Disease   b) Root rot Disease   c) Root knot Disease   d) Common pest of Mulberry

Practicals:
1. Identification of different types of silkworms.
2. Morphology of egg, larva, pupa and adult of different silkworm types.
3. Sex differentiation of Larva, Pupa and Adult Silkworms
4. Identification of root knot diseases, root galls, egg masses, larvae and nematodes

UNIT – II   **12**
Silk worm Rearing
1.1 Prerequisite for silkworm rearing.
1.2 Silkworm Rearing Equipments
1.3 **Rearing Practices**- Procurement of quality seeds, Brushing, Preparation of feed bed and
feeding, Bed Cleaning, Spacing, Mounting, Harvesting of Cocoons, Post Cocoon Processing-
Stifling, Reeling.
1.4 Role of Environmental factors in rearing.

Practicals:
1. Estimation of Hatching and Brushing Percentage of silkworm Eggs
2. Estimation of Moisture Content of Mulberry Leaves for chawki Rearing
3. Determination of mulberry Leaf Driage in the Rearing Bed
4. Practical demonstration of cooking, reeling and re-reeling of a sample cocoon.

UNIT- III   **11**
Pests and Diseases
1.1 Introduction and classification of different types of silkworm diseases
1.2 Influence of environment and Nutrition on the incidence of diseases.
1.3 Pests of silkworm: Uzi fly, dermestid beetles and vertebrates
1.4 Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial
1.5 Control and prevention of pests and diseases

Practicals:
1. Identification of different silkworm diseases and Method of their disposal.
2. Identification of major silkworm pests.
3. Estimation of Uzi fly infestation during late age silkworm rearing.
4. Visit to Sericulture Centre.

UNIT- IV   **11**

Sericulture Economics and Marketing

1.1 Mulberry cultivation (per hectare) –Cost and returns under irrigation and rainfed condition.
1.2 Economics of egg production: Expenditure and income.
1.3 Economics of silkworm rearing: Investment and returns
1.4 Economics of silk reeling (per kg of raw silk): Cost and returns for different types of reeling establishments.
1.5 Sericulture marketing organization for seed cocoon, raw silk and silk fabric
1.6 Traditional and regulated markets, their merits and limitations

Practicals:
1. Identification of Textile fibres by physical and chemical tests—microscopic examinations, flame test and solubility test for polyester, cotton, silk.
2. Study Tour to Silk fabric manufacturing unit, Power loom and Handloom.

REFERENCE BOOKS

1. Manual on Sericulture; Food and Agriculture Organisation, Rome 1976
2. Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
3. Silkworm Rearing and Disease of Silkworm, 1956, Ptd. By Director of Ptg., Stn. & Pub. Govt. Press, Bangalore.
4. Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan1972.
5. Manual of Silkworm Egg Production; M. N. Narasimhanna, CSB, Bangalore 1988.
6. Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.
7. Economic Zoology-Shukla and Upadhyaya, Rastogi Publication, Meerut
8. Sericulture and Pest Management- T.V.Sathe and A.D.Jadhav Daya Books, 2001
9. Agro-Cottage Industry Sericulture- Hiware C.J.
10. Crop pests and how to fight them- Govt. of Maharashtra Pub. Bombay.
11. Sericulture Training Manual by Soo-ho-Lim, Sang-Poong Lee.

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
Faculty of Science And Technology
ZOOLOGY
B. Sc. Third Year; Semester V
SKILL ENHANCEMENT COURSE ZOOLOGY (SECZ)
SECZ –III (E): PARASITES OF PUBLIC HEALTH IMPORTANCE
Or
SECZ –III (F): VERMICULTURE AND VERMICOMPOSTING
<u>CONTINUOUS ASSESSMENT (CA)</u>

CENTRE: DATE:

Maximum Marks: 25

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	Seminar Presentation	15	
2.	Test	10	
	Total Marks	**25**	

Swami Ramanand Teerth Marathwada University, Nanded
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ZOOLOGY
B. Sc. Third Year; Semester VI
SKILL ENHANCEMENT COURSE ZOOLOGY (SECZ)
SECZ –IV (G): AQUARIUM KEEPING
Or
SECZ –IV (H): SERICULTURE

CONTINUOUS ASSESSMENT (CA)

CENTRE: **DATE:**

Maximum Marks: 25

SEAT NUMBER: ………………………..

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
3.	Seminar Presentation	15	
4.	Test	10	
	Total Marks	**25**	

Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
Faculty of Science And Technology
ZOOLOGY
B. Sc. Third Year; Semester V
SKILL ENHANCEMENT COURSE ZOOLOGY (SECZ)
SECZ –III (E): PARASITES OF PUBLIC HEALTH IMPORTANCE
Or
SECZ –III (F): VERMICULTURE AND VERMICOMPOSTING
<u>END OF SEMESTER EXAMINATION (ESE)</u>

CENTRE: DATE:

Maximum Marks: 25

SEAT NUMBER: ………………………..

Sr. No.	End of Semester Examination (ESE)	Maximum Marks	Marks Obtained
1.	Skill Work Report Submission	10	
2.	Overall Skill Judgment	10	
3.	Skill Work Presentation	05	
	Total Marks	**25**	

Name & Signature
Examiner – 1

Name & Signature
Examiner – 2

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Swami Ramanand Teerth Marathwada University, Nanded
CHOICE BASED CREDIT SYSTEM (CBCS)
Faculty of Science And Technology
ZOOLOGY
B. Sc. Third Year; Semester VI
SKILL ENHANCEMENT COURSE ZOOLOGY (SECZ)
SECZ –IV (G): AQUARIUM KEEPING
Or
SECZ –IV (H): SERICULTURE
END OF SEMESTER EXAMINATION (ESE)

CENTRE: DATE:

Maximum Marks: 25

SEAT NUMBER: ………………………..

Sr. No.	End of Semester Examination (ESE)	Maximum Marks	Marks Obtained
1.	Skill Work Report Submission	10	
2.	Overall Skill Judgment	10	
3.	Skill Work Presentation	05	
	Total Marks	**25**	

Name & Signature   Name & Signature
Examiner – 1   Examiner – 2

Swami Ramanand Teerth Mathawada University, Nanded

B. Sc. Final YearPhysics Syllabus (CBCS Pattern)
(Effective from 2018-2019)

Disclaimer

*The Syllabus of **B. Sc. Physics Final Year (Semester V and VI)** given in this document is prepared following the Choice Based Credit System (CBCS), adopted by the **S.R.T.M. University** as per the recommendations by the **UGC, New Delhi,** and has been duly approved by the Faculty, the Academic Council and the Management Council of the University.*

B. Sc. Physics T. Y. (CBCS) Course Structure and Marking Scheme Of Semester V

Semester	Paper No.	Name of the Course	Credits	Contact (instruction) hours		Assessment pattern (marking scheme)		
				per week	Total	End semester examination (ESE)	Continuous Assessment (CA)	Total Marks
Semester V	**DSEP I** *(Section A)* **P-XII**	**Quantum Mechanics (P-XII)**	**02**	**03**	**45**	**40**	**10**	**50**
	DSEP I *Elective* Course *(Section B)* **P-XIII**	**Solid State Physics (P-XIII A)** *OR* **Solar Energy (P-XIII B)** *OR* **Astrophysics (P-XIII C)**	**02**	**03**	**45**	**40**	**10**	**50**
Semester V Practical Course	**DSEPP I P-XVI** *(Section A)*	**Practicals based on theory courses P-XII**	**01**	**04**	**06 practicals** (24 Periods)	**20**	**05**	**25** *(Annual Pattern)*
	DSEPP I P-XVII *(Section A)*	**Practicals based on elective course P-XIII**	**01**	**04**	**06 practicals** (24 Periods)	**20**	**05**	**25** *(Annual Pattern)*
Semester V SEC	**SEC III** *(Skill Enhancement Course)*	**Renewable energy & Harvesting** *OR* **Electrical Circuit Analysis Skill**	**02**	**---**	**45 Hands-on**	**25**	**25** *(Test 15 + Seminar 10)*	**50**

B. Sc. Physics T. Y. (CBCS) Course Structure and Marking Scheme Of Semester VI

Semester	Paper No.	Name of the Course	Credits	Contact (instruction) hours per week	Contact (instruction) hours Total	Assessment pattern (marking scheme) End semester examination (ESE)	Assessment pattern (marking scheme) Continuous Assessment (CA)	Total Marks
Semester VI	**DSEP II** (Section A) **P-XIV**	**Atomic, Molecular and Nuclear Physics** (P-XIV)	**02**	**03**	**45**	**40**	**10**	**50**
	DSEP II *Elective Course* (Section B) **P-XV**	**Digital and Communication Electronics (P-XV A)** *OR* **Linear and Digital Integrated Circuits (P-XV B)** *OR* **Fiber Optics Communication (P-XV C)**	**02**	**03**	**45**	**40**	**10**	**50**
Semester VI Practical Course	**DSCPP II** **P-XVI** *(Section B)*	**Practicals based on theory courses P-XIV**	**01**	**04**	**06 practicals** (24 Periods)	**20**	**05**	**25** (*Annual Pattern*)
	DSEPP II **P-XVII** *(Section B)*	**Practicals based on elective papers P-XV**	**01**	**04**	**06 practicals** (24 Periods)	**20**	**05**	**25** (*Annual Pattern*)
Semester VI SEC	**SEC IV** *(Skill Enhancement Course)* **SEC IV**	*Physics Workshop Skill* **OR** *Semiconductor Devices Application Skill*	**02**	**---**	**45 Hands-on**	**25**	**25** (Test 15 + Seminar 10)	**50**

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Preamble:

Swami Ramanand Teerth Marathwada University, Nanded, following the directives of the **University Grants Commission, New Delhi (UGC)**, has been trying hard to enhance the academic standard of this region and has taken several steps in recent past to improve the quality of higher education in its jurisdiction. These include the improvement and revision of the existing curricula in tune with the courses at national and international level, implementing innovative methods in teaching-learning processes, imparting skill based value added education, improvisation in the examination and evaluation processes, etc. These measures are very much useful in achieving **3Es, the *equity, efficiency and excellence*** in higher education of this region. However, the diversified approaches followed by different faculties and universities within India puts a limit on bringing the global equality in higher education across the country. This is because majority of universities within India follow conventional method of awarding percentage of marks for the performance of the students in their semester end examinations, in contrast to the grades awarded by the institutions of national reputes like IITs, IISERs, IISC and central universities. The scheme of conversion of the scores from percentage to point based grades and letter grades vary widely across the institutions and universities, which in turn produces a large range of disparity and difficulty in comparing performances of students graduating from different universities and institutes.

To overcome such anomalies in assessing performances of the candidates graduating from different universities UGC in recent past has undertaken an exercise of restructuring the curricula of different courses offered by various universities across the country. Though academic flexibility and autonomy is provided to the universities to design their own examination and evaluation methods best suiting the curricula and teaching–learning methods adopted in conducted and affiliated colleges, there is a global need to devise a sensible mechanism for awarding grades to the performance of students. As a result the UGC, New Delhi has suggested all the universities to adopt the grading system of computing the ***cumulative grade point average*** **(CGPA)** for assessing academic performance of the students in the university examinations. This is important not only to compare the performances of the students graduating from different universities but also provide mobility to the students in joining different institutions within India as well as in other countries. The common grading system followed by different universities also enables the potential employers to assess performances of candidates uniformly. As a result S.R.T.M.U. has adopted the ***cumulative grade point average*** **(CGPA)** system for assessing performance of students

studying in its jurisdiction from the academic year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and also to enhance the latent skills of the students SRTMU has also adopted the ***Choice Based Credit System*** **(CBCS)** at graduate as well as post-graduate level. The CBCS system offers flexibility to the students in choosing courses of their own choice from the exhaustive list comprising core, elective/minor or skill based components that are evaluated following the grading system. In the coming academic year 2018-2018 the university shall be implementing the same for the B. Sc. Third Year students. This document provides detailed information on metodology of choosing different components of B. Sc. Third Year (Semester V and Semester VI) Physics theory and practical courses.

The courses offered by this university are of student-centric nature and help them to understand the basic laws of nature and develop necessary skills to apply them to the advanced areas of studies. There are two common or core or mandatory courses meant to provide adequate knowledge of various branches of physics and to prepare the students for applying them for advanced courses. In addition, there will be elective courses as well as few skill based courses, which are of advanced nature and help the students to develop their skills through hands-on activities. The details of the courses and activities are as follows:

Outline of the Choice Based Credit System:

1. Discipline Specific Compulsory (DSC) Courses: Every student graduating in Science faculty with Physics as one of the optional subject is required to **study t**hese theory and practical papers as core or compulsory courses. There shall be two such theory papers (P-XII and P-XIV, each of 02 credits), one each in Semester V and VI, whose performance shall be assessed at the end of the respective semesters. There shall be one practical course corresponding to both these compulsory courses, however, the performance of candidates in the practical course shall be assessed on the annual basis i.e., at the end of the Semester VI by a pair of external examiners.

2. Discipline Specific Elective (DSE) Courses: Students have freedom to choose an advanced course of their interest and inclination from a pool of courses made available by the university for a particular semester. These courses are of specific or specialized or advanced or supportive nature and are designed such that they provide extended scope to the students or enable them to expand their knowledgebase. Every student has a freedom to elect one of such theory course of 02 credits, whose performance will be assessed at the end of the corresponding semester. These elective courses will be supplemented by practical courses each of 01 credits, however, they will be assessed following annual pattern i.e., at the end of the academic year. Attempts will also be made to offer elective courses of interdisciplinary nature from some other

subjects, disciplines, or faculties; however, for the availability of such courses the students are required to consult their teachers.

3. Skill Enhancement Courses (SEC): These courses are aimed at providing hands-on-training, competencies, skills, etc. to the students. As these courses are primarily of hands-on-training type, therefore, students are expected to devote much of their time in laboratory activities rater than the conventional classroom teaching. Therefore, one-third of the time allocated to this course will be utilized for the classroom teaching, imparting instructions, etc., while remaining two-third will be utilized by the students in developing their skills through the hands-on exercises. The exercises to be undertaken for this purpose shall be of different nature than that of their regular laboratory / practical courses. There shall be two such skill enhancement courses, one each in semester V and VI, which shall be selected by the students depending on their choice and inclination. Performance of the students in these couses shall be assessed at the end of the semester VI following annual pattern by a pair of external examiners along with their practical courses. Students have freedom to choose the Skill Enhancement Courses (SEC III and IV) from either of their optinal paper at B. Sc. Third Year.

 4. **Laboratory/Practical Courses**: Every students studying in B Sc final year (Semester V and VI) is required to complete two laboratory / practical courses (Paper Nos. P-XVI and P-XVII), which shall be assessed / examined at the end of the Semester-VI (annual pattern). Paper P-XVI comprises practicals based on the compulsory (DSC) papers P-XII and P-XIV, while P-XVII comprises those based on the elective (DSE) papers P-XIII and P-XV.

 The B. Sc. Third Year (Semester V and VI) Physics syllabus given in this document has been prepared by different subcommittees constituted in the meeting of the BOS in Physics held on 10th April 2018 and is finalized after due consent from all the respected members. The BOS has invited comments, suggestion, corrections in the draft syllabus from all the Physics teachers affiliated to this university and has incorported those suggestions in the syllabus presented in this document.

(***Prof. M. K. Patil***)

Chairman, Board of Studies in Physics

Swami Ramanand Teerth Marathwada University Nanded
B. Sc. Third Year Physics (Semester – V) Syllabus
Choice Based Credit System (CBCS) effective from June -2018

P-XII DSEP I (Section A) - Discipline Specific Compulsory Paper:

Quantum Mechanics

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning objectives: *The objective of this course is to introduce the students to the world of microscopic particles such as molecules, atoms, atomic nuclei and elementary particles, study their dynamics employing wave analogy, and also to make the connections between the rules governing the microscopic particles with that of the macroscopic bodies around us. This course is the pre-requisite for several advanced courses in physics and chemistry and is necessary for understanding the behavior of molecules, atoms and elementary particles. The pre-requisite for this course is knowledge of calculus, wave theory and modern physics. This course is the core course and every student pursuing B Sc with physics as one of the optional is required to study this course.*

Unit I Particle Properties of Waves (**12 Periods**)
Introduction, Photoelectric Effect, Quantum Theory of Light, The Compton Effect, de Broglie waves, Wave function, de Broglie Wave Velocity, Wave and Group velocities, G. P. Thomson experiment, The Uncertainty principle and its applications.

Unit II Schrödinger's Equation (**12 Periods**)
Introduction, Schrödinger's Equation: Time dependent form, Probability current, Expectation Values, Operators, Schrödinger's Equation: Steady-state form, Eigen values and Eigen functions, Problems.

Unit III Applications of Quantum Mechanics (**09 Periods**)
Introduction, The particle in a box: energy quantization, The particle in a box: wave functions, The particle in a box: Momentum Quantization, The Harmonic Oscillator, The Harmonic Oscillator-Energy level, The particle in a three dimensional box

Unit IV Quantum Theory of Hydrogen Atom (**12 Periods**)
Schrödinger's equation for the Hydrogen Atom in spherical polar co- ordinates, separation of Variables, Quantum numbers –Total quantum number, Orbital quantum number, Magnetic quantum number, spin quantum number.

Books Recommended:
    1. Perspectives of Modern Physics-Arthur Beiser (McGraw-Hill Int.Edition)
    2. Modern physics – R. Murugeshan.(S.Chand & Co.XIth Revised edition)
    3. Text Book of Quantum mechanics – Kakani & Chandaliya ((S.Chand & sons)
    4. Quantum Mechanics – Chatwal and Anand (Himalaya Publishing)
    5. Quantum Mechanics- Ghatak and Loknathan

P-XIII A - DSEP I (Section B) – Discipline Specific Elective Paper:

A. Solid State Physics

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objective: *This course is designed to provide fundamental knowledge of the crystallography, principles behind the formation of matter, their structure and physical properties. This course also enables the students to understand the relationship between the internal structure and various properties of matter such as periodicity, structure and bonding in solids, making these solids an attractive material for the device applications. At the end of this course, students will be able to classify the materials in different classes based on their physical, thermal, electrical, and magnetic properties. This is an elective course of 02 credits offered at Semester V.*

Unit I Crystal structure (10 Periods)
Introduction, Crystal Lattices and Translation vectors, Unit cell, Basis, Symmetry operations, Point groups, space group, Types of lattices, Simple crystal structure (HCP, FCC, BCC, SC), Structure of Diamond, NaCl, Problems.

Unit II Bonding in Solids and X-Ray Diffraction (10 periods)
 Inter atomic forces and types of bonding, ionic bond, covalent bond, metallic bond, hydrogen bond, Vander-waal's bond.
 X-ray diffraction, Bragg's law, Laue's method, Rotating crystal method

Unit III Thermal properties of Solids (12Periods)
Specific heat of gases, Specific heat of solids, Classical theory of Lattice heat Capacity, Einstein's theory of heat Capacity, Debye's theory of specific heat of solids, Limitations of Debye model

Unit IV Free Electron Theory of Metals (13 Periods)
The outstanding properties of metals, Drude-Lorentz theory, Thermal conductivity, Electrical conductivity, Widemann- Franz relation, Sommerfeld Model, Electrical conductivity and Ohms law, Electronic specific heat, Thermoionic emission, escape of electrons from metal.

Books Recommended:

1. Solid State Physics and Electronics – R. K.Puri & V. K. Babar (S.chand & Co.)
2. Solid State Physics – Saxena,Gupta, Saxena (Pragati Prakashan Meerut)
3. Solid State Physics – Puri & Babar (S.chand & Co.)
4. Introduction to Solid State Physics -by Kittel, Wiley and Sons, 7th Edition.
5. Material Science by M. Arumguarn, Anuradha Publishers.
6. Solid state Physics – R.L.Singhal (Kedar Nath Ram Nath Co., Meerut)

P-XIII B - DSEP I (Section B) – Discipline Specific Elective Paper:

B. Solar Energy

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objective: *This course is aimed to introduce the students to the nature of the energy that originates from the Sun, capable enough to drive nearly all the systems found on the Earth. This course enables the students to realize importance and utilization of the abundantly available solar energy as an alternative non-conventional energy source. This course starts with an introduction to the nature and vastness of the solar energy radiation and then enables the students to know the methods to convert and store this abundantly available energy into usable form by employing devices like photovoltaic systems. This is an elective course of 02 credits.*

Unit I Nature of solar radiation   **(10 Lectures)**

Energy generation in the Sun, Spectral distribution, extra-terrestrial radiation, its variation over a year, terrestrial radiation, beam, diffuse and global radiation, and angles used to define direction of solar radiation and orientation of surface

Unit II Solar Photovoltaics   **(9 Lectures)**

Working principle of solar cell, Details of silicon solar cell manufacturing and structure, different types (generations) of solar cells, solar cell-solar module-solar string-solar array

Unit III Solar photovoltaic systems   **(8 Lectures)**

Stand alone solar photovoltaic system: block diagram and description of each block, grid connected solar photovoltaic system: block diagram and description of each block
Example of one stand alone photovoltaic system

Unit IV Solar Thermal Conversion   **(9 Lectures)**

Plank's law, Wien's law and Stephan's law, Concept of selective surface, conduction, radiation and convection; collectors used for solar thermal conversion: flat plate collectors, evacuated tube collectors and concentrators

Unit V Solar thermal system   **(9 Lectures)**

Description of solar water heating system: components and working principle, flat plate collector: construction details, energy balance equation and efficiency, different loss mechanisms

Reference books:

1. Solar Photovoltaics – by Chetan Singh Solanki (Third Edn.)
2. Solar Energy – by S. P. Sukhatme and J. K. Nayak (Third Edn.)

P-XIII (C) DSEP I (Section B) – Discipline Specific Elective Paper:

C. Astrophysics

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objectives: *Astronomy and Astrophysics is the oldest branch of science, perhaps started with the origin of the humankind, and has evolved systematically with time. In the present era with the availability of the state-of-the-art observing facilities across the electromagnetic spectrum, thanks to the technological advancements, the scope of the study of the astronomical objects have became more interesting and challenging. This study involves the knowledge of Classical Mechanics, Quantum Mechanics, Nuclear physics, Statistical Mechanics, Electrodynamics, Spectroscopy, Mathematical Physics, Modern Electronics, Chemistry and even Biological sciences. At the end of course, the students will be able to understand the important concepts of astronomical objects and will be in a position to provide a fundamental connections between different fields of the science in general and physics in particular.*

Unit I Fundamentals of astronomy: (10 Periods)
Brief history of astronomy (geocentric universe, heliocentric universe), co-ordinate systems (celestial sphere, horizon, equatorial co-ordinate systems), Greenwich Sideral time, Local Sideral time, zonal time, Hour angle and mean solar time, Astronomical Distance, astronomical unit (AU), light year, parsec, distance measurement in astronomy-stellar parallax

Unit II The Solar Family   (10 Periods)
Kepler's laws of planetary motion, the Earth's orbit and spin, the Moon's orbit and spin. the planets in the solar system - the terrestrial and Jovian planets, structure, composition and atmospheres of the planets, ring systems and satellites of the planes, asteroids, meteors and meteorites, comets and their origin, solar and lunar eclipses, Origin of the Solar System: The Nebular hypothesis.

Unit III Astronomical Techniques   (15 Periods)
Photon and non-photon astronomy, Photons (electromagnetic waves), Wavelength and frequency, Photon energy, Temperature, electromagnetic frequency bands – windows in astronomy
Black body radiation- Planck laws, Wien displacement law, Brightness, Radiant Flux and Luminosity. Magnitude systems: Apparent and absolute magnitudes, Distance Modulus; Determination of Temperature and Radius of a star

Atmospheric effects (absorption, seeing) - Basics of telescopes - Noise and statistics - Photon detectors - Basics of photometry - Spectroscopy and polarimetry.

Unit IV The sun as a star   (10 Periods)
The Sun as a star, Solar Parameters, Solar Atmosphere, Solar Photosphere, Chromosphere, Corona, Solar Activity, Sunspots and sunspot cycle, solar limb darkening, solar neutrino puzzle.

Reference Books:
1.   Modern Astrophysics – B.W. Carroll and D.A. Ostlie, 1996, Addison-Wesley Publishing Co., Inc.
2.   The Physical Universe: An Introduction to Astronomy – Frank H. Shu, 1982, University Science Books, Sausalito, California
3.   Astrophysics by Baidyanath Basu
4.   Introduction to Astrophysics by K D Abhyankar

SEC III (A) Skill Enhancement Course: *A. Renewable Energy and Harvesting*

Credits: 02	*Periods*: 45	*Total Marks*: 50 (*CA=25, ESE=25*)

Learning Objectives: *Aim of this course is to introduce and create awareness among the students about use of the non-conventional energy sources such as solar energy, wind energy, tidal energy, biomass, etc. After completing this course the students will not only gain knowledge of various non-conventional energy sources but also get hands-on experience of utilizing them in real life. As this course is primarily of hnads-on trianing type, therefore, the students will be trained to harvest these non-conventional energy sources and design their own gadgets to convert and use them for their house hold purposes.*

Uuit 1 Fossil Fuels and Alternate Sources of Energy   **(12 Lectures)**
Fossile fuels and Nuclear Energy, Need of renewable energy, Non-conventional energy sources, Wind Energy, Tidal Energy, Solar Energy, Biomass Energy.

Unit 2 Solar Energy and Harvesling   **(12 Lectures)**
Importance, Storage of Solar Energy, Applications of Solar Energy, Solar Water Heater, Solar Distillation, Solar Cooker, Solar Greenhouses, Solar cell charecterstics of Photovoitaic (pv) Systems.

Unit 3 Wind Energy Harvesling   **(11 Lectures)**
Fundameials of Wind Energy, Wind Turbines and Different Electrical Machines in Wind Turbines, Power Eleclronic Interfaces and Grid Interconnection Technologies.

Unit 4 Ocean Energy   **(10 Lectures)**
Oscean Enersy Potential against Wind and Solar Enevgy, Wave Energy Devices. Geothermal Energy Technologies, Hydropower Technologies.

Hands on Exercises:
1. Studying basics of solar energy
2. Assemble solar cooker
3. Studying basics of solar electricity
4. Installation of solar panels and solar energy harvesting
5. Studying basics of Biomass Energy as an alternative source
6. Generating electricity from wind energy and its storage
7. Studying the construction ans working of a solar lantern
8. Desigiing and constructing photovoltaic system for a domestic house requiring 5kVA power
9. Designing and constructing wind turbine system to power a house requiring 2kVA

Reference Books:

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
4. Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004,
Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

SEC III (B) Skill Enhancement Course: *B. Electrical Circuit Analysis Skill*

Credits: 02	*Periods*: 45	*Total Marks*: 50 (*CA=25, ESE=25*)

Learning Objectives: *Aim of this course is to create awareness among the students about the electrical circuits, wiring of the electrical appliances and enable them to check for troubleshoots through hands-on exercises. This course introduces the students to various electrical components including their characteristics and power losses. As this course is of skill based, therefore, after completing this course students will not only be able to check the electrical connections at house-hold but will also learn the skill to repaire the electrical appliances for the general troubleshoots and wiring faults.*

Unit I Understanding Electrical Circuits   **(15 Lectures)**
Main electric circuit elements and their combinations, rules of analyzing the DC electrical circuits, quantifying current and voltage drops across the circuit elements. A.C. Circuits: Single-phase and three-phase alternating current sources, rules to analyze the AC electrical circuits, understanding real, imaginary and complex power components of the AC source, power factor and approaches to save energy and money.

Electrical circuit drawing symbols, blueprints, reading schematics, ladder network diagrams. Electrical Schematics, Power circuits, Control circuits and reading the circuit schematics. Tracking the connections of elements and identifying current flow and voltage drop.

Unit II Electrical Transformers, Generators and Motors   **(10 Lectures)**
DC Power sources, AC and DC generators, characteristics of the circuit elements inductance, capacitance, and impedance, transformer workings and characteristics

Working of electric motors, single-phase, three-phase AC and DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

Unit III Electrical Circuit Protection   **(15 Lectures)**
Relays, fuses and disconnect switches, circuit breakers, overload protection devices, electrical ground-fault protection, grounding and isolating electric circuits, phase reversal, surge protection. Interfacing DC or AC sources to control elements (relay protection device)

Unit IV Electrical Wiring   **(10 Lectures)**
Different types of conductors and cables, basics of wiring: star and delta connections, voltage drops and electrical losses across the connecting cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays.

    Hands on Exercises:

    1. Awareness of electrical safety tools and rescue of person in contact with live wire

    2. Studying electrical performance and power consumption of a given number of bulbs connected in series and parallel circuits

    3. Checking specific gravity of lead acid batteries in home UPS and toping-up with distilled water

    4. Practicing soldering and de-soldering of various electrical and electronic components

5. Identifying Phase, Neutral and Earth on power sockets and checking the healthiness of mains using a test lamp

6. Identifying primary and secondary windings and measuring primary and secondary voltages in various types of transformers

7. Connecting an ELCB and testing the leakage of an electrical motor control circuit

8. Connecting battery and load to an UPS and testing its performance in battery mode

9. Studying construction and working of AC and DC motors

10. Trouble shooting electrical circuits

11. Studying electrical circuit protection using relays, fuses and circuit breakers

12. Dismantle electric fan / motor and identify the damaged / burnt part of winding in it

13. Drawing blueprints and wiring of single phase electrical circuit for a house hold supply

Books Recommended:
1   A text book in Electrical Technology - B L Theraja - S Chand & Co.
2   A text book of Electrical Technology - A K Theraja
3   Performance and design of AC machines - M G Say ELBS Edn.

B. Sc. Third Year Physics (Semester – VI) Syllabus
Choice Based Credit System (CBCS) Course effective from June -2018

P-XIV DSCP II (Section A) - Discipline Specific Compulsory Paper:
Atomic, Molecular & Nuclear Physics

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objectives: *Aim of this course is to introduce the students to the world of physics of atoms, molecules and nuclei, their structures, emission of Gamma rays, X-rays, optical and microwave spectra from these systems, the interaction of atoms and molecules with electric and magnetic fields. This course also provides adequate knowledge on the nuclear energy sources and reactions with its application in establishing nuclear reactors.*

Unit I Atomic Physics (15 Periods)
The Vector Atom Model, Quantum numbers associated with the vector atom model, LS and J-J coupling, The Pauli's exclusion Principle, Selection rules, Intensity rules, Interval rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.

Unit II Molecular Spectra (10 Periods)
Regions of Electromagnetic Spectra, Classification of Molecular Spectra, Theory of pure rotational spectra, Theory of rotation-vibration spectra, Raman Effect, Experimental study,

Unit III Nuclear Fission and Nuclear Reactions (10 Periods)
Nuclear Fission, the fission products, energy release in fission, nuclear transmutation reactions, Conservation laws, Nuclear reaction kinematics

Unit IV Nuclear Fusion and its applications (10 Periods)
Nuclear fusion, p-p chain reaction as the source of energy in the Sunlike stars, thermal nuclear reactor, the neutron cycle, controlled and uncontrolled thermonuclear reactions.

Recommended Books:
   1. Modern physics- R. Murugeshan, Kruthigaprasath. (S.Chand & Co.)
   2. Atomic physics – J.B.Rajam. (S.Chand & Co.)
   3. Nuclear Physics – D.C.Tayal (Himalaya Publishing House)
   4. Nuclear Physics – Irving Kaplan
   5. Introduction to Atomic Spectra: H E White, McGraw Book Company, Inc.
   6. Basic Nuclear Physics- B. N. Shrivastav.

P-XV A - DSEP II (Section B) - Discipline Specific Elective Paper

A. Digital and Communication Electronics

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objectives: *This course enabels the students to understand the importance and interconvertibility of various number systems, principles of digital gates, and working principle of communication systems. After completing this course students will be in a position to know the working of communication systems i.e., modulators, demodulators, transmitters and receivers, etc.*

Unit I Number Systems (12 Periods)
Number System:- Decimal numbers, Binary numbers, Binary arithmetic, Ones complement representation, Twos complement representation, Octal Numbers, Hexadecimal numbers, Inter-conversions of number systems, Binary coded decimal (BCD), Gray code, Excess-3 code.

Unit II Logic Gates (12 Periods)
AND gate, OR gate, NOT gate, NAND gate, NOR gate, EX-OR and EX-NOR gates, Universal properties of NAND and NOR gates.
Boolean operations, logic expressions for 2,3 & 4 inputs, laws of Boolean algebra, De -Morgen's theorems, SOP form of Boolean expressions, simplification of Boolean expressions using K- maps (up to 4 variables),Half adder, Full adder

Unit III Modulation and Demodulation (12 Periods)
Introduction, Types of Modulation, Expression for A. M. voltage, AM waves, Frequency spectrum of AM wave, Power Output in AM, Expression for frequency modulated voltage, Principle of demodulation, linear diode AM detector or demodulator.

Unit IV Communication Electronics: (book5, 6) (09Periods)
Introduction, Block diagram of basic communication system, Essential elements of A.M.   Transmitter. A.M. receiver: Turned Radio Frequency (TRF) Receiver, Super heterodyne receiver, Characteristics of radio receivers: sensitivity, selectivity, fidelity & their measurements.

   Books Recommended:

   1.Modern Digital Electronics- R.P. Jain, Tata McGraw Hill Pub. Company (Third edition)
   2.Digital Fundamentals-Thomas L. Floyd, Universal Book Stall
   3.Digital Principles and Applications- A. P. Malvino, (McGraw Hill International Editions(Fourth Edition)
   4.Digital Electronics with Practical Approach- G. N. Shinde, Shivani Pub., Nanded
   5.Electronics and Radio Engineering – M. L. Gupta
   6.Communication Engineering – J.S. Katre (Tech Max Pub – Second revi. edition)

P-XV B - DSEP II (Section B) - Discipline Specific Elective Paper

B. Linear and Digital Integrated Circuits

Credits: 02	*Periods*: 45	*Total Marks*: 50 (*CA=10, ESE=40*)

Learning Objectives: *This course enabels the students to understand the importance of Operational Amplifier for various applications, importance and interconvertibility of various number systems, principles of digital gates, and working principle of digital gates. After completing this course students will be in a position to know the working of various types of flip-flps and counters used in barious applications.*

Unit I Operational Amplifier & Its applications   **(12 Periods)**
Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground.
Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator

Unit II Digital Electronics Concepts   **(15 Periods)**
Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method
Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean Algebra
Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP).
Binary Addition, Half and Full Adder, Half and Full Subtractor, 4-bit binary Adder / Subtractor.

Unit III Combinational and Sequential Circuits   **(9Periods)**
Multiplexers, De-multiplexers, Decoders, Encoders.
SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop.

Unit IV Registers and Counters   **(9Periods)**
Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).
Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

    Reference Books:
    1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
    2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
    3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw Hill Publications
    4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
    5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
    6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
    7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
    8. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

P-XV C - DSEP II (Section B) - Disciplne Specific Elective

C. Fiber Optical Communication

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Learning Objectives*: This course is aimed to offer a broad view on the fundamentals and salient features of the modern communication technique i.e., fiber optical communication, which revolutionized communication technology and has become integral part of the Engineering and related technologies. This course provides a deep understanding of the fiber optical communication and salient features of designing and developing different types of optical fibers to be used for specific purposes. Through this course the students will learn the concepts of propagation and behavior of light rays through the optical fibers of different refractive indices. The pre-requisite for this is that the students must know characteristics of different light sources including monochromatic sources like LASERS, and electromagnetic wave theory.*

Unit I **(12 Lectures)**
Introduction to Fiber optics, Snell's law, Total Internal Reflection, Transmission of light in optical fiber, Concept of Acceptance angle, Relation between acceptance angle and refractive indices of the media (i.e. Numerical Aperture of the fiber), Meridional rays and skew rays.

Unit II **(10 Lectures)**
Types of fibers and their transmission ray characteristics, Step index single mode and multimode optical fiber waveguides, Guided modes or mode volume of step index multimode fibers, Normalized frequency

Unit III **(13 Lectures)**
Graded index fibers, Refractive index profiles with α parameters, Ray transmission in graded index fibers, Comparison of Intermodal dispersion in Graded index and Step index fibers, Mode volume or Guided modes in Graded index fibers.

Unit IV **(10 Lectures)**
 Single mode fibers, maximum core diameter for single mode operation, cutoff wavelength.

> **Reference Books**:
> 1. Optical Fiber Communications: Principles and Practice, John M Senior
> 2. Optical Fibers & Fiber Optical Communication Systems,   S. K. Sarkar
> 3. Introduction to fiber optics, R S Khairnar

SEC IV (A) Skill Enhancement Course
A. Physics Workshop Skills

Credits: 02	*Periods*: 45	*Total Marks*: 50 (*CA=25, ESE=25*)

Learning Objectives: *Aim of this course is to create awareness among the students about the mechanical, electrical and electronic tools through hands-on activities. This course introduces the students to the workshop skills like cutting, drilling, filing, different types of AC and DC generators, soldering-desoldering of electrical and electronics components, constructing regulated power supplies, etc., therefore, after completing this course students will gain skills of using various workshop tools and also to find faults and general troubleshoots and wiring faults.*

Unit I Introduction   **(4 Lectures)**
Measuring units. Conversion to SI and CGS. Familiarization with meter scale, Vernier caliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Unit II Mechanical Skill   **(10 Lectures)**
Concept of workshop practice. Concept of machine processing. Introduction to common machine tools like shaper, drilling, and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block.. Make funnel using metal sheet.

Unit III Electrical Skills   **(08 Lectures)**
DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Response of inductors and capacitors with DC or AC sources. Operation of transformers..

Unit IV Electronic Skill   **(08 Lectures)**
Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator Electronic switch using transistor and relay

Hands on Exercises:

1. Measure dimensions of solid blocks of different sizes using Vernier Calliper
2. Making funnel using metal sheet
3. Designing and constructing a transistorized regulated power supply
4. Constructing voltage regulating circuits using IC LM 317
5. Soldering and de-soldering of circuits using discrete components (R, L, C, Diodes, transistors, etc)
6. Designing and making of printed circuit boards (PCBs)
7. Soldering of ICS on PCB
8. Constructing and testing working of IC 555 Timer
9. Winding a coil or transformer of different number of turns and testing their performances
10. Wiring of simple circuits using Bread Board

Reference Books:

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

SEC IV (A) Skill Enhancement Course
B. Semiconductor Devices Application Skill

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=25, ESE=25*)

Learning Objectives: *This course is aimed to introduce the students to the working characteristics comparing the performances of various types of semiconductor devices. Therefore, after completing this course they will gain experience of soldering of electronics circuits, constructing DC regulated power upplies, etc.*

Unit I Semiconductor Diodes   (10 Lectures)
Construction, working and characteristics of different types of P-N junction diodes, Construction, working and characteristics of Zener diode, Construction, working and characteristics of Photo diode and Varactor diode.

Unit II Field Effect Transistors   (5 Lectures)
Construction, working and characteristics of JFET, Construction, working and characteristics of MOSFET

Unit III Rectifiers   (5 Lectures)
Block diagram of power supply, half wave rectifier, Full wave rectifier, ripple factor and efficiency of half and Full wave rectifiers

Unit IV Thyristor and UJTs   (10 Lectures)
Construction, working and characteristics of SCR and Construction, working and characteristics of UJT.

Hands on Exercises:
1. Study and compare the V-I Characteristics of various types of P-N junction diodes (e.g. general purpose, LEDs, Zener Diode, etc.)
2. Study and compare the working of Photo diode and Varactor diode
3. Study and compare the working properties of the *n*-channel and *p*-channel JFETs
4. Study and compare the working properties of the *n*-channel and *p*-channel MOSFETs
5. Construct and test the performance of a FET Amplifier
6. Study the working of half wave rectifier and determine ripple factor for different R, L, C filters
7. Study the working of full wave rectifier and determine ripple factor for different R, L, C filters
8. Study of SCR characteristics
9. Study of UJT characteristics
10. Construct UJT based free running oscillator and change its frequency.
11. Construct a test circuit of SCR using UJT triggering

Reference Books:
1. Electronic Principles: *A P Malvino*, Tata Mc. Graw Hill Pub. Co. Ltd.
2. Basic Electronics (Solid State): *B L Theraja*, S. Chand Publishing
3. Principles of Electronics: *V K Mehta and Rohit Mehta*, S. Chand Publishing
4. Thyristors and their Applications*: M. Ramamoorty,* Macmillan Press Limited 1977

P-XVI DSCPP I (Section A & B): Practicals Based on Theory Paper Nos. P-XII & XIV
(*Assessment to be done at the end of VIth Semester i.e., Annual Pattern*)

Credits: 02	*Periods*: 45	*Total Marks*: 50 (*CA=10, ESE=40*)

1. Coefficient of viscosity by oscillating disc method
2. Determination of Rydberg's constant
3. Hartmann's dispersion formula
4. Temperature of flame
5. Cauchy's constant by using spectrometer
6. Conductivity by Forbe's method
7. Determination of Planck constant (h) by photo cell.
8. e / m by Thomson's method
9. Determination of resolving power of prism
10. Diffraction at Cylindrical Object: Determination of Wavelength
11. Thermal conductivity of an insulator by Lee's disc method.
12. Resolving power of grating
13. Y By Konings Method
14. To Study the Spectral Characteristics of a photovoltaic solar cell
15. To determine the wavelength of H-alpha emission line in Hydrogen spectrum

Note: Every student is required to perform **at least twelve (12) practicals** out of seventeen experiments in semesters V and VI. They have to complete the record book / journal listing atleast 12 experiments and have to submit/present before the panel of examiners at the time of their practical examination.

P-XVII DSEPP I (Section A & B) - Practicals Based on Theory Paper Nos. P-XIII & XV
(*Assessment to be done at the end of VIth Semester i.e., Annual Pattern*)

Credits: 02	*Periods*: 45	*Total Marks:* 50 (*CA=10, ESE=40*)

Practicals Based on Discipline Specific Elective DSEP I (Section A)

i.   *Elective – A: Solid State Physics (P-XIII A)*

1.   To study the Hysteresis curve of the transformer core
2.   Study of variation of thermo e.m.f. as a function of temperature
3.   Study of CRO Measurement of frequency and voltage sensitivity
4.   Determination of electrical conductivity of graphite rod
5.   Determination of temperature coefficient of thermister
6.   Study of energy bad gap of a semiconductor
7.   Determination of Planck constant (h) by LED
8.   Comparison of capacity by Method of mixture
9.   I-H curve by Magnetometer method
10. To measure resistivity of semiconductor by four probe method
11. Determination of crystal structure using Laue pattern
12. Determination of crystal structure by rotating crystal method

ii.   *Elective – B: Solar Energy (P-XIII B)*

1.   V-I characteristics of a solar panel
2.   Characteristics of silicon solar cell
3.   Studying performance of solar flat plate collectors
4.   Studying working of solar water heating system
5.   Characteristics of solar cooker
6.   Study of Power versus load characteristics of Solar Photovoltaic panel.
7.   Conversion of solar energy into voltage using thermoelectric modules
8.   Study of Series combination of Solar Photovoltaic panels
9.   Study of Parallel combination of Solar Photovoltaic panels

iii.   *Elective –C: Astrophysics (P-XIII C)*

1. To determine mass of the Jupiter by studying revolution of its moons using the CLEA software

2. To study radiation pattern of the Sun and hence estimate effective surface temperature and luminosity of the Sun.

3. Estimating first-order atmospheric extinction of starlight using given data

4. Measuring sky brightness using solid state photometer

5. Studying solar limb darkening effect

6. Temperature of an artificial star

7. Photoelectric photometry of stars using CLEA software

8. Measuring distance to Moon by parallax method.

9. Identifying and measuring diameters of Craters on the Moon surface.

10. Measurement of distance of star clusters by main sequence fit method

11. Observing Sun sun-spots and measuring their diameter

Note: Every student is required to perform **at least six (06) experiments** from the list given above corresponding to the elective paper (Elective I) offered to him for semester V. This will form half part of the practical paper P-XVII (**DSEP I), while the remaining half will be the laboratory work corresponding to the elective paper offered to him during semester VI. Performance of the students for both these electives as a practical paper P-XVII will be assessed at the end of semester VI by a panel of external examiners. They are required to submit the journal / record book indicating atleast 12 experiments, o6 from each elective at semester V and VI, at the time of practical examination.**

Practicals Based on Discipline Specific Elective DSEP I (Section B)

i.   *Elective – A: Digital and Communication Electronics (P-XV A)*

1. Verification of truth table of basic gates (AND, OR, NOT) using ICs.
2. Construction of basic gates (AND, OR, NOT) using NAND gates
3. Construction of basic gates (AND, OR, NOT) using NOR gates
4. Construction and study of half adder using NAND gates.
5. Construction and study of full adder using NAND gates.
6. Implementation of Boolean expression from the given truth table using K- map.
7. Study of Colpits oscillator
8. Study of Hartley Oscillator
9. Study of low pass and high pass filter using resistance and capacitance
10. Clipper and Clamper circuits
11. Study of A.M. Modulator
12. Study of A.M. Demodulator

ii.   *Elective – B: Linear and Digital Integrated Circuits (P-XV B)*

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
2. To design inverting amplifier using Op-amp (741,351) & study its frequency response
3. To design non-inverting amplifier using Op-amp (741,351) & study frequency response
4. To add two dc voltages using Op-amp in inverting and non-inverting mode
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To construct 4- bit binary adder
8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. To build JK Master-slave flip-flop using gates
10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.
12. To construct 4- bit binary subtractor

iii.   Elective – C: Fiber Optic Communication (P-XV C)

1. Demonstrate the use of fiber optic trainer kit

2. Identify the recourses and their uses on the given fiber optical trainer kit

3. Make optical fiber setup to transmit and receive analog and digital data

4. Demonstrate FM modulation and demodulation using OFC trainer kit using audio signal and voice link

5. Demonstrate PWM modulation and demodulation using OFC trainer kit using audio signal and voice link

6. Demonstrate PPM modulation and demodulation using OFC trainer kit using audio signal and voice link

7. Studying loss pattern of power due to transmission of signal through fibers of different lengths

8. Studying loss of power due to the bending of optical fibers

Note:

1. Every student is required to perform **at least six (06) experiments** from the list given above corresponding to the elective paper (Elective II) offered to him for semester VI. This will form half part of the practical paper P-XVII (**DSEPP I), while remaining half will form the laboratory work corresponding to the elective paper offered to him during semester V. Performance of the students for both these electives as a practical paper P-XVII will be assessed at the end of semester VI by a panel of external examiners. They are required to submit the journal / record book indicating atleast 12 experiments, o6 from each elective at semester V and VI, at the time of practical examination.**

2. Assessment of the Skill Enhancement (SEC) papers: Continuous Assessment of the SEC I and II includes Test / Tutorial of 15 marks on the theory aspect and Seminar of 10 marks (Test 15 + Seminar 10 =25), while remaining 25 marks will be on the basis of the performance of the student in the End Semester Examination (ESE) in the form of seminar / practical work to be conducted by a pair of external examiners at the end of Semester IV

(***Dr. M. K. Patil***)
Chairman, BOS in Physics

Question Paper Pattern
B. Sc. Third Year Semester V and VI

Time: 02 Hrs   **Total Marks: 40**

Note: All questions are compulsory and carry equal marks

Question 1 – Attempt any FOUR (each of 2 marks)   **8 marks**
  i.
  ii.
  iii.
  iv.
  v.
  vi.

  (Note: This question will be based on the entire syllabus and must contain at least one sub-question from each unit)

Question 2 – Attempt any TWO of the following (each of 4 marks)   **8 marks**
  a.
  b.
  c.

  (Note: This question will be based on Unit I and Unit II, with a minimum of 1 sub-question and a maximum of 2 sub-questions from each unit)

Question 3 – Attempt any ONE of the following (each of 8 marks)   **8 marks**
  a.
  b.

  (Note: This question will be based on Unit I and Unit II, one sub-question from each unit)

Question 4 – Attempt any TWO of the following (each of 4 marks)   **8 marks**
  a.
  b.
  c.
  (Note: This question will be based on Unit III and Unit IV, with a minimum of 1 sub-question and a maximum of 2 sub-questions from each unit)

Question 5 – Attempt any ONE of the following (each of 8 marks)   **8 marks**
  a.
  b.
  (Note: This question will be based on Unit III and Unit IV, one sub-question from each unit)

Question Paper Pattern for Practical Course
Of B. Sc. Third Year Semester V and VI
(Annual Pattern)
Practical Paper Nos. P-XVI and P-XVII

Time: 03 Hrs   **Total Marks: 40**

Note: *i. Every student is required to complete one experiment in the final examination*
ii. The distribution of the 40 marks will be as given below

Q-1 (a) Experimental work will carry *25 marks*

    (b) Calculations, Units, Results, Graphs, etc. will carry *10 Marks*

    (c) Viva-voce will be for *05 marks*