**RASHTRASANT TUKADOJI MAHARAJ, NAGPUR UNIVERSITY, NAGPUR**

# SYLLABUS FOR B.Sc. ZOOLOGY (SEMESTER PATTERN)

**(With effect from the academic year 2013-2014)**

The semester pattern syllabus for B.Sc. Three Year Degree Course in the Subject - Zoology comprises of six semesters. Each semester is based on six theory periods and six practical periods per week. The examination of each semester shall comprise of two theory papers each of three hours duration and carries 50 marks each and a practical of 4 hours duration carries 30 marks. Internal assessment for each semester based on two theory papers of 10 marks each and shall be conducted by university approved teachers. Internal assessment marks should be submitted to the university one month prior to the final examination. Candidates are expected to pass separately in theory, internal assessment and practical examination.

**The Structure of Syllabus for B.Sc. Zoology (Semester Pattern) along with distribution of marks is also displayed in the following Table**

| Semester | Semesterwise Theory Papers and Practicals | Marks | | | Total Marks |
|---|---|---|---|---|---|
| | | Theory | Internal Assessment* | Practical | |
| **Semester - I** | **Theory**<br>**Paper – I** : Life and Diversity of Animals-Nonchordates (Protozoa to Annelida) | 50 | 10 | | 150 |
| | **Paper -II** : Environment Biology | 50 | 10 | | |
| | **Practical - I** (Based on Paper I & II) | | | 30 | |
| **Semester- II** | **Theory**<br>**Paper - III** : Life and Diversity of Animals- Nonchordates (Arthropoda to Hemichordata) | 50 | 10 | | 150 |
| | **Paper - IV** : Cell Biology | 50 | 10 | | |
| | **Practical - II** (Based on Paper III & IV) | | | 30 | |
| **Semester- III** | **Theory**<br>**Paper - V** : Life and Diversity of Animals-Chordates (Protochordata to Amphibia) | 50 | 10 | | 150 |
| | **Paper - VI** : Genetics | 50 | 10 | | |
| | **Practical - III** (Based on Paper V & VI) | | | 30 | |
| **Semester - IV** | **Theory**<br>**Paper - VII** : Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals) | 50 | 10 | | 150 |

Contd. on Pg. 2

| | | | | | |
|---|---|---|---|---|---|
| | **Paper - VIII** : Molecular Biology and Immunology | 50 | 10 | | |
| | **Practical - IV** (Based on Paper VII & VIII) | | | 30 | |
| **Semester - V** | **Theory**<br>**Paper - IX** :General Mammalian Physiology I | 50 | 10 | | 150 |
| | **Paper - X** : Applied Zoology I (Aquaculture and Economic Entomology) | 50 | 10 | | |
| | **Practical - V** (Based on Paper IX & X) | | | 30 | |
| **Semester - VI** | **Theory**<br>**Paper - XI** : General Mammalian Physiology II | 50 | 10 | | 150 |
| | **Paper - XII** : Applied Zoology II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics) | 50 | 10 | | |
| | **Practical - VI** (Based on Paper XI & XII) | | | 30 | |
| | | **Grand total** | | | 900 |

*****Internal assessment –

- (For Semester I to IV) Based on students attendance and the performance during Unit test exam. and field work
- (For Semester V & VI) Based on students attendance and the performance during Unit test exam., field work and seminar

## Semester - I

## Paper – I : Life and Diversity of Animals - Nonchordates (Protozoa to Annelida)

**Unit – I** **(9 Periods)**

**Protozoa** : General characters and classification up to classes

***Paramoecium*** : Structure and reproduction

***Plasmodium*** : Structure and life cycle

**Parasitic Protozoans of Man :** *Entamoeba, Trypanosoma, Giardia and Leishmania* - Mode of infection and its control

**Unit – II** **(9 Periods)**

**Porifera** : General characters and classification up to classes

***Sycon*** : Structure, reproduction and development, Canal system in sponges

**Coelenterata** : General characters and classification up to classes

***Obelia*** : Structure and life cycle, corals and coral reef formation

**Unit – III** **(9 Periods)**

**Helminthes** : General characters and classification up to classes

***Ascaris*** : External morphology, reproductive system and life cycle

***Taenia solium*** : Structure and life cycle

**Elementary idea of parasitic adaptations in helminthes**

**Unit – IV** **(9 Periods)**

**Annelida** : General characters and classification up to classes

**Leech** : Morphology, digestive and urinogenital system

Trochophore larva and its significance

Vermiculture and its importance

**Semester – I**

**Paper – II : Environmental Biology**

**Unit – I** **(9 Periods)**

Atmosphere: Major zones and its importance, composition of air

Hydrosphere: Global distribution of water, Physico-chemical characteristics of water

Lithosphere: Types of rocks, formation of soil

Renewable and non- renewable energy sources

**Unit – II** **(9 Periods)**

Ecosystem - Definition and types

Detailed study of pond ecosystem

Food chain, food web and ecological pyramids

Energy flow in an ecosystem, Single channel, Y – shape and Universal model

**Unit – III** **(9 Periods)**

Biodiversity and its conservation

Causes of reduction of biodiversity

Wildlife conservation acts (1972 and 1984), Introductory study of national parks and sanctuaries – Tadoba, Kanha, Bharatpur and Nagzira

Hot spots of biodiversity in India

**Unit – IV** **(9 Periods)**

Sources, effect and control measures of air pollution, Acid rain, green house effect, ozone depletion and global warming

Sources, effect and control measures of water pollution

Sources effect and control measures of noise pollution

Toxic effect of heavy metals (lead, cadmium and mercury) – Bioaccumulation and biomagnification

**Semester – I**

**PRACTICAL – I (Based on Paper – I and II)**

**Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)**

**& Section B : Environmental Biology**

**Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)**

**1. Study of museum specimens (Classification of animals up to orders)**

I. Protozoa (Slides) : *Paramoecium ,Euglena,* Amoeba*, Plasmodium vivax*

II. Porifera: *Sycon, Leucosolenia, Hyalonema, Euplectella, Spongilla*

III. Coelenterata : *Obelia, Aurelia, Tubipora, Fungia, Adamsia*

IV. Platyhelminthes : *Planaria, Fasciola, Taenia*

V. Aschelminthes : *Ascaris, Drancunculus, Ancylostoma, Wuchereria*

VI. Annelida : *Aphrodite, Nereis, Chaetopteurs, Tubifix, Hirudinaria*

**2. Study of permanent slides**

*Enatmoeba, Giardia*, Sponge gemmules, Sponge spicules,V.S. *Sycon*, T.S. *Sycon, Obelia* medusa, Miracidium, Redia and Cercaria larvae of *Fasciola*,T.S. male and female *Ascaris,* Scolex of *Taenia,* Mature and gravid proglottids of *Taenia solium,* T.S. of Leech through crop pockets, Trochophore larva

**3. Dissection**

Digestive, nervous and reproductive system of Earthworm

**4. Mounting**

Spicules and gemmules of Sponge, *Obelia* colony, *Nereis* parapodia, Jaws of Leech, Nephridia of Leech.

**Section B: Environmental Biology**

1. Estimation of dissolved oxygen of water
2. Estimation of free $CO_2$ of water
3. Estimation of pH of water sample
4. Estimation of total hardness of water
5. Study of pond ecosystem - Producers, consumers and decomposers
6. Quantitative analysis of plankton

**Visit to a National park and Sanctuary**

**Distribution of Marks – Total Marks 30**

| | | |
|---|---|---|
| i. | Identification and Comment on Spots (4 Museum specimens + 1 Env. bio. spot + 3 slides) | 08 |
| ii. | Dissection - | 08 |
| iii. | Environmental biology experiment | 04 |
| iv. | Permanent stained preparation | 03 |
| v. | Submission of certified practical record | 03 |
| vi. | Submission of Slides & tour diary | 02 |
| vii. | Viva voce | 02 |

**Semester – II**

**Paper – III : Life and Diversity of Animals – Nonchordates**

**(Arthropoda to Hemichordata)**

**Unit – I** **(9 Periods)**

**Arthropoda** : General characters and classification up to classes

**Cockroach** : Mouth parts, digestive system and reproductive system

**Insects as Vectors** : Mosquito, Housefly, Sandfly, Tse-Tse fly

**Study of crustacean larvae** : Nauplius, Zoea and Megalopa; Social behavior inhoney bees

**Unit – II** **(9 Periods)**

**Mollusca** : General characters and classification up to classes

***Pila*** : Morphology, digestive, respiratory and reproductive system

**Pearl formation in Mollusca**

**Molluscan larvae :** Glochidium and Veliger

**Unit – III** **(9 Periods)**

**Echinodermata** : General characters and classification up to classes

***Asterias*** : External features and digestive system

Water vascular system and locomotion in Starfish

**Echinoderm larvae** : Bipinnaria and Auricularia

**Unit – IV** **(9 Periods)**

**Hemichordata** : General characters and phylogeny

***Balanoglossus*** : External features and digestive system

Reproduction in *Balanoglossus* , Tornaria larva

Affinities of *Balanoglossus*

**Semester – II**

**Paper – IV: Cell Biology**

**Unit – I** **(9 Periods)**

Ultrastructure of prokaryotic and eukaryotic cell

Plasma membrane: Structure- Fluid Mosaic Model and functions

Endoplasmic reticulum: Types, ultrastructure and functions

Golgi complex: Ultrastructure and functions

**Unit – II** **(9 Periods)**

Ultrastructure of mitochondria

Oxidative phosphorylation – Glycolysis and Kreb's cycle

Electron Transport Chain and terminal oxidation

Lysosome: Structure, polymorphism and functions

**Unit – III** **(9 Periods)**

Nucleus: Ultrastructure of nuclear membrane

Structure and functions of nucleolus

Chromosome: Structure and types, structure of nucleosome

Giant chromosomes: Lamp-brush and polytene chromosome

**Unit - IV** **(9 Periods)**

Ribosome: Structure, types, Lake's model and functions

Somatic cell division: Cell cycle and Mitosis

Meiosis (different phases and significance), synaptonemal complex

Cellular ageing and cell death, Elementary idea of cancer and its causative agents

**Semester – II**

**PRACTICAL – II (Based on Paper – III and IV)**

**Section A : Life and Diversity of Animals – Nonchordates (Arthropoda to Hemichordata) & Section B: Cell Biology**

**Section – A : Life and Diversity of Animals – Nonchordates (Arthropoda to Hemichordata)**

1. **Study of museum specimens** (Classification of animals up to orders)
   - I. Arthropoda : *Peripatus, Cyclops, Daphnia, Lepas, Sacculina, Limulus,* Crab, *Scolopendra, Julus,* Dragonfly, Grasshopper, Moth
   - *II.* Mollusca : *Chiton, Dentalium, Aplysia, Pila, Mytilus, Loligo, Sepia, Octopus*
   - *III.* Echinodermata : *Asterias, Ophiothrix, Holothuria, Antedon, Echinus*
   - *IV.* Hemichordata : *Balanoglossus, Saccoglossus*
2. **Study of permanent slides**-

   Nauplius, Zoea and Megalopa larva of Arthopoda, Veliger and Glochidium larva of Mollusca, T.S. of arm of star fish, Bipinnaria and Auricularia larva, T.S. *Balanoglossus* through collar and proboscis, Tornaria larva
3. **Dissection -**
   - I. Digestive system of Cockroach
   - II. Reproductive system of Cockroach
   - *III.* Nervous system of *Pila*
4. **Mounting-**

   Crustacean larvae and plankton**;** Mouth parts, trachea and salivary gland of Cockroach; Gill lamella, osphradium and radulla of *Pila*

**Section B: Cell Biology**

1. Study of pictures of ultra structure of prokaryotic cell & eukaryotic cell
2. Study of osmosis in human RBCs ( hypotonic, hypertonic and isotonic medium)
3. Demonstration of mitotic cell division in onion root tips by squash method
4. Demonstration of meiosis in *Tradescantia* bud/ Grasshopper testis by squash method
5. Demonstration of salivary gland chromosome in Chironomous larva
6. Demonstration of mitochondria in buccal epithelium/ lip mucosa by Janus Green-B method
7. Use of ocular micrometer and measurement of micro objects
8. Demonstration of Barr body in blood smear

**Distribution of Marks – Total Marks 30**

| | | |
|---|---|---|
| i. | Identification and Comment on Spots (5 Museum specimens + 3 slides) | 08 |
| ii. | Dissection - | 08 |
| iii. | Cell biology experiment | 04 |
| iv. | Permanent stained preparation | 03 |
| v. | Submission of certified practical record | 03 |
| vi. | Submission of Slides | 02 |
| vii. | Viva voce | 02 |

**List of Recommended Books : (For Semester – I & II)**

**Life and Diversity of Animals – Non Chordates**


1. Barnes **– Invertebrate Zoology (Halt-Saunders international)** Philadelphia, USA
2. Barradaile L.A. & Potts F.A. – **The Invertebrate**
3. Nigam **– Biology of Nonchordates**
4. Kotpal, Agrawal & Khetrapal **– Modern Text Book of Zoology - Invertebrates,** Rastogi Publication, Meerut
5. Puranik P.G. & Thakur R.S. **– Invertebrate Zoology**
6. Majupuria T.C. **– Invertebrate Zoology**
7. Dhami & Dhami **– Invertebrate Zoology**
8. Parker & Hashwell, **Textbook of Zoology Vol. I (Invertebrates)** A.Z.T.B.S. Publishers & Distributors, New Delhi
9. Dr. S.S. Lal **Practical Zoology Invertebrates 9th edition,** Rastogi Publication Meerut
10. EJW Barrington– **Invertebrate Structure and Function** ELBS III Edition

11. R.L. Kotpal **– Phylum Protozoa to Echinodermata (series),** Rastogi and Publication, Meerut
12. Parker J. and Haswell W. – **Text Book of Zoology**, ELBS Edition
13. Vidyarthi – **Text Book of Zoology**, Agrasia Publishers, Agra
14. Jordan E.L. and Verma P.S. – **Chordate Zoology**, S. Chand and Co., New Delhi
15. Ayer E. – **Manual of Zoology**
16. M.D. Bhatia – **The Indian Zoological Memories – Leech**
17. Beni Prasad – **The Indian Zoological Memories – Pila**
18. P. K. Gupta – **Vermicomposting for Sustainable Agriculture**, Agrobios India Ltd
19. A manual of Practical Zoology Invertebrates – P. S. Verma

**Environmental Biology**

1. Ashthana D.K. **– Environmental Problem & Solution**
2. Agrawal K.C. **– Environmental Biology**
3. Agrawal K.C. - **Biodiversity**
4. Mukharjee **– Environmental Biology**
5. S. Arora **– Fundamentals of Environmental Biology**
6. Sharma **– Ecology & Environmental Biology**
7. Verma P.S. & Agrawal V.K. **– Environmental Biology, S. Chand.**
8. Trivedi & Rao **– Air Pollution**
9. Chapman & Reiss – **Ecology-Principles and Applications**, Cambridge
10. Chatterjee B – **Environmental Laws-Implementation and Problems**
11. Sharma P.D. – **Environmental Biology**, Rastogi Publication, Meerut
12. Trivedi R.K. – **Hand Book of Environmental Laws, Rules, Guidelines, Compliances and Standards, Enviromedia**
13. Odum E.P. and Barret – **Fundamentals of Ecology**, Thomson
14. Smith R.L. – **Ecology and Field Biology**, Harper Collins
15. D.N. Saxena **– Environmental Biology**, Studium Press (India)
16. Davis – **Behavioral Ecology**
17. Kumar and Asija – **Biodiversity – Principle of Conservation**
18. Rao and Rao – **Air Pollution**
19. S. Satyanarayan, S. B. Zade, S.R. Sitre and P.U. Meshram – **A Text Book of Environmental Studies**, Allied publisher (India)
20. Smitz – **Introduction to Water Pollution**
21. N.S. Subrahmnyam A V.S.S. Sambamurthy **– Ecology**

**Cell Biology**

1. C.B. Powar, **Cell Biology** – Himalaya Publication, New Delhi
2. Dr. S.P. Singh, Dr. B.S. Tomar – **Cell Biology** 9th revised edition, Rastogi Publication, Meerut
3. Gupta P.K. – **Cell and Molecular Biology**, Rastogi Publication, Meerut

4. Veer Bala Rastogi – **Introduction to Cell Biology**, Rastogi Publication, Meerut
5. Gerald Karp – **Cell and Molecular Biology-Concepts and Experiments**, John Wiley, 2007
6. De-Robertis – **Cell Biology**
7. Verma and Agrawal **– Concepts of Cell Biology**
8. Dowben **– Cell Biology**
9. Witt **– Biology of Cell**
10. Ambrose and Eastyr – **Cell Biology**

**Semester – III**

**Paper – V : Life and Diversity of Animals - Chordates**

**(Protochordata to Amphibia)**

**Unit – I** **(9 Periods)**

**Protochordata** : General characters and classification up to order

***Herdmania*** : Structure, digestive system, ascidian tadpole and retrogressive metamorphosis

***Amphioxus*** : Structure, digestive system, circulatory system, sense organs and protonephridia

**Agnatha** : General characters of Cyclostomata (*Petromyzon* and *Myxine*)

**Unit – II** **(9 Periods)**

**Pisces** : Salient features of Chondrichthyes and Osteichthyes, Origin of paired fins in fishes

Migration and Accessory respiratory organs in fishes

**Amphibia** : General characters and classification up to order

Parental care and Neotony in Amphibia

**Unit – III** **(9 Periods)**

Gametogenesis and type of eggs

Fertilization of egg

Post fertilization development of fish

Types of scales of fishes, Development of placoid scales

**Unit – IV** **(9 Periods)**

Frog Embryology - Cleavage , blastulation and gastrulation

Fate map, Morphogenetic movements in gastrula of frog

Development of respiratory organs in frog

Development of Aortic arches of frog

**Semester – III**

**Paper – VI : Genetics**

**Unit – I** **(9 Periods)**

Mendelian Principles- Dominant recessive relationships, Mendelian laws

Interaction of genes- Epistasis - dominant and recessive, codominance, incomplete dominance

Quantitative genetics – Polygenic traits, inbreeding and outbreeding, hybrid vigor

Extracellular genome – Presence and functions of mitochondrial DNA, plasmids

**Unit – II** **(9 Periods)**

Cytoplasmic inheritance- *Kappa* particles in *Paramecium*, $CO_2$ sensitivity in *Drosophila*, milk factor in mice

Linkage and crossing over – Basic concepts of linkage, types and theories

Concepts of genes – Cistron , muton and recon

Genetic disorders in human beings – Haemoglobin disorders – Thalassemia and Sickle cell anemia. Metabolic disorder: Phenylketonurea

**Unit – III** **(9 Periods)**

Sex determination – ZZ, XY, XO, ZW pattern, Sex determination in *Drosiphila* – Genic balance theory, Environmental sex determination in *Bonellia*

Chromosomal aberrations: addition, deletion, duplication and inversion

Gene mutations- Spontaneous and induced mutations, mutagenic agents

Disorders related to chromosomal number- Turner syndrome, Klinefelter syndrome and Down syndrome

**Unit – IV** **(9 Periods)**

Lethal genes – Concepts and consequences

Population genetics: Basic concepts in population genetics, Hardy Weinberg equilibrium and its significance

Genetic counseling – Introduction , purpose, hereditary diseases and disorders

Applied genetics - DNA fingerprinting , amniocentesis, sperm banks, karyotyping

**Semester – III**

**PRACTICAL – III (Based on Paper – V and VI)**

**Section A : Life and Diversity of Animals – Chordates (Protochordata to Amphibia)**
**& Section B : Genetics**

**Section A : Life and Diversity of Animals – Chordates (Protochordata to Amphibia )**

1. **Identification, classification , distinguishing characters and adaptive features of**
   - *I.* **Urochordata** : *Herdmania, Salpa, Doliolum*
   - *II.* **Cephalochordata** : *Amphioxus*
   - *III.* **Cyclostomata** : *Petromyzon, Myxine*
   - *IV.* **Pisces** *: Pristis, Torpedo, Notopterus, Exocoetus, Clarius, Ophiocephalus, Catla, Rohu, Mrigal*
   - *V.* **Amphibia** : *Ichthyophis ,Bufo, Salamander*
2. **Dissection of the locally available culturable fish-**
   - i. Digestive system
   - ii. Reproductive system
   - iii. Brain

3. **Developmental Biology** –
   **Study of permanent slides of Frog embryology**: T.S. Blastula, T.S. Gastrula, T.S. Neurula, T.S. tadpole passing through internal and external gill stage

4. **Study of permanent slides-**
   *Amphioxus* through Pharynx, Intestine, Gonad and Caudal region; V.S. skin, T.S. Testis, T.S. Ovary of Frog; T.S. Stomach, T.S. Intestine, T.S. Liver of fish

5. **Permanent stained preparation:**
   Fish scales – Placoid, cycloid, ctenoid; Hyaline cartilage and striated muscle

**Section B : Genetics** –

1. Study of monohybrid and dihybrid ratio
2. Study of normal human karyotype ( Normal male and female)
3. Study of characters and karyotypes of Syndrome like Down, Klinefelter & Turner
4. Study of the genetic traits (Hardy Weinberg law) in human being (Tongue rolling, ear lobe, PTC taster/ non taster)

**Distribution of Marks –** **Total Marks 30**

| | | |
|---|---|---|
| i. | Dissection | 06 |
| ii. | Identification and comment on spots (4 Museum specimens, 4 slides – 2 from frog embryology and 2 from histology) | 08 |
| iii. | Genetics experiment | 03 |
| iv. | Genetics study – Karyotypes , syndromes, genetic traits in man | 03 |
| v. | Permanent stained preparation | 03 |
| vi. | Submission of certified practical record | 03 |
| vii. | Submission of slides | 02 |
| viii. | Viva voce | 02 |

## Semester – IV
## Paper - VII : Life and Diversity of Animals – Chordates (Reptilia, Aves and Mammals)

**Unit – I** **(9 Periods)**

**Reptilia**- Classification based on temporal vacuities

Poison apparatus, biting mechanism , snake venom and its importance

**Aves** – Comparison of Ratitae and Caranitae, Flight adaptations and migration

**Mammals** – General characters of Prototheria, Metatheria and Eutheria

**Unit –II** **(9 Periods)**

Modern theories of evolution : Darwinism and Neo-Darwinism

Adaptations – Cursorial, Aquatic, Terrestrial, Fossorial and Volant

Introduction to genetic basis of evolution – Species Deme, Variation

Races in Man (Caucasoid, Negroid, Mongoloid and Australoid)

**Unit –III** **(9 Periods)**

Comparative account of aortic arches and heart in Reptiles, Birds and Mammals

Structure of hen's egg

Development of chick up to premitive streak stage

Development of extra embryonic membranes in chick and functions

**Unit –IV** **(9 Periods)**

Blastocyst and implantation in Mammals; Types of placenta on the basis of morphological and histological structure; functions of placenta

Stem cells : Sources, types and their use in human welfare

Biological clock : Diurnal and rhythmic behavior in birds and mammals

Role of pheromones in reproductive behavior

**Semester – IV**

**Paper - VIII : Molecular Biology and Immunology**

**Unit - I** **(9 Periods)**

DNA: Structure of DNA, forms of DNA, properties of DNA, DNA as a genetic material

RNA: Structure of RNA, types of RNA, RNA as a genetic material

Prokaryotic and eukaryotic gene structure

**Recombination in Bacteria**: Bacterial transformation – Griffith's experiment, Conjugation in bacteria, transduction

**Unit - II** **(9 Periods)**

**DNA replication**: Semiconservative model, Meselson Stahl experiments. Process of replication – origin of replication, concept of replication, directionality of replication

**Genetic code**: Characteristics of genetic code, Wobble hypothesis

**Protein synthesis**: Transcription mechanism – Initiation , elongation and termination of transcription. Translation – activation of amino acids, transfer of activated amino acids to tRNA, Initiation, elongation and termination of polypeptide chain; inhibitors of protein synthesis

**Gene regulation models** - Lac operon and tryptophan operon

**Unit - III** **(9 Periods)**

**Concepts of immunity –** Innate and acquired immunity, organs of the immune system

**Antigen -** Structure, diversity, functions and types of antigen

**Antibody**- Structure, types and functions

**Antigen-antibody interaction** – Precipitation and agglutination

**Unit - IV** **(9 Periods)**

**Types of immune response**: B cell response (antibody mediated), T cell response (cell mediated)

**Complement system:** Basic concepts of complement cascades, classical, alternative and MBL pathways, implications of complement system in immune defense

**Cytokines**- General account on cytokines, Cytokine related diseases

**Autoimmunity and immunodeficiencies**- Autoimmune diseases and their treatment, AIDS and other immunodeficiencies

**Semester – IV**

**PRACTICAL – IV (Based on Paper – VII and VIII)**

**Section A : Life and Diversity of Animals – Chordates**

**(Reptilia, Aves and Mammals) & Section B: (Molecular Biology and Immunology)**

**Section A : Life and Diversity of Animals – Chordates (Reptilia, Aves, Mammals, Embryology)**

1. **Identification, classification , distinguishing characters and adaptive features of –**
   - i. **Reptilia** : *Chameleon, Varanus, Pharynosoma, Draco, Tortoise*, Cobra, Krait, Russel's viper, Sea snake
   - ii. **Birds** : Owl, Woodpecker, Kingfisher, Kite, Duck, Parrot
   - iii. **Mammals** : Squirrel, Mongoose, Bat, Loris, Rabbit
2. **Study of skeleton of Rabbit and Fowl**
3. **Developmental Biology** –

**Study of permanent slides of chick embryology W.M.:** 18 hrs, 24 hrs, 30 hrs, 36 hrs, 72hrs

4. **Study of permanent slides-** V.S. skin of Bird, Filoplume of bird, V.S. Skin of Mammal

**Section B: Molecular Biology and Immunology**

**Molecular Biology :**

1. Staining of DNA and RNA in blood smear of fish/human by methyl green pyronin technique
2. Introduction to basic laboratory instruments and equipments- Autoclave, Centrifuge, pH meter, Micropipettes, Digital balance, Homogenizer, Electrophoresis apparatus; Molar and normal solutions calculations
3. Isolation of DNA (Genomic DNA from any available source) by phenol extraction method

**Immunology :**

1. Determination of blood groups (ABO and Rh) in humans
2. Antigen – Antibody interaction by double diffusion method (Ouchterlony)
3. Study of histological slides of organs of immune system – Thymus, Lymph nodes and Spleen

**Distribution of Marks –** **Total Marks 30**

| | | |
|---|---|---|
| i. | Identification and comment on spots-<br>(3 Museum specimens, 5 slides – 2 from chick embryology;<br>from histology and 1 from immunology, 2 bones) | 10 |
| ii. | Molecular biology experiment | 08 |
| iii. | Immunology experiment | 07 |
| iv. | Submission of certified practical record | 03 |
| v. | Viva voce | 02 |

**List of Recommended Books: ( For Semester - III and IV)**

**Life and Diversity of Animals -Chordates**


1. T. B. of Zoology vol II – Parker & Haswell
2. T. B. of Vertebrate Zoology -S. N. Prasad
3. Chordate Zoology –E. L. Jorden and P. S. Verma
4. Vertebrate Zoology – Vishwanath
5. Zoology of Chordates – Nigam H. C.
6. Phylum: Chordata – Newman H.H.
7. Biology of Vertebrates –Walter & Sayles
8. The Vertebrate Body – Romer A. S.
9. Comparative Anatomy of the Vertebrates – Kingslay J. D.
10. The Biology of Amphibia – Noble G. K.
11. Snakes of India – Gharpura K. G.
12. Life of Mammals – Young J.Z.
13. Vertebrates – Kotpal R. L.
14. Introduction to Chordates – Majupuria T.C.
15. Vertebrate Zoology – Dhami & Dhami
16. T. B. Vertebrate Zoology – Agrawal
17. Protochordates – Chatterjee & Pandey
18. Protochordates – Bhatia
19. T. B. of Chordates – Bhamrah and Juneja
20. Chordate Anatomy – Arora M.P.
21. The Chordates – Alexander.
22. T. B. of Animal Embryology – Puranik
23. T. B. of Chordate Embryology – Dalella & Verma
24. T. B. of Embryology – Sandhu
25. T. B. of Embryology – Armugam

26. Early Embryology of Chick – Pattern
27. Chordate Embryology – Verma & Agrawal
28. Chordate Embryology – Tomar
29. The Frog – Rugh
30. An Introduction to Embryology – Balinsky
31. Comparative Vertebrate Embryology – Mcwen
32. Developmental Biology – S. C. Goel
33. Introduction to Embryology – Berry
34. Organic Evolution – N. Armugam
35. Evolution – M. P. Arora
36. Animal Behavior – Smith and Hill
37. Animal Behavior – Arora
38. Animal Behavior – Gundevia and Singh
39. Practical Zoology Vertebrates – Dr. S. S. Lal, Rastogi Publication, Meerut
40. A manual of Practical Zoology Vertebrates – P. S. Verma

**Genetics**

1. Genetics & Genetic Engineering – Joshi
2. Genetic Engineering & its applications – Joshi
3. Genetics – Gardener
4. Genetics – Winchester
5. Genetics – Gupta
6. Principles of Genetics – Sinnot Dunn, Dobzansy
7. Genetics –Ahluwalia
8. Genetics – Sarin
9. Elementary Genetics – Singleton
10. General Genetics – SRb, Owen & Edger
11. Genetics –Alenberg
12. Foundation of Genetics – Pai
13. Genetics - Stickberger
14. T. B. of Genetics- Veerbala Rastogi
15. Gene VI by Benjamin Lewis, Oxford press
16. Gene VIII by Benjamin Lewis, Oxford press
17. Genetics Vol. I and II by Pawar C. B., Himalaya publication

**Molecular Biology**

1. Cell and Molecular Biology by De Robertis- E. D. P., I. S. E. publication
2. Molecular Biology by Turner P. C. and Mc Lennan , Viva Books Pvt. Ltd
3. Advanced Molecular Biology by Twyman R. M., Viva Books Pvt. Ltd
4. Molecular Biology by Freifelder D., narosa publication House

5. Molecular Biology of Gene by Watson J. D. et. al., Benjamin publication
6. Molecular Cell Biology by Darnell J. Scientific American Books USA
7. Molecular Biology of the Cell by Alberts B., Bray D. Lewis J., garland publishing Inc
8. Essentials of Molecular Biology by Freifelder D., narosa publication House
9. Molecular Cell Biology by Laodish H., Berk A., Zipursky S. L., Matsudaira P. Baltimore D. and Darnell J., W. H. Freeman and Co.
10. The Cell: Molecular Approch by Cooper G. M.
11. Molecular Biology by Upadhay A and Upadhay K. Himalaya publication
12. Molecular cell Biology by Bamrach
13. Cell and Molecular Biology by P.K. Gupta

**Immunology**

1. Immunology – R. C. Kuby et al.
2. Immunology - Tizzard
3. Immunology -. Roitt, Brostoff and D. Male
4. Immunology - Abbas

**Semester – V**

**Paper - IX : General Mammalian Physiology –I**

**Unit – I : Enzymes** **(9 Periods)**

Enzymes – Distribution and chemical nature of enzymes

General properties of enzymes

Classification of enzymes

Factors affecting enzyme activity

**Unit-II : Nutrition and Digestion** **(9 Periods)**

Structure and functions of digestive glands - (Salivary, Gastric, Intestinal, Liver and Pancreas )

Gastrointestinal hormones

Digestion and absorption of proteins, carbohydrates and lipids.

Vitamins- Fat soluble and water soluble vitamins; Sources, deficiency and diseases

**Unit-III :Respiration** **(9 Periods)**

Respiratory pigments - Types , distribution and properties

Mechanism of Respiration

Transport of $O_2$ and $CO_2$

Respiratory disorders and effects of smoking

**Unit-IV : Circulation** **(9 Periods)**

Composition and functions of blood

Blood clotting – Intrinsic and extrinsic factors, blood groups and *Rh* factor

Cardiac cycle

E.C.G. and Blood pressure

**Semester – V**

**Paper –X : Applied Zoology-I**

**(Aquaculture and Economic Entomology )**

**Unit –I : Aquaculture** **(9 Periods)**

Site selection and construction ,Pre stocking and post stocking manangement of nursery, rearing and stocking ponds

Breeding of fishes by bund and Chinese hatcheries. Induced breeding by hypophysetion. New generation drugs in induced breeding

Brief study of freshwater aquaculture system – Polyculture, cage culture, sewage fed fish culture, integrated fish farming

Fish products and byproducts, Fish preservation

**Unit-II** **(9 Periods)**

Prawn culture and Pearl culture

Fabrication and setting up of aquarium and its maintenance

Breeding of aquarium fishes – Live bearers and egg layers

Diseases caused by fungi, bacteria, protozoa and helminthes

**Unit-III : Economic Entomology** (Methods of pest control) **(9 Periods)**

Chemical control : Insecticides - Pyrethroids, carbomate and HCN – mode of action, merits and demerits

Biological control – Biological agents – predators and parasites; merits and demerits

Crop pest: Life cycle, damage and control of

*I.* Cotton spotted boll worm -*Earias vitella*

*II.* Stored grain pest- Rice Weevil, *Sitophilus oryzae*

Animal pest: Life cycle, damage and control of –

*I.* House fly – *Musca nebulo*

*II.* Stable fly – *Stomoxys calcitrans*

**Unit-IV : Economic Entomology** (Industrial entomology) **(9 Periods)**

Sericulture- Types of Silkworm. Life cycle and rearing of mulberry silkworm, *Bombyx mori*

Life cycle and rearing of non mulberry silkworm (Tasar), *Antheraea mylitta* ; Brief idea of coccon processing for silk fabric - coccon boiling, reeling, rereeling, winding, doubling, twisting and weaving

Apiculture – Types of honey bees. Life cycle, culture, movable frame hive, bee product and its economic importance

Lac culture – Lac insect, *Laccifer lacca* - Life cycle, Lac processing, Lac products and Economic Importance

**Semester – V**

**PRACTICAL – V (Based on Paper IX and X)**

**Section A: General Mammalian Physiology - I and Section B : Applied Zoology –I (Aquaculture and Economic Entomology)**

**Section A: General Mammalian Physiology – I**

1. Detection of action of salivary amylase on starch
2. Detection of carbohydrates, proteins and Lipids
3. Detection of Vitamin A and Vitamin C
4. Measurement of lung capacity
5. Preparation Haemin crystal
6. Total count of WBC and RBC
7. **Study of histological slides of Mammal** – T.S. salivary gland, T.S. stomach, T.S. intestine, T.S. pancreas, T.S. liver and T.S. lung

**Section B : Applied Zoology –I (Aquaculture and Economic Entomology)**

**Aquaculture:**

1. **Collection and identification of fishes**
   - *a.* Freshwater edible fishes – catla, rohu, mrigal, grass carp, silver carp, *Cyprinous carpio* , *Ophiocephalous, Clariaus, Heteropneustes, Wallago, Mystus,*
   - *b.* Aquarium fishes – Gold fish, Molly, Sword tail, Kissing *Gourami*
2. **Dissection**: a. Digestive, reproductive and brain with pituitary of culturable fishes
   b. Gonosomatic index
3. **Fabrication and setting up of aquarium**
4. **Mounting**: Scales of fishes, zooplankton

**Economic Entomology:**

1. **Study of Insect Pest**
   a. Agriculture pest – Grasshopper , Red Cotton bug, Gram pod borer, Cotton pink bollworm, Cotton spotted bollworm
   *b.* Medical pest – House fly, Mosquito , *Pediculus humanus*
   c. Veterinary pest – Stable fly , Dog tick, Bird lice
   d. Stored grain pest – Stored grain weevil, Flour moth
   e. Useful Insects – Honeybee, Silk moth, Lac insect, Dragon fly, Lady bird beetle
2. **Mounting** : Mouth parts, Legs, wings of any insects and sting of Honeybee
3. **Visit** to – Fish farm, Apiculture, Sericulture, Agricultural educational centre, Sea shore and Lake

| **Distribution of Marks** | | **Total Marks 30** |
|---|---|---|
| i. | Physiology experiment | 05 |
| ii. | Identification and comment on spots (2 from Mammalian histology,3 from Aquaculture and 3 from Economic Entomology) | 08 |
| iii. | Dissection of fish / Gonosomatic index | 05 |
| iv. | Permanent stained preparation | 02 |
| v. | Submission ,collection and study tour report | 02 |
| vi. | Submission of certified practical record | 03 |
| vii. | Viva voce | 05 |

**Semester – VI**

**Paper -XI : General Mammalian Physiology - II**

**Unit –I : Nerve and Muscle Physiology** **(9 Periods)**

Types of neurons, E.M. structure of neuron

Conduction of nerve impulse

Ultrastructure of striated muscle, Sliding filament theory of muscle contraction

Properties of muscles (Twitch, Tetanus, Tonus, Summation, All or None Principle, Muscle fatigue)

**Unit-II : Excretion** **(9 Periods)**

Structure of uriniferous tubule

Mechanism of urine formation

Counter – current mechanism

Normal and abnormal constituents of urine; Elementary idea of dialysis

**Unit-III : Endocrinology** **(9 Periods)**

Structure and functions of pituitary gland

Structure and functions of thyroid and parathyroid gland

Structure and functions of adrenal gland

Structure and functions of pineal gland

**Unit-IV : Reproduction** **(9 Periods)**

Oestrous and menstrual cycle

Male and female sex hormones

Causes of infertility in male and female

Contraceptives – Mechanical and hormonal ; *In-vitro* fertilization

**Semester - VI**

**Paper - XII : Applied Zoology –II**

**( Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)**

**Unit –I : Biotechniques** **(9 Periods)**

**Concepts of sterilization**: Filtration, autoclaving, dry heat sterilization, wet sterilization and radiation

**Separation of biomolecules**: Centrifugation (Sedimentation, density gradient); Chromatography ( Elementary idea of thin layer, gel filtration and ion exchange - Principles and applications)

**Electrophoresis**: Agarose gel electrophoresis, SDS-PAGE

Principles of colorimeter and spectrophotometers

**Unit-II : Microtechnique** **(9 Periods)**

Fixation, dehydration, clearing, embedding & section cutting

Difficulties encountered during section cutting (causes and remedies)

Double staining with Haematoxylin and Eosin

Histochemical staining techniques for carbohydrates (Periodic acid schiff), proteins (Mercury-bromophenol blue) and lipids (Sudan black-B)

**Unit-III : Biotechnology (9 Periods)**

Basic concepts in recombinant DNA technology, Gene isolation method- Shotgun cloning

Isolation of gene- DNA manipulation enzymes: Nucleases, ligases, polymerases

Basic concepts of cloning vectors and splicing : Insertion of DNA and ligation using blunt ends, cohesive ends, Cloning vectors

Application of biotechnology: Insulin and vaccine production

**Unit-IV : Bioinformatics and Biostatistics (9 Periods)**

Bioinformatics: Definition, Basic concepts in bioinformatics, importance and role of bioinformatics in life sciences

Bioinformatics databases- introduction, types of databases

Nucleotide sequence databases, Elementary idea of protein databases

Biostatistics – Tabulation of data, presentation of data, sampling errors, mean, mode, median, probability, standard error and standard deviation

**Semester – VI**

**PRACTICAL – VI (Based on Paper XI and XII)**

**( Section A: General Mammalian Physiology – II and Section B: Applied Zoology – II , Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)**

**Section A : General Mammalian Physiology – II**

1. Detection of urea, albumin, sugar and creatin in urine
2. Sperm count in a given semen sample
3. **Dissection:** Endocrine glands of Culturable fishes
4. **Study of histological slides of Mammal** – T.S. kidney, pituitary, thyroid, adrenal, testis, ovary; uterus, placenta, medulated and non medulated nerve fibre, smooth and striated muscle

**Section B : Applied Zoology – II ( Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)**

1. Separation of amino acids by paper chromatography
2. Separation of proteins by electrophoresis technique
3. Block preparation and section cutting
4. Double staining method (H-E)
5. Demonstration of carbohydrates, proteins and lipids by histochemical methods
6. Determination of mean, mode, median from a given biostatistical data and/or graphical representation of the data using computers

7. Use of internet for survey of literature using protein and nucleotide databases(NCBI)
8. Use of softwares like Microsoft offices
9. **Visit to Biotechnology centre to study working principles of different instruments**

| **Distribution of Marks** | | **Total Marks 30** |
|---|---|---|
| I. | Physiology experiment | 05 |
| II. | Identification and comments on spots (Mammalian histology 3 spots) | 03 |
| III. | Microtechnique - Section cutting, spreading and H-E staining of given slide | 03 |
| IV. | Dissection of fish | 05 |
| V. | Analysis of given biostatistical data | 02 |
| VI. | Retrieval of specific literature from given information | 02 |
| VII. | Submission of slides and study tour report | 02 |
| VIII. | Submission of certified practical record | 03 |
| IX. | Viva voce | 05 |

**List of Recommended Books: (For Semester V and VI)**

**Physiology**


1. Human Physiology – Chatterjee A. G. vol. I & II
2. Medical Physiology – Gyton
3. T. B. of Animal Physiology – Berry
4. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
5. Animal Physilogy – Arora M.P.
6. General and Comparative Physiology – Hoar W. S.
7. T. B. of Animal Physiology – Hurkat and Mathur
8. Animal Physiology – Nahbhushan and kodarkar
9. T. B. of Animal Physiology & General Biology – Thakur & Puranik
10. General Endrocrinology – Turner Bagnaro
11. Reproduction and Human welfare – Greep and koblinsky
12. Animal Physiology – Shashtri & Goel
13. Animal Physiology – Verma & Tyagi
14. Human Physiology - Vander and sheman
15. Applied Physiology – Keels, Neils and Joels
16. Animal Physiology – Rastogi S. C.
17. Animal Physiology – Veerbala Rastogi

18. Comparative Vertebrate Endocrinology – Beutley

**Aquaculture**

1. Wealth of India, Raw Material, Vol. IV – ICAR
2. Fishes of India vol I & II- Day
3. Fish & Fisheries of India – Jhingran
4. Hatchery Manual for Common Indian & Chinese carps – Jhivgan & Pallin
5. Fish Pathology – Roberts
6. Introduction of Fishes – Khanna
7. Fishery Science & Indian Fishes – Khanna
8. Fishery Science & Indian Fisheries – Shrivastava
9. A Manual of F. W. Aquaculture – Santhanam
10. An Aid to Identification of Commercial Fishes of India & Pakistan- Mishra
11. Standard Methods for Examination of Water & Waste Water - APHA
12. Hand Book of Breeding of Major Carps by Pituitary Hormones – S. L. Chonder
13. Principles of Aquaculture – Zade S. B., Khune C. J., Sitre S.R. and Tijare R.V.

**Entomology**

1. T. B. of Applied Entomology – K. P. Shrivastava
2. T. B. of Agricultural Entomology - II S Pruthi
3. Modern Entomology – D. B. Tembhare (2nd Edition)
4. A Hand Book of Practical Sericulture – Ullar S. R. & Narsimhanna M.N.
5. Destructive and Useful Insects – Metcalf C.L. & Flint W.P.
6. General Text Book of Entomology – Richards O. W. & Davis R. G.
7. Agricultural Pests of India & South East Asia – Atawal A.S.
8. Hand Book of Economic Entomology for South Asia – Ayyar & Ram Krishna.
9. Medical Entomology – Hati A. K.
10. Bee-Keeping in India – Singh S

**Biotechnique and Microtechnique**

1. Animal Tissue Technique – Humason
2. Histological Technique – Devaenport
3. Microtechnique – Jiwaji & Patki
4. Microtechnique – Wankhede
5. Biophysical Chemistry – Upadhyay, Upadhyay and Nath
6. Techniques in Life Sciences – D. B. Tembhare

**Biotechnology**

1. Elements of Biotechnology – Gupta
2. T. B. of Biotechnology – Dubey
3. Modern Concept of Biotechnology – Kumar H. D
4. Advances in Biotechnology – Jogdand

5. T. B. of Biotechnology – Chatwal
6. Molecular Biotechnology – Primrose

**Bioinformatics and Biostatistics**

1. Mount W. 2004. Bioinformatics and Sequence Genome Analysis 2nd Editon CBS Pub. New Delhi.
2. Bergman, N. H. Comparative Genomics. Humana Press Inc. Part of Springer Science+Business Media, 2007.
3. Baxevanis, A. D. Ouellate, B. F. F. 2009. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. John-Wiley and Sons Publications, New York.
4. Campbell A. M. and Heyer, L. J. 2007. Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings.
5. Des Higgins and Willie Taylor 2000. Bioinformatics: Sequence, Structure and Databanks. Oxford University Press.
6. Rashidi H. H. and Buehler 2002. Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
7. Gibas Cynthia and Jambeck P. 2001. Developing Bioinformatics Computer Skills: Shroff Publishersand Distributors Pvt. Ltd. (O'Reilly), Mumbai.

**RTM, NAGPUR UNIVERSITY, NAGPUR.**

**SEMESTER PATTERNSYLLABUS**

**FOR B Sc. BOTANY**

B.Sc. SEMESTER- I

| | |
|---|---|
| PAPER-I | Viruses, Prokaryotes& Algae |
| PAPER-II | Fungi, Lichen, Plant-Pathology&Bryophyta |

B.Sc. SEMESTER-II

| | |
|---|---|
| PAPER-I | Pteridophyta& Gymnosperms |
| PAPER-II | Palaeobotany& Morphology of Angiosperms |

B.Sc. SEMESTER-III

| | |
|---|---|
| PAPER-I | Angiosperm Taxonomy |
| PAPER-II | Cell Biology, Plant Breeding& Evolution |

B.Sc. SEMESTER-IV

| | |
|---|---|
| PAPER-I | Angiosperm Anatomy& Embryology |
| PAPER-II | Genetics & Molecular Biology |

B.Sc. SEMESTER-V

| | |
|---|---|
| PAPER-I | Biochemistry & Plant Physiology-I |
| PAPER-II | Plant Ecology I |

B.Sc. SEMESTER-VI

| | |
|---|---|
| PAPER-I | Plant Physiology- II& Biotechnology |
| PAPER-II | Plant Ecology- II, Techniques & Utilization of Plants. |

**SEMESTER – I**

**PAPER – I**

**VIRUSES, PROKARYOTES AND ALGAE**

**Unit I**

**Introduction to Botany**.

**Virus**: General characteristics and nature of Viruses,.

Ultra structure of TMV, Structure and Multiplication of $T_4$ - Bacteriophage. Economic importance.

**Mycoplasma** : - structure, Properties, Reproduction.

Comparison between Archaebacteria and Eubacteria.

**Unit II**

**Bacteria**:-Cell structure, Flagella. Reproduction: (Binary fission, Conjugation). Economic importance.

**Cyanobacteria:** -General account, Economic Importance, Ultra cell structure, Reproduction. eg.*Nostoc.*

**Unit III**

**Algae** – General characteristics, Classification (Fritsch 1954),

**Life history of**: - *Oedogonium, Chara.*

**Unit IV**

Algae **- Life history** of *Vaucheria, Ectocarpus, and* Economic importance of Algae.

Note:- Developmental stages not expected

**List of Practicals :**

Study of Bacterial forms from permanent micropreparation

Gram staining of Bacteria, ultrasturcture of Bacteriophage from TEM photographs

Study of Cyanobacteria: *Nostoc*.

Study of Algal genera: *Oedogonium, Chara, Vaucheria, Ectocarpus.*

**SEMESTER – I**

**PAPER – II**

**FUNGI, LICHEN, PLANT PATHOLOGY, BRYOPHYTA**

**Unit I**

**Fungi**:- General charachteristics, Classification( Alexopoulos 1996), Economic importance

Life history of: - *Albugo, Mucor.*

**Unit II**

**Fungi**- Life history of :- *Puccinia, Cercospora*

**Lichens** :- Types, Reproduction and Economic importance

**Unit III**

**Plant pathology**:– Host, pathogen, symptoms, Causes and Control of following diseases:-Leaf curl of Papaya, Citrus canker and Red rot of Sugarcane

**Bryophyta**:–Classification (Proskauer 1957), General characters (Hepaticopsida, Anthocerotopsida and Bryopsida), Economic importance, and alteration of generation

**Unit IV**

**Life history of**:- *Riccia, Anthoceros, Funaria*

**Note:** developmental stages not expected

**List of Practicals :**

Study of Fungal genera:- *Albugo, Mucor, Puccinia, Cercospora*

Study of Lichen: - Thallus structure, Types

Plant pathology: – Leaf curl of Papaya, Red rot of Sugarcane, Citrus canker

Study of Bryophytes :- *Riccia, Anthoceros, Funaria*

*Botanical Excursions (One short/Long excursion is compulsory).*

**Semester - I Botany Practical examination**
**Question Paper**

**Time: 5 hrs** **Marks: 30**

**Q. 1)** Gram Stain the given Bacterial strain / Stain the **Cyanobacterial** material [A], & Identify **04**

**Q. 2)** Identify & give characters of the given **Algal** material [B]and make a temporary Mount **04**

**Q. 3)** Identify & give characters of the given **Fungal** material[C] and make a temporary Mount **04**

**Q. 4)** Identify & give characters of the given **Bryophytic** material [D] and make a temporary Mount **04**

**Q. 5)** **Spotting** : **06**

| | | |
|---|---|---|
| E-Virus/Bacteria/Cyanobacteria | F- Algae | G- Fungi |
| H-Bryophyte | I- Plant pathology | J- Lichen |

**Q. 9)** Viva-voce **03**

**Q. 10)** Practical Record & Excursion Report **05**

**SEMESTER – II**

**PAPER – I**

**(PTERIDOPHYTA & GYMNOSPERMS)**

**Unit I**

**Pteridophyta** :- Classification system (Smith 1952), General characters (Psilopsida, Lycopsida, Sphenopsida and Pteropsida), Economic importance, alternation of generation

**Life history of**:- *Rhynia, Selaginella*

**Unit II**

**Life history** of:- *Equisetum,*

Apogamy, Apospory, Stelar system in pteridophytes, Concept of heterospory and seed habit.

**UNIT III**

**Gymnosperms:-** Classification (Stewart 1982), General characters, Economic importance, alternation of generation.

**Life cycle** of the following:- *Cycas.*

**UNIT IV**

**Life cycle** of the:- *Pinus*.

*Cycadeoidea* (morphology, anatomy of Stem and flower)

NOTE: Developmental stages not expected.

**List of Practicals**

Study of Pteridophytes : *Rhynia, Selaginella, Equisetum.*

Study of Gymnosperm: *Cycas*, *Pinus*, *Cycadeoidea.*

**SEMESTER – II**

**PAPER – II**

**PALAEOBOTANY & MORPHOLOGY OF ANGIOSPERMS**

**Unit I**

**Palaeobotany**: Geological time scale

**Fossilization**: Replacement theory, Infilteration theory

**Types of fossils**: Impression, Compression, Petrifaction

Fossil plants: Gymnosperms: *Glossopteris* (Leaf, Scutum),

**Unit II-**

**Root Morphology** - Tap root & adventitious roots, Modifications for storage, Respiration & reproduction.

**Stem Morphology**:- shape, surface, texture, nature, Branching (Monopodial, Sympodial), modifications (Runner, Rhizome, Tuber, Bulb, cladode).

**Leaf Morphology**:--Typical Leaf, Types (Simple, Compound), Phyllotaxy, Venation, and modifications of leaf (Tendril, Phyllode)

**Unit III-**

**Inflorescence**: Simple (Racemose and Cymose type).

**Flower**: Details of typical flower, Epigyny, Perigyny & Hypogyny, Androphore, Gynophore & Gynandrophore.

**Calyx & Corolla:** - Cohesion, Forms of corolla and Aestivation.

**Unit IV**

**Flower**: **Androecium: -** Parts, Cohesion & Adhesion, Fixation, dehiscence. **Gynoecium:** - Parts, Cohesion, Adhesion, Placentation.

**Fruit**: Classification of fruits, simple and aggregate fruits, Composite fruit.

**List of Practicals**

***i.*** **Fossils** : Types, *Glossopteris*, *Cycadeoidea*

**ii.** Study of **Root**: Types, Modifications.

**iii.** Study of **Stem**: shape, surface, texture, nature Branching, Modifications (Ex. *Hibiscus, Ocimum,* any grass).

**iv.** Study of **Leaf**: Stipules, base, kind, shape, surface, margin, Apex, texture, Phyllotaxy, Venation & Modifications.

**v.** **Inflorescence:** Types.

**vi.** **Flower**: Parts, Thalamus, Calyx, Corolla, Androecium, Gynoecium.

**vii.** **Fruits:** Types.

**Botanical Excursion**: (Two short or one long out of the state is compulsory).

**Semester II practical examination**

**Question Paper**

**Time : 5 hrs** **Marks : 30**

**Q. 1)** Identify & give characters of the given **Pteridophytic** material **[A]**and make temporary Mount. **04**

**Q. 2)** Identify & give characters of the given **Gymnospermic [B]** material and make temporary mount **04**

**Q. 3)** Describe the given **leaf** material **[C]** **04**

**Q.4)** Describe (Calyx, Corolla, Androecium & Gynoecium) of given **Flower [D]**. **04**

**Q. 5)** **Spotting** : **06**

| | |
|---|---|
| E. Pteridophyte | F. Fossil |
| G. Gymnosperm | H. Vegetative morphology |
| I. Inflorescence/flower | K. Fruit. |

Q. 9) Viva-voce **03**

Q. 10) Practical Record & Excursion Report **05**

**SEMESTER – III**

**PAPER – I**

**ANGIOSPERM TAXONOMY**

**Unit I**

Origin of Angiosperms (Benettitalean theory). Phylogeny of Angiosperm: Homology, monophyly, polyphyly, Clads.

**Fossil Angiosperms**: Flower (Sahanianthus).

**Angiosperm Taxonomy**: Floras, Herbarium, keys (Indented and Bracketed), Holotype, Lectotype, Neotype.

**Botanical Nomenclature**: Principles (rank and ending of taxa, principle of priority),

**Unit II**

**Classification of angiosperms**: Natural, Artificial, Phylogenetic system of classification.

**Systems of classification**: Bentham & Hooker and Engler &Prantl (along with merits and demerits),

**Modern trends in Taxonomy** : Cytotaxonomy (Karyotype), Phytochemistry (Proteins, flavonoids, Betalains) , Taximetrics to taxonomy.

**Unit III**

**Study of Families** (Dicot): Malvaceae, Brassicaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae)

**Unit IV**

**Study of Families** (Dicot): Asteraceae, Asclepiadaceae, Euphorbiaceae

Study of Families (Monocot): Poaceae

**List of Practicals**

Study of Families covered in the theory portion.

Study of fossil Angiosperms micropreparation and specimens: *Sahanianthus*, *Enigmocarpon*

*Botanical Excursions (Two short or One long out of the state is compulsory).*

**SEMESTER – III**

**PAPER – II**

**CELL BIOLOGY, PLANT BREEDING & GENETICS**

**Unit I**

Structure of typical plant cell, Ultrasturcture and functions of: Cell wall, Cell Membrane (Fluid mosaic model), Nucleus, Endoplasmic reticulum (RER and SER)

**Unit II**

Ultrastructure & Functions of: Golgi Complex, Vacuoles, Ribosomes (70S and 80S), Mitochondria, Chloroplasts,

**Unit III**

Chromosome organization: Morphology (chromatid, chromomere, centromere, telomere, secondary constriction, satellite, karyotype), Molecular organization (Nucleosome model)

Sex Chromosome : Structure of sex chromosome in plants (XY type in *Melandrium*)

Cell division in plants: Mitosis, Meiosis and their significance.

**Unit IV**

Plant Breeding- Definition and objective, Pure line selection, Hybridization (emasculation, bagging, crossing, labelling), Colonal selection, Heterosis (Definition and scope)

Biostatistics- Mean, Mode, Median, Standard deviation, Standard error, Student's t- test

Evolution- Origin of life (Millers theory),

**List of Practicals**

Study of Cell organelles with the help of photographs/ Slides

Study of mitosis in plant material

Study of meiosis in plant material

To calculate Mean, Mode, Median, standard error from the given data (At least 10 problems to be solved)

To calculate the student's t-value from the given data (At least 10 problems to be solved)

**Semester III practical examination**

**Question Paper**

**Time : 5 hrs** **Marks : 30**

Q. 1) Describe in technical language the given Angiospermic material [A]**.** Classify &Identify the Family giving reasons **06**

Q. 2) Write floral formula and Draw Floral Diagram of the given flower [B] **03**

Q. 3) Prepare semi-permanent squash / smear of given material [C] & Identify the stage of cell division **05**

Q. 4) To solve the given problem of biostatistics **04**

Q. 5) Spotting : **04**

D. Fossil angiosperm H. Cell organell (photocopy)

E. Cytology I. Taxonomy

Q. 6) Viva-voce **03**

Q. 7) Practical Record & Excursion Report **05**

**SEMESTER – IV**

**PAPER – I**

**ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS**

**Unit I**

Basic body plan & Modular type of Growth.

Meristems :Classification of meristems based on origin and position.

Permanent tissue and their functions:Simple tissue (parenchyma, collenchyma, sclerenchyma), Complex tissue(xylem and phloem).

**Unit II**

Apical meristem of Root and Shoot: Apical cell theory, tunica-corpus theory, Types of root apex according to Newman.

Primary structure of root in dicot (Sunflower) and monocot (Maize)

Primary structure of stem in dicot (Sunflower) and monocot (Maize)

Types of vascular bundles- dicots and monocots

Cambium (structure, types, function)

**Unit III**

Periderm, growth ring, sap wood, heart wood

Secondary growth (Sunflower stem) and anomalous secondary growth in *Bignonia* and *Dracena* stem.

Anatomy of leaf: Dicot (Nerium), monocot (Maize).

Senescence and abscission of leaves.

**Unit IV**

Pollination: Types and adaptation, significance

Structure of anther, Microsporogenesis, male gametophyte

Types of ovules, structure of anatropous ovule

Megasporogenesis and female gametophyte (polygonum type)

Double fertilization and triple fusion, endosperms and its types, Structure of dicot (Onagad) and monocot embryo.

**List of practicals**

Study of simple tissue, complex tissue and secreatory tissue from permanent slides

Study of types of vascular bundles

Study of internal structure of dicot and monocot root using hand section and prepare temporary mounts -Sunflower, Maize

Study of internal structure of dicot and monocot stem using hand section and prepare temporary mounts -Sunflower, Maize

Study the growth ring in woods-Teak wood

Study of internal structure of secondary growth and anomalous secondary growth using hand section and prepare permanent micropreparations - *Bignonia* stem and *Dracena* stem.

Study of internal structure of leaves- *Nerium*, Maize

Study of types of ovules, anther structure, pollen grains, adaptations for pollination

To calculate the percent pollen germination in the given specimen

*Botanical Excursions (One short tour is compulsory).*

**SEMESTER- IV**

**Paper-II**

**Genetics & Molecular Biology**

**Unit- I**

Mendelism: - Laws of inheritance (Law of segregation and independent assortment)

Interaction of genes: Allelic- Incomplete dominance (1:2:1 ratio in *Mirabilis jalapa*); Non-allelic- Complementry (9:7 ratio) and Dominant epistasis (12:3:1 ratio)

Linkage: Definition, Theory of linkage (Coupling and Repulsion theory), types (complete and incomplete), significance

**Unit- II**

Crossing over: Definition, theories (Breakage and reunion), significance

Variation in chromosome number: Polyploidy (auto- and allo-), aneuploidy (nullisomics, monosomics, trisomics and tetrasomics), significance

Structural changes in chromosome: deficiency, duplication, significance of inversion and translocation.

**Unit- III**

Structure of DNA (Watson and Crick model)

Semi conservative method of DNA replication in eukaryotes

Concept of gene; Benzor's concept, cistron, mutons and recons, jumping gene.

Mutation: Spontaneous and induced, physical and chemical mutagens, application of induced mutations in crop improvement

DNA damage and repair: Photoreactivation, excision repair

**Unit- IV**

Satellite and repetitive DNA

Genetic code: Definition and characteristics

t-RNA (Clover leaf model)

Gene expression in prokaryotes: Transcription and translation

Regulation of gene expression (Lac operon model).

**List of practicals**

To prove the Mendel's law of segregation with the help of coloured beads.

To prove the Mendel's law of independent assortment with the help of coloured beads.

From the given data workout the type of gene interaction in the given cross (Atleast 10 problems of each type mentioned in theory syllabus).

**Semester IV Practical examination**

**Question Paper**

**Time : 5 hrs** **Marks : 30**

Q. 1) Prepare temporary mount of the given material [A](Root/Leaf)& Identify giving diagnostic character **03**

Q. 2) Prepare double stained permanent mounts of the given material [Stem] [B] & Identify giving diagnostic character **06**

Q. 3) Calculate percent germination in the given pollen grains [C] **02**

Q. 4) To prove Mendel's Law of Inheritance through coloured beads [D] **04**

Q. 5) To work out the type of gene interaction in the given cross from the given data. **03**

Q. 6) Spotting: **04**

E- Tissue F- Root anatomy

G-Stem anatomy H-Embryology

Q. 7) Viva-voce **03**

Q. 8) Practical record and excursion report **05**

**SEMESTER – V**

**PAPER – I**

**BIOCHEMISTRY & PLANT PHYSIOLOGY-I**

**Unit I**

**Carbohydrates**: Definition, properties and role; Classification: Aldoses and ketoses; monosaccharides, disaccharides and polysaccharides; Structure of Glucose and starch

**Lipids:** Definition, properties and role; fatty acids, oils and waxes, beta oxidation.

**Aminoacids**- Chemistry of amino acids present in proteins (Classification), peptide bond

**Basics of Enzymology**: Nomencleture, Characteristics and properties of Enzymes, factors affecting enzyme activity, Holoenzyme, Apoenzyme, Co-enzymes& Co-factors, Regulation of Enzyme Activity (Enzyme-Substrate Complex Theory), Mechanism of Action (Lock & Key Model, Induced Fit Model)

**Unit II**

**Plant-water relations:** Properties of water, diffusion, diffusion pressure deficit and its significance; Osmosis: Concept, types, osmotic potential and its significance; Imbibition: concept and significance

**Water conduction through xylem**: Root pressure theory, cohesion-adhesion theory; transpiration; stomatal opening mechanism with reference to $K^+$-malate hypothesis

**Phloem transport**: Munch hypothesis

**Unit III**

**Mineral nutrition**: Role and deficiency symptoms of macro- and micro- nutrients (N, P, Fe, Mn, B , Ca); Solute transport: passive (Donnan's equilibrium), active (carrier concept)

Lipid metabolism:

**Respiration:** Types (aerobic and anaerobic respiration), respiratory substrates and Respiration quotient, glycolysis, Kreb's cycle, oxidative phosphorylation (ETS); fermentation (alcohol and lactic acid), photorespiration. Glyoxylate cycle .

**Unit IV**

**Photosynthesis:** concept, definition, significance, photosynthetic pigments and their role, action spectra, Emerson's enhancement effect, red drop mechanism; photolysis of water (Hill's reaction), cyclic and non-cyclic photophosphorylation, Light independent reactions: C3, C4 and CAM pathways and their significance; factors affecting photosynthesis

**Nitrogen metabolism**: Mechanism of biological nitrogen fixation, importance of nitrate reductase

**List of practicals**

To study the effect of various chemicals on permeability of membranes.

To study the ascent of sap in suitable plant material.

To separate chlorophyll pigment by paper chromatography.

To determine the RQ of given plant material.

To perform microchemical tests for determination of reducing and non-reducing sugars, starch, cellulose, oils and proteins.

To study the effect of light intensity and quality, $CO_2$ concentration and temperature on rate of photosynthesis by suitable method.

To determine osmotic potential of the cell sap by plasmolytic method.

To study the activity of enzyme amylase, catalase and peroxidase.

Miner Physiology experiments

**SEMESTER – V**

**PAPER – II**

**PLANT ECOLOGY - I**

**Unit I**

Ecology: definition, branches and significance of ecology

Climatic Factors: Atmospheric (Gaseous composition), Light & Temperature (effect on vegetation).

Edaphic Factor :Pedogenesis, Soil profile, Soil properties (physical and chemical)

**Unit II**

Physiographic factor- Biotic Factor: Interactions between plants and animals and human, Interaction between plants growing in a community, Interactions between plants and soil microorganisms. Biogeochemical Cycles: Nitrogen, phosphorous

**Unit III**

Ecosystem: Biotic and Abiotic components, Food chain, Food web, Ecological pyramids

Autecology (definition, importance), ecad, ecotype- characteristics and importance

Synecology (or community ecology)- Study of community: analytical (quantitative- frequency, density, abundance; qualitative- Life forms, Raunkier's Biological spectrum) and synthetic characters (presence, fidelity, dominance)

**Unit IV**

Principles of Phytogeography, Distribution (wides, endemics, discontinuous species), Theories (Landbridge and continental drift), Climatic regions of India, Phytogeographic regions of India (Chatterjee 1962; Name, distribution area, typical vegetation)

**List of practicals:**

To determine frequenct, density, abundance of the community by quadrate method.

To determine the homogeneity of vegetation by Raunkiers frequency diagram.

To determine the water holding capacity of the given soil samples.

To determine the water rising capacity of the given soil samples.

To determine the soil moisture of the given samples.

*Botanical Excursions (One short tour is compulsory).*

**Semester V Practical examination**

**Question Paper**

**Time : 5 hrs** **Marks : 30**

Q. 1) To perform given Physiology Experiment [A] & report the findings **06**

Q. 2) To perform the given Biochemical Experiment [B] & report the findings **04**

Q. 3) To perform the given Ecological Experiment [C] & report the findings **05**

Q. 4) To perform the given microchemical test [D] & report the findings **03**

Q. 5) Spotting : **04**

E - Plant Physiology

F -Plant Physiology

G - Ecology (Component of aquatic ecosystems)

H - Ecology(Component of terrestrial ecosystems)

Q. 6) Viva Voice **03**

Q. 7) Practical Record & Excursion Report **05**

**SEMESTER – VI**

**PAPER – I**

**PLANT PHYSIOLOGY-II & BIOTECHNOLOGY**

**Unit I**

Growth: Concept, growth curve, phases of growth

Phytochromes: Pr and Pfr forms, their role

Circadian rhythms and biological clock

Plant growth regulators: Role of auxin, cytokinins, gibberilins, ABA and ethylene

Plant movements: Tropic and nastic movements

**Unit II**

Photoperiodism: physiology of flowering, photoperiodism and vernalization, role of florigen

Senescence and abscission

Seed dormancy: Causes and role, methods to break seed dormancy

Plant defence: Definition: Hypersensitive response and Systemic acquired resistance; Role of secondary metabolites (Terpenes and phenolic compounds)

**Unit III**

Plant tissue culture: definitions of- totipotency, explant, asceptic culture, in vitro, micropropagation; methods of sterilization (autoclaving, dry heat, chemicals), culture media (MS media) hormone requirement & applications of tissue culture.

Callus and organ culture (shoot tip, anther) and its application, cybrid production and its application.

**Unit IV**

Genetic engineering: Tools- Enzymes (Restriction enzymes, ligases, DNA polymerases), Plasmid as cloning vectors.

DNA library: cDNA and genomic library.

*Agarobacteriumtumefaciens* mediated gene transfer, structure of Ti -plasmids

Advantages and disadvantages of transgenic plants, example Bt cotton and golden rice.

**List of Practicals**

To determine seed viability by a convenient method

Principle and working of: oven, autoclave, laminar air flow hood

To study the structure of following vectors on the basis of photographs and diagrams: plasmid vector, Binary vector

To study the effect of various plant growth regulators on the growth and development of plants.

To study steps of genetic engineering from photograph example Bt cotton and golden rice.

**SEMESTER – VI**

**PAPER – II**

**PLANT ECOLOGY, TECHNIQUES & UTILIZATION OF PLANTS**

**Unit I**

Plant succession: Definition, Causes of succession, Hydrosere, Xerosere

Plant adaptations: Morphological, Anatomical & Physiological responses of Hydrophytes, Xerophytes, Halophytes (with one example)

**Unit II**

Environmental Pollution: Agricultural, noise and thermal pollution, Control of environmental pollution, Environmental management

Natural resources- types (renewable and non-renewable), factors for depletion; conservation of forest and water resources

**Unit III**

Principle, types and application of: microscopy (Light, fluorescent,SEM, TEM), centrifugation, electrophoresis (SDS-PAGE and Agarose), spectroscopy (UV-Vis), chromatography (Paper chromatography, Thin layer chromatography)

**Unit IV**

Utilization of **Plants**: Morphology, Utilization and Important chemical constituents of :-

Food: Wheat; Oil: Ground nut; Fibre: Cotton; Spices: Clove; Beverages: Coffee; Medicinal: Neem; and Rubber.

**Ethnobotany**: Introduction, definition, branches &importance of ethnobotany

**List ofPracticals**

To study the morphological and anatomical characteristics of anyone hydrophyte and xerophyte.

To study the morphological characteristics of cladode, phylloclade, phyllode and pneumatophores.

Principle and working of: spectrophotometer, microscope etc.

To determine the DO of water samples

different sources.

To study the dust holding capacity of leaves.

To estimate transparency, pH and temperature of different water bodies

To estimate salinity (chlorides) of different water samples.

To determine the percent leaf-area injury of different leaf samples collected around polluted sites.

Utilization of **Plants**: Morphology, Utilization and Important chemical constituents of plants mentioned in theory. To study the plants of ethnobotanical importance.

Microchemical Tests: Lipid, Proteins, starch, Lignin, Carbohydrates, Cellulose.

Electrophoretic /chromate graphic separation of amino acids carbohydres

*Botanical Excursions (One short tour is compulsory).*

**Semester VI Practical examination**

**Question Paper**

**Time : 5 hrs** **Marks : 30**

Q. 1) To determine seed viability [A] & report the findings **05**

Q. 2) To study the given Ecological material [B] & report the findings. **05**

Q. 3) Electrophoretic/chromatographic separation of amino acid and carbohydrates [D]. **04**

Q. 4) Morphology, anatomy and utilization of the given plant material [E]. **04**

Q. 5) **Spotting:** **04**

E -Ecology (morphology)

F - Biotechnology Instruments

G - Utilization of plant

H -Utilization of plant

Q. 7) Viva Voice **03**

Q. 8) Practical Record & Excursion Report **05**

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B. Sc. Semester V Suggested Laboratory Exercises

MAJOR PLANT PHYSIOLOGY EXPERIMENTS (ANY NINE ):

1. To study the permeability of plasma membrane using different concerntrations of organic solvents.
2. To study the effect of temperature on permeability of membranes.
3. To determine the osmotic potential of vacuolar sap by plasmolytic method.
4. To determine the water potential of any tuber.
5. To compare the rate of transpiration from two sufaces of leaf- a) bell jar method b ) Cobalt chloride method.
6. To determine the path of water (Ascent of sap).
7. To separater chloroplast pigments a) by solvent method and preparation of their absorption spectra b) paper chromatography.
8. To separate amino acids from plant materials an paper chromatography and their identification by comparison with standards.
9. To measure rate of photosynthesis by Wilmott's bubbler under variable conditions of light, temperature and $CO_2$.
10. To compare rates of respiration f various plant parts.
11. To demonstrate bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant materials.

MINOR MAJOR PLANT PHYSIOLOGY EXPERIMENTS (ANY SEVEN ):

1. To demonstrate the phenomenon of dispersion.
2. To demonstrate the phenomenon of adsorption.
3. To demonstrate the phenomenon of imbibitions.
4. To demonstrate the root pressure.
5. To demonstrate that the amount of water absorbed and the amount of water transpired is approximately equal.
6. To demonstrate that the light is necessary for photosynthesiss (Ganong's light screen).
7. To demonstrate that the light, chlorophyll and $CO_2$ are necessary for photosynthesis (using Moll's half-leaf experiment).
8. To demonstrate fermentation by Kuhne's tube.
9. To demonstrate aerobic respiration.
10. To demonstrate the evolution of $CO_2$ in respiration.
11. To demonstrate that the part of energy is released in the form of heat during respiration.
12. To demonstrate the measurement of growth of germination pea seeds.
13. To demonstrate the phomenon of gravitropism (geotropism), phototropism and hydrotropism.
14. To demonstrate seed vaiability test by T.T.C. ( Triphenyl-tetrazolium chloride).

15. To demonstrate the phenomenon of nastic movement in *Mimosa pudica / Biophytum sensituvum* plants.

Suggested Laboratory Exercises

ECOLOGY EXPERIMENTS (Any nine):

1. To determine the minimum number of quadrates required for reliable estimate of biomass in grasslands.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiaer's Standard Frequency Diagram.
3. To estimate importance value index for grassland species on the basis of relative frequency relative density and relative biomass in protected and razed grassland.
4. To measure the vegetation cover of grassland through point-frame method.
5. To measure the above-ground plant biomass in a grassland.
6. To determine the Kemp's constant for dicot and monocot leaves and to estimate leaf-area-index of a grassland community.
7. To determine diversity indices (Richness, Simpson, Shannon-Wiener) un grazed and protected grasslands.
8. To estimate bulk density and porosity of grassland and woodland soil.
9. To determine moisture content and water holding capacity of grassland and woodland soil.
10. To study the vegetation structure through profile diagram.
11. To estimate transparency, pH and temperature of different water bodies.
12. To measure dissolved oxygen content in polluted and unpolluted water samples.
13. To estimate salimity of different water samples.
14. To determine the percent leaf-area-injury to different leaf samples collected around polluted sites.
15. To estimate dust-holding capacity of the leaves of different plant species.
16. To study the ecological characters (morphological and anatomical) of the following plants-
    a. **Hydrophytes**: *Hydrilla, Vallisneria, Nymphaea, Potamogeton, Eichhornia* and *Trapa*. (Any Four).
    b. **Xerophyte**: i. For morphological features: *Acacia auriculiformis, Parkinsonia, Muehlenbeckia, Ruscus, Asparagus, Kalanchoe, Euphorbia nerifolia, Opuntia*; ii. For morphological and anatomical features: *Nerium, Casuarina*.
    c. **Halophytes**: for morphological features: *Rizophora*.
    d. **Epiphytes**: for morphological and anatomical features: Orchid (*Vanda*).
    e. **Parasite**: For morphological and anatomical features: *Cuscuta*.

    Note: - 1. Experiment no. 16 is compulsory, 2. Frequent tours to the different ecological sites to study vegetation are compulsory. 3. One long excursion is

essential, 4. Excursion and study tour reports dully signed by the H.O.D. to be submitted at the time of examination.

Suggested Laboratory Exercises

BIOCHEMISTRY EXPERIMENTS (Any nine):

1. To study the ENZYME activity of **Catalase** and **Peroxidase** in suitable plant material as influenced by pH and temperature.
2. To study the ENZYME activity of **Amylase** from germination Barley/ Wheat grains.
3. Colorimeteric/Spectrophotometric estimation of sugar and starchy (Carbohydrates in suitable plant materials.
4. To prepare the standard curve of protein and determine the protein content in plant samples.
5. Estimation of Anthocyanin pigments from different plant material (At least two) and preparation of absorption spectra.

**Semester VI Practical**

Biotechnology:

1. To get acquainted with the laboratory equipments, apparatus and instruments in biotechnology laboratory.
2. To demonstrate the technique of micropropagation by using different explants e.g. axillary buds and shoot meristem.
3. To demonstrate the technique of anther culture.
4. To demonstrate the root and shoot formation from the apical and basal portion of the stem segments in liquid medium containing different hormones.
5. To isolate protoplast from different tissues using commercially available enzymes.
6. Immobilization of embryos from suitable plant seeds using sodium alginate.

Utilization of plants:

1. **Food plants:** Study of morphology, structure and simple micro-chemical tests of the food storing tissues in rice, wheat, maize, potato and pulses (soybean, pea) and sugarcane.
2. **Fibres:** Study of cotton flower, section of cotton ovules developing seeds to trace the origin and development of cellulosic 'fibers' (seed epidermal hair, microscopic study of cotton and test for cellulose). Section and staining of jute stem to show the location and development of fibres, microscopic structure and test for lingo-celllose.
3. **Vegetable oils:** Study of hand sections of groundnut, mustard and coconut and staining of oil droplets by Sudan-III and Sudan black.
4. **Field visits:** Study sources of firewood (ten plants), timber-yielding trees (ten plants), and bamboos, preparation of list mentioning special features.

5. **Spices:** samples of black paper, cloves, cinnamon (had sections and opend fruit of cardamom and describe them briefly) survey of spices found and use locally for practical assignment.
6. **Medicinal plants:** preparation of an illustrated inventory of ten medicinal plants used in indigenous system of medicine and allopathy- write their botanical and vernacular names, part/s used and diseases disorders for which they are prescribed.
7. **Beverages:** study section of boiled coffee beans and tea leaves to study the characteristic structural features.
8. **Rubber:** Collect illustrative materials of *Havea Brasilensis*, study morphology of the plant and tapping practices, history of rubber, list the many uses of rubbers.

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**B.Sc. HOME SCIENCE**

**SEMESTER –I**

**B.Sc. HOME SCIENCE SEMESTER –I**
**PAPER-I**
**Fundamentals of Food Science and Nutrition-I**
**(1T-1)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives :-**

1. To understand the functions of food and the role of various nutrients, their requirements and effect of deficiency and excess.
2. To promote basic knowledge pertaining to various food groups and nutrients.
3. To make students familiar with the different methods of cooking, their advantages and disadvantages.
4. To develop ability to improve the nutritional quality of food.

**THEORY**

COURSE CONTENT

**UNIT- I**

**INTRODUCTION TO FOOD AND NUTRITION**

1. Basic terms used in Food and Nutrition. Definitions-Foods, Nutrition, Optimum nutrition, Nutritional status, Nutrients and Health
2. Functions of food-Physiological, psychological and social
3. Characteristics of basic food groups and their contribution to the diet
4. Nutrients and their type (Macronutrient / Micronutrient)
5 Thermodynamic effect of food (SDA)
6. Scope of Nutrition

**UNIT- II**
**BALANCED DIET AND RDAs**
**Balanced Diet**

1. Definition
2. Concept of balanced diet
3. Factors affecting balanced diet

Recommended Dietary Allowances (RDAs) of the ICMR for the different food groups for various life stages.

4. Energy:Definition and factors affecting BMR.Units of measuring food energy:Calorie,kilo-calorie, joule, kilo-joule and mega- joule

Energy measurement of food (Bomb calorimeter)

**UNIT- III**

**CARBOHYDRATES AND FIBRE**

1. Carbohydrates – Definition, classifications, functions, sources, digestion and absorption and deficiency states.

2. Fibre- Definition, Types of dietary fibre and sources.

Role of fibre in prevention of diseases

**UNIT- IV**

**MACRONUTRIENTS**

1. Protein- Definition, classifications, functions, sources, digestion and absorption and deficiency states Protein sparing action of carbohydrates

2. Fats - Definition, classifications, functions, sources, digestion and absorption and deficiency states.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**

1. Food Presentation and Table Setting.
2. Preparation of Ingredients: Pre-preparation, methods of mixing, methods of cooking.
3. Simple cooking- preparation, serving, calculation of cost and yield

a. Appetizers: Soups (any 2).

b. Starters: a) Paneer Preparations b) Samosa c) Kabab d) Cutlet (any 2).

c. Salad: a) Sprouted b) Vegetable c) Fruits (any 2).

d. Raita: (any 2).

e. Snacks: Pakoras, Namkin, Sandwiches, Idli, Dhokla (any 2)

**BOOKS RECOMMENDED**


1. **Nutritive Value of Indian Foods:** Gopalan C, Rama Shastri&Balasubramanin S.C., National Institute of Nutrition, 1993

2. **Food Science, Chemistry and Experimental Foods**: Dr.M.Swaminathan,The Bangalore Printing and Publishing Co. Ltd. 1995.

3. **Essentials of Food and Nutrition,** Vol.I (Fundamental aspects): Dr.Swaminathan, 2nd edition BAPPCO, 1985

4. **Applied Nutrition**: R. RajlakshamiOxford & IBH Pub. Co.pvt Ltd,3rd edition, 1981.

5. **Foods and Nutrition**: The Educational Planning Group, Delhi, Arya Publishing House. 3rd edition, 1991.

6. **Food Chemistry**: Meyer, L.H. CBS Publishers & Distributors, Delhi, 1987.

7. **Scope manual on Nutrition**: Latham M.C., McGandy, McCann M.B.& Stare F.J. Published by the Upjohn Co, Kalamazoo, Michigan, 2nd edition. The Upjohn Co, Kalamazoo, Michigan 1972.

8. **Every Day Indian Processed foods**: K.T. Achaya, National Book Trust, India, 1984

9. **The book of Ingredients**: Philip Dowell & Adrian Bailey, Michaey, Michael Joseph, Ltd, 1980.

10. **Indian Food Composition Tables**: Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition,2017.

## B.Sc HOME SCIENCE SEMESTER - I

## PAPER -II
## Fundamentals of Human Development
## (1T-2)

| Total Marks | 100 |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives :**

1. To make the students aware of science of Human Development.
2. To make student aware of methods of studying human behaviour.

**Theory :**

**Unit I –**

1. What is Human Development? Definition of HD, why do we need to study HD?
2. Brief history and interdisciplinary nature
3. HD as a scientific discipline
4. Scope of the subject
5. Opportunities for roles and employment
   - researcher : on issues related to HD
   - educationist : ranging from pre-school to University
   - planner of policies or programs related to child and family welfare

   -implementing interventions for different aspects related to HD (include special educators, personnel in agencies catering to all age groups i.e. from crèches to old homes)
6. Settings available
   Early child hood care & Education – Creche, pre-school centres, day care centres, hobby centre, early stimulation programme
   ICDS – anganwadi
7. Family & Child Welfare Programmes

8. Children with special needs.

**Unit II – Growth & Development**

1. Meaning of growth & development, Principles of growth & development
2. Domains of development
3. Stages of development
4. Context of development
   **a)** Genetic inheritance : introduction to genes and number of chromosomes, Genotype and Phenotype.
   **b)** Context of development: Family, SES, gender and culture(Bronfenbrenners contextual view)
5. Needs & Rights of children.

**Unit III:- Prenatal development** –

- Conception & stages, Factors influencing
- Complications / hazards during pregnancy
- Prenatal care, child birth
- At risk Babies
- Child friendly hospitals.

**Unit IV– Neonate**

- Physical characteristics.
- Abilities – sensory & perceptual
- Adjustments & reflexes
- Care of the newborn
- Immunization.

**INTERNAL ASSESSMENT** (Refer Direction)

Preparation of workbook(any one)

Care during pregnancy

Needs and rights of children

| | |
|---|---|
| **Total Marks** | **20** |

**Practicals**

1. Methods of child study –
   - Anthropometry, Observation, Interview, Questionnaire, Case study, Projective, Psychological tests, Sociometry, Longitudinal and cross sectional approach

2. A survey of cultural practices related to pregnancy

3. Plan & develop activities to facilitate development in different domains and submit a flip / album of activities.

**References :**


- Santrock, J.W. (2006). Child development New York : Mc Graw Hill.

- Swaminathan, M. (1998), The first five years : A critical perspective on early childhood care and education in India. New Delhi : Sage .


**B.Sc. HOME SCIENCE SEMESTER – I**
**PAPER – III**
**Fundamentals of Textile & Clothing**
**(1T-3)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES :**

1. To get acquainted with basic knowledge of textile fibers.
2. To acquire knowledge of various principles of clothing constructions, and their application.

**Unit I :**

1. Scope of textile and Importance of clothing :.
2. Classification of textile fibers, General and essential properties of textile fibers
3. Manufacturing process of natural fibers.;-Cotton, silk, wool , Linen(Flex).
4. Physical and chemical properties of natural fibres

**Unit II :**

1. Manufacturing process, of man made fibers :- viscose rayon, nylon, polyester
2. Physical and chemical properties of man madefibres
3. Latest fibres :- Introduction and use of - Organic cotton , Bamboo , Soy, Lyocel, Metallic, Lycra(spandex)

**Unit III :**

1. Factors affecting clothing : Age, Climate, Occasion, Occupation and Fashion.
2. Introduction to Tools for Garment construction- Measuring tools, marking tools, Cutting tools, sewing tools, Pressing tools,
3. Sewing machine –parts, functions, care

**Unit IV : Clothing**

1. General principles of clothing construction .Process of Taking body measurements for different garments,
2. Importance of drafting method .



3. Preparation of Cloth for clothing construction. Cutting & stitching according to design and textures of fabric (plaids, stripes, border and bold designs).

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**

1. Demonstration of taking body measurements.
2. Drafting, cutting &stitching of ;-Apron, Baby Frock
3. Embroidery album Decorative stitches - chain, herringbone, stem, running, lazy-daisy, satin, French knot, bullion stitch, buttonhole(Make 4 samples of combination of 2 decorative stitches)
4. Introduction to a sewing machine with a demonstration and practice of learning the running of sewing machine on paper on straight lines, curved lines and corners

**References:**


- DeulkarDurga - Household Textile and Laundry Work, Orient Longman, Delhi.
- Dantyagi S. - Fundamentals of Textile and their care. Orient Longman, Delhi.
- Dorling Kindersley- The complete Book of Sewing, London, New York.
- Dorothy Siegart, Lyle-Modem Textiles, John Wiley and Sons.lnc New York
- Doongaji. S and Deshpande R - Basic Process of Clothing Construction.
- Erwin, Mabel and kinchen- Clothing for Modern ,Mac Milan publishing, New York.
- Fabrics science by Joseph Puzzuto
- Modern textiles by Dorothy Siegert Lyle
- Understanding fabric from fiber to finished cloth by Dbbie and Giollo
- Understanding textiles by Phyllis G. Tortora and Billie J Collier
- Corbman,P.B., Textiles-Fibre to Fabric, Gregg Division/McGraw Hill Book Co.,US, 1985.
- Joseph M.L.,Essentials of Textiles ($5^{th}$ Edition), Holt, Rinehart and Winston Inc.,Florida, 1988.

**B.Sc. HOME SCIENCE SEMESTER – I**
**Paper – IV**

**(Fundamentals of Family Resource Management)**

**(1T-4)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objective :**

1) To develop good taste through the study of basic elements and principles of design

2) To develop aesthetic sense and to be good art consumer

**COURSE CONTENT: Theory**

**UNIT I –Fundamentals of Art**

**A)**

1. Introduction to Fundamentals of Art
2. Meaning of Art
3. Elements of Art

i) Line ii) Form iii) Colour iii) Texture vi) Space v) Light vi) Pattern vii) Idea

**B) Design in current life style**

1. Aesthetic sense and its importance
2. Importance of good taste
3. Objectives of design –i) Beauty ii) Expressiveness iii) Functionalism
4. Concept of Design
5. Types of design:
   i) Structural ii) Decorative iii) Naturalistic iv) Stylized v) Geometric vi) Abstract vii) Modern viii) Traditional

**UNIT II– Introduction to Management**

**A) Management**

1. Introduction
2. Definition
3. Basic concept of management
4. Nature and role of management in changing world.
5. Need of management in day to day life

**B) Motivating Factors of Human Life**

1. **Values:** a) Definition b) Importance c) Classification ---i) Intrinsic ii) Instrumental iii) Human



needs values

2. **Goals:** a) Definition b) Importance of goal setting c) Classification—Short term, Intermediate, Long term, Mean-end goal.
3. **Standard:** a) Definition b) Importance c) Classification—i) Conventional ii) Flexible iii)Qualitative iv) Quantitative

**UNIT III–Interior Decoration**

1. Meaning and Definition of Interior Decoration
2. Importance of interior decoration
3. Essential factors in interior decoration
4. Interior decoration of various rooms
5. Material required for decoration

**UNIT IV– Principles of Design in Interior**

1) Harmony
   a) Definition and importance
   b) Harmony of line and shape
   c) Harmony of texture
   d) Harmony of idea
   e) Harmony of colour
   f) Application in Interior decoration
2) Balance

a) Definition and importance
b) Types of balance – Formal, Informal
c) Application in Interior decoration

3) Rhythm

a) Definition and importance
b) Method of obtaining rhythm
c) Application in interior decoration

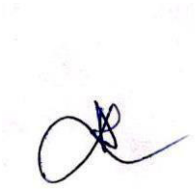
4) Proportion

a) Definition and importance
b) Proportion and space
c) Proportion and line
d) Proportion and scale
e) Application in interior decoration

5) Emphasis

a) Definition and importance
b) What to emphasis
c) How to emphasis





d) How much to emphasis
e) Where to emphasis
f) Application in interior decoration

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**
Experiment No. 1 – Line direction

a) Vertical b) Horizontal c) Zigzag d) Diagonal e) Curved

Experiment No. 2- Types of design

a) Structural and Decorative
i) Naturalistic and stylized
iii) Geometric and Abstract
ii) Modern and Traditional

Experiment No.3- Principles of Art

- Harmony
- Balance
- Proportion
- Rhythm
- Emphasis

ACTIVITIES
Accessories in interiors (Any one)
a) Greeting Cards b) Macramé work
c) Door Mats d) Roti Rumal
e) Ceramic Work

**Books Recommended**

1) Goldstein H/ Goldstein v – Art in Everyday Life Macllian co, New York 4th Edition

2) Mann M- Home Furnishing, weley Easterly Pvt Ltd.

3) SundarajText Book of Household arts orient long man, Bombay

4) Good year &Klohar Managing for effective living John Wiley and Sons.

5) Gross-crandall-knollManagement for Modern families Prentice Hall, Inc. New Jersey.

6) Nickell- Rice- Tucker, Management in family living John Wiley & Sons.

7) Swanson Bettye Introduction to Home Management McMillan Pub. House.Inc.New York

**B.Sc. HOME SCIENCE SEMESTER – I**
**PAPER - V**
**Fundamentals of Home Science Extension**
**(1T-5)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives :-**

1) To understand meaning & need of Home Science extension
2) To understand meaning and importance of Rural Sociology.
3) To know the Society in respect of Social Problems.

**Theory:**

**Unit – I**

1. **Education** :- : Meaning & definitions of education, concept, need, types of education - formal, informal & non-formal education, variation between formal & non-formal education.
2. **Extension education**:-
   Meaning, definitions, origin of extension education, objectives, principles, fields & essential links in the chain
   of Rural Development.

**Unit – II**

3. **Home Science**.-Meaning, Definitions of Home Science, Philosophy of Home Science objectives of Home Science, Scope of Home Science, fields, Characteristics of Home Science in Colleges & Universities.
4. **Home Science Extension** :-Meaning & Definitions of Home Science Extension, Concept of Home Science Extension, Philosophy,
   Objectives and Characteristics of Home Science Extension.

**Unit- III**

5. **Rural Sociology** :-Meaning of sociology and Rural Sociology, Scope of Rural Sociology, Elements of Rural Sociology in India, Importance of the Study of Rural Sociology.
6. **Rural Society** :-Meaning of Rural Society, Importance of Rural Society, Characteristics of Rural Society, rural social groups,
   Classification of Social groups, Formal & informal institutions in Rural Society.

**Unit – IV**

7. **Social Problems** :-Meaning & Definitions of social problems, Importance of knowledge of Social problems, Difference between urban and rural social problems.
8. **Poverty and Rural Social Problems** -:Meaning and causes of poverty, Problems of Over Population, Caste tension, Problem of Unemployment, Poor Health & sanitation. Problems of tribals and its solutions.

| **Total Marks** | **20** |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

**Practical**

1. Writing of a circular letter to communicate effectively to masses.
2. Preparation of extension bulletin on any home science.
3. Handling and operation of camera for extension photography.
4. Preparation and presentation of charts.
5. Collection and use of photographs on development aspects.

**Books Recommended :**


1. Directorate of extension : Extension Education in Community Development.
2. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
3. Chandra.A., Shah. A. and Joshi. V.: Fundamentals of teaching Home Science, Sterling Publishers,
   New Delhi, 1989.
4. Devdas. R. P., Methods of teaching Home Science, National Council of Education.1978.
5. Singh. K., Rural Sociology, Prakashan Kendra, Lucknow.
6. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.


## B.Sc. HOME SCIENCE SEMESTER –I

## PAPER –VI

## Ecology and Environment -I

## (1T-6)

| **Total Marks** | **50** |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**OBJECTIVES:**

1. To get acquainted with the physical environment and its components
2. To know the methods to protect the environment and conserve natural Resources.

**Theory:**

**UNIT –I:**

**ECOSYSTEM**

1. Ecology- Definition, types.
2. Ecosystem – Definition, components and types. Detail structure of grassland and pond ecosystem
3. Food chain, food web and ecological pyramids

**UNIT –II**

**ENVIRONMENT**

1. Definition, elements of environment (Atmosphere, Hydrosphere, Lithosphere)
2. Biogeochemical cycles – oxygen cycle, carbon cycle, Nitrogen and Hydrological cycle.

**UNIT- III**

**NATURAL RESOURCES**

1. Definition, types, renewable & Non- Renewable resources
2. Conservation of wild life, forest resources, Afforestation , water management
3. Study of National parks & sanctuaries – Tadoba, Kanha, Nagzira, Bhar

**Unit – IV**

**POLLUTION**

1. Definition, sources, prevention and control measures of Air, Water, Noise, Soil and Radioactive Pollution. Pollution control through various laws.
2. Acid rain, green house effects, Ozone depletion and global warming.
3. Toxic effects of heavy metals – lead. Chromium and mercury.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **10** |
|---|---|

**Practicals:**

1. Determination of Hydrogen Ion Concentration (pH) of Water and Wastewater.
2. Detection of dissolved oxygen in a given water sample by Wrinkler's method
3. Estimation of Acidity of Water
4. Estimation of Chlorides of Water
5. To prepare plan and layout of a garden.

***Books Recommended:***

1. Environmental Biology by P.D. Sharma



2. Ecology & Environment by P.D. Sharma
3. Environmental Pollution by S.S. Dara

**B.Sc. HOME SCIENCE –SEMESTER I**
**Paper VII**
**BASIC CHEMISTRY-I**
**(1T-7)**

| **Total Marks** | **50** |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**COURSE CONTENT :THEORY**

**UNIT-I**

**(a) Water:** Sources, impurities, hard and soft water, hardness, temporary and permanent hardness, disadvantages of hard water for domestic purpose,

**(b)** Methods of purification of water for domestic purpose (i) Screening, ii) sedimentation, iii) coagulation, iv) gravity sand filter and pressure filtration and v) sterilization: boiling, chlorination (chlorine gas, bleaching powder, chlorine tablet), ozonization, and ultraviolet radiation

**Unit-II**

**(a) Alloy:** Definition, Classification of alloy (ferrous and Non-ferrous), purpose of making an alloy

**(b)** Effect of alloying various elements on properties of steel, composition and uses of stainless steel and brass.

**Unit-III**

**a) Theory of Valency:** Electrovalency, Co-valency, and co-ordinate valency and its properties, with examples like formation of sodium chloride (NaCl), Magnesium oxide (MgO), Hydrogen($H_2$) , Oxygen ($O_2$), Sulphurdioxide ($SO_2$).

**b) Physical Properties of Liquids:** Surface tension (definition, determination of surface tension by Stalagmometer method). Viscosity (definition, determination by Ostwald's Viscometer) Factors affecting surface tension and viscosity.

**Unit-IV**

**(a) Colloids**: Definition, types of colloidal systems, Types of colloidal solution, methods of preparation, properties (Tyndall Effect, Brownian Movement, Electrophoresis, Electro-osmosis) and colloids in daily life (applications)

**(b) Emulsion and gel**: definition, types, methods of preparation, properties and their applications.

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Theory IA Marks** | **10** |

**Practicals:**

**A) Volumetric analysis:**

1. Single acid base titration, Determine the Normality and weight per liter.
2. Determination of total and permanent hardness of water by EDTA titration.

**B) Physical Experiments .**

1) Determination of viscosity of given liquid by Ostwald's Viscometer.

2) Determination of Surface tension of given liquid by Stalagmometer.

3) Preparation of colloidal solution of starch.

**BOOK RECOMMENDED:**


1. Text-Book of organic Chemistry: B; S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
2. Text Book of Physical Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
3. A Text Book of Basic and Applied Chemistry, P.C. Jain and Monica Jain.
4. Polymer Science by V.R. Gowarikar, Wiley Ester Ltd. 1987.
5. Text Book of Organic Chemistry by J. L. Finar, Longman Publication.

**B.Sc. HOME SCIENCE SEMESTER I**
**PAPER -VIII**
**Applied Physics and Basic Computer I**
**(1T-8)**

| **Total Marks** | **50** |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**Objectives:** To refresh concepts in Physics and Computers.

**Unit-I**

**Measurements and units:** Definition of Physics, need of physics, Physical quantities, Necessity of measurement of quantities, FPS, CGS, MKS and SI systems of units (Main features of each system of units and comparison of these systems of units), necessity of a SI system of units. Concept of least count of a measuring instrument, significant figures.Concept and definition of scalar and vector quantities.

**Unit- II**

**Fundamental and derived quantities:** Concept of fundamental and derived quantities. Definitions of : Distance, displacement, area, volume, mass, density, speed, velocity, momentum, acceleration, force, work done, pressure, kinetic energy, potential energy, temperature, potential difference, current, resistance, power (electrical and mechanical).SI and CGS units of these quantities.Classification of these quantities as scalar and vector quantities.

**Unit- III**

**Mechanics:** Statements of Newton's laws of motion, and two examples each. Definition of uniform circular motion.Concept, definition and examples of centripetal force and centrifugal force.
Concept and definition of friction, types of friction (static and dynamic), friction as an advantage and disadvantage (at least five situations), measures to minimize undesired friction (use of lubricants, washers, ball bearings, surface coating, surface polishing, design modification etc.)

**Unit- IV**

**Computer Basics:** Characteristics of computers, Uses of computer in various fields, basic components of a computer system (block diagram), working of each block. Unit of memory (Bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte).concept of software and hardware.

| **Total Marks** | **10** |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

**Practicals:**

1. Use of Vernier Calipers to determine dimensions of a given object.



2. Use of Screw Gauge to determine dimension of a given object.
3. Comparison of measurements with Scale, Vernier Callipers and Screw Gauge.
4. Determination of density of a solid object.
5. Use of Travelling Microscope to determine inner diameter of a Capillary tube.
6. Determination of coefficient of Static Friction between two surfaces in contact.
7. Use of keyboard as an input device for computer to enter text in note pad. Save and print the file.
8. Use of mouse as an input device for computer to draw different shapes in 'Paint'. Save and print the file.

**Reference Books:**


1. Principles of physics (vol. I & II) – Halliday &Resnik
2. Principles of physics – Subramanyam, Brijwal
3. How things work (vol. I & II ), INDUS (Harper Collins India)
4. Elements of Computer Science, S. K. Sarkar, A. K. Gupta, S. Chand & Co., New Delhi
5. Fundamental of computers E. Balguruswamy, Mc Graw Hill Education Pvt. Ltd. New Delhi
6. Computer fundamental (concepts, system & application) Pradeep K. Sinha, Priti Sinha, Sixth edition 2011, B.P.B . Publication
7. Comdex computer course, Vikas Gupta, PM Publication, New Delhi


## B.SC HOME SCIENCE SEMESTER - I
## PAPER - IX
## English and Communication Skills-I

**(1T-9)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |

**Objectives** :

1. To prepare the students to communicate effectively and fluently in English.
2. To enable students listening, speaking reading and writing.

3. To strengthen grammatical accuracy
4. To prepare the students to deal with customers, professional, counselors in correct grammatical, idiomatic English.
5. To provide personality development training through situational role play,interview techniques, group discussions,seminar presentation etc.

**Theory :**

**Unit I :**

**1.Listening Skills**

a. Importance of Listening Skills

b. Developing Listening Skills

**2.BusinessProposals**a.

a. The terminology used for formal commercial dealings like beauty parlour, boutique, diet counseling, Nursery and KG,

b. Drafting Business Proposals (To draft a proposal for setting up a new venture or new business )

c. Written Communication with banks, applying for loans and or extension of credit, etc.

d. Activities related to Listening Skill

Situational listening Skills (Meeting, Dialogue, Seminars etc)To make a proposal

**Unit II**

2. Voice training and expression

(*Effective Public Speaking*)

2. Paragraph writing on any given topic

3. Articles

**Unit III**

1. Correction of Errors
2. Precis Writing
3. Comprehension Passage
4. Active and Passive Voice
5. *Goal Setting*

**Unit IV**

1. Preposition
2. Advertisement Copy
3. Publicity Handouts
4. *Time Management*
5. Official/ Business Letter writing
6. Sales Letter
7. Enquiry Letter
8. Quotation Letter
9. Complaint Letter
10. Adjustment Letter
11. Letter to the editor of a newspaper
12. E-mail writing , Adding a Question Tag

**Internal Assessment(IA):** **Total Marks : 20**

a) Situational listening Skills (Meeting, Dialogue, Seminars etc)

b) To make a proposal

c) Three minutes Presentation

d) Paragraph writing

e) Précis Writing

f) Comprehension Passage

g) Grammar Exercise h) Advertisement Copy i) Letter writing

**Reference Books**:


1. Professional Communication Skills : By Pravin S.R.Bhatia, A.M Sheikh: S.Chand and company
2. English Grammar Composition and Effective Business Communication By M.A. Pink, S.E.Thomas : S.Chand
3. You can Win Shiv Khera
4. 7 Habits of Highly effective people :Steven Corey
5. Enjoying EverydayEnglish ,A.Rama Krishna Rao. Sangam Publication
6. Applied English Grammar and Composition Dr. P.C.Das New Central Book Agency(P) Ltd
7. Malgudi Days by R.K. Narayan

**B.Sc. HOME SCIENCE**

**SEMESTER –II**

**B.SC. HOME SCIENCE SEMESTER –II**
**PAPER-I**
**Fundamentals of Food Science and Nutrition-II**
**(2T-1)**

| **Total Marks** | **150** |
|---|---|
| Theory+ IA | 80+20 = 100 |
| Practical +IA | 40+10 = 50 |

**OBJECTIVES:**
1. To understand the functions of food and the role of various nutrients, their requirements and effect of deficiency and excess.
2. To promote basic knowledge pertaining to various food groups and nutrients.
3. To make students familiar with the different methods of cooking, their advantages and disadvantages.
4. To develop ability to improve the nutritional quality of food.

**THEORY**

**COURSE CONTENT**
**Unit- I**
**Vitamins -**Classification of Vitamins
**Fat Soluble Vitamins:**
Functions, Sources and Deficiency of:
1) Vitamin A 2) Vitamin D 3) Vitamin E 4) Vitamin K

**Unit- II**
**Water Soluble Vitamins**:
Functions, Sources and Deficiency of: i) Thiamine ($B_1$) ii) Riboflavin ($B_2$)
iii) Niacin ($B_3$) iv) Pyridoxine ($B_6$) v) Biotin vi) Folic Acid
vii) Cyanocobalamin ($B_{12}$) viii) Vitamin C

**Unit- III**
**Minerals**
Functions, Sources and Deficiency of:
Major Mineral -1) Calcium 2) Phosphorous 3) Iron 4) Iodine
B) Trace element- 1) Sodium 2) Potassium 3) Magnesium 4) Zinc

**Unit -IV**
**Water and Methods of Cooking**
**Water:** Functions of water in human body, water balance, sources of water, effect of dehydration and its prevention.
**Methods of Cooking:**
1. Objectives of cooking food

2. Advantages of cooking food
3. Different cooking methods and different cooking media
4. Effect of different cooking methods on nutritive value of food

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | 20 |
|---|---|

**PRACTICALS**

Simple cooking- preparation, serving, calculation of cost and yield.

a) **Cereals:** – Plain Rice, Pulao, Sweet Rice MasaleBhat (any 2)

b) Chapati, Puri, Paratha, Missi Roti, PuranPoli, Bhakri (any 2).

c) **Pulse Preparation**: Whole, Dehusk and Sprouted (any 2 ).

d) **Vegetable Preparation**: Dry Curries and Baked (any 2).

e) **Fruit Preparation:** Fresh, Dried Baked and Steamed (any 2).

f) **Milk Preparation**: Porridge, Desserts, Curds, and Paneer Preparation (any 2).

g) **Egg Preparation**: Boiled, Fried, Poached and Custard (any 2)

| **Total Marks** | **40+10=50** |
|---|---|
| Presentation | 10 |
| Cooking | 10 |
| Sensory Evaluation | 10 |
| Record | 10 |
| IA | 10 |

| **Total Marks** | 10 |
|---|---|

**INTERNAL ASSESSMENT**

**Any one of the following**:

1. Market survey of the food commodities as per food groups and their cost.
2. Latest Kitchen appliances in the market-their use and upkeep (any 5).
3. Scrap Book: Related to food groups, sources, deficiencies of various nutrients.

**Books Recommended**


1. **Nutritive Value of Indian Foods:** Gopalan C, Rama Shastri&Balasubramanin S.C., National Institute of Nutrition, 1993
2. **Food Science, Chemistry and Experimental Foods**: Dr.M.Swaminathan,The Bangalore Printing and Publishing Co. Ltd. 1995.
3. **Essentials of Food and Nutrition,** Vol.I (Fundamental aspects): Dr.Swaminathan, 2nd edition BAPPCO, 1985.
4. **Applied Nutrition**: R. RajlakshamiOxford & IBH Pub. Co.pvt Ltd, 3rd edition, 1981.
5. **Foods and Nutrition**: The Educational Planning Group, Delhi, Arya Publishing House. 3rd edition, 1991.
6. **Food Chemistry**: Meyer, L.H. CBS Publishers & Distributors, Delhi, 1987.
7. **Scope manual on Nutrition**: Latham M.C., McGandy, McCann M.B.& Stare F.J. Published by the Upjohn Co, Kalamazoo, Michigan, 2nd edition. The Upjohn Co, Kalamazoo, Michigan 1972.
8. **Indian Food Composition Tables**:.Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition, 2017.

**B.Sc HOME SCIENCE SEMESTER - II**
**PAPER -II**
**Development In Early Years**
**(2T-2)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 +20= 100 |
| Practical + IA | 40+10= 50 |

**Objectives :**

1. To understand growth and development during infancy & early childhood
2. To study the factors influencing development during infancy and early childhood years
3. To understand development in key areas – physical, motor, cognitive language, social & emotional development .

**Theory :**

**Unit I** – Introduction to the early years :

1. Significance of the early years
2. Concept of developmental tasks & milestones
3. Play - meaning and importance and types of play
4. Infancy – Physical growth and development – body size, skeletal growth ,motor development(development of posture, learning to walk) factors influencing and facilitating motor development.

**Unit II**- Infancy :-Socio – Emotional, Cognitive & Language Development

1. Socio – emotional development – family, socialization, attachment, infant emotions, influences on social – emotional development
2. Cognitive development – sensory motor development, factors influencing cognitive development
3. Language development – Language acquisition during infancy,
4. Factors influencing language development, facilitating language development.

**Unit – III** Early Childhood : Physical motor, Social – Emotional development.

1. Physical growth and development – body size, skeletal growth, physiological changes, factors influencing and facilitating physical growth
2. Motor development – gross and fine motor development, factors influencing and facilitating motor development.
3. Social and emotional development – relationships with family , peers teachers

4. Self concept, self esteem and gender identity.

**Unit IV** : Early Childhood : Cognitive and Language development.

1. Cognitive development :- Characteristics and accomplishments, factors influencing cognitive development
2. Language development – Characteristics and accomplishments, factors influencing and facilitating language development .
3. Moral feelings, moral reasoning and moral behavior.

**INTERNAL ASSESSMENT (Refer Direction)**
**Preparation of workbook (any one)**
**Hazards of infancy**
**Hazards of early childhood**

| | |
|---|---|
| **Total Marks** | **20** |

**Practical Examination.**

| | |
|---|---|
| Total Marks | 40+10 |
| Preparation of worksheets | 10 |
| Preparation of teaching aid | 10 |
| 2 Questions | 05 |
| Activities for Stimulating Development | 05 |
| Record Book | 10 |
| Internal Assessment | 10 |

**Practicals:**

1. Visit to nursery school to observe infrastructural set up , teaching methods and activities
2. Preparation of teaching aids for nursery school children (4 teaching aids).
3. Preparation of a creative activities album :
4. Painting – Finger, stencil, blow, string, splatter, single / multiple water wash, rag, sponge, cotton, large brush etc.
5. Printing : Block, cork, vegetables, cord, leaf, finger, palm, thumb foot printing
6. Activities with crayon & chalk crayon, wet chalk drawing
7. Modelling & Sculpture – Clay, dough, Plasticine
8. Paper activities –
9. Paper tearing, crumpling, twisting, collage, mosaic, paper cutting, pasting, origami.
10. work sheets

**INTERNAL ASSESSMENT**

| | |
|---|---|
| **Total Marks** | **10** |

**1 . Preparation of workbook on**

- Early childhood centre

**References :**


1. Bee H., (1995). The Developing Child> Harper Collins College Publishers
2. Berk, L. (2006).Child Development, New York : Allyn & Bacon.
3. Cole, M. &cole, S.R. (1996). The Development of children W.H.
4. Freeman and company.
5. Santrock (2006). Child Development . New York : Mc. Graw – Hill


**B.SC. HOME SCIENCE SEMESTER – II**
**PAPER – III**
**SEWING TECHNIQUES**
**(2T-3)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 |
| Practical +IA | 40+10 |

**OBJECTIVES:**

1. To understand the importance and necessity of various construction techniques for different fabrics, and to acquire the skills to apply those construction techniques in a sample form
2. To acquire knowledge and skill regarding stitching techniques for various garment components such as plackets, pockets, cuffs, collars, and fasteners which are ultimately used for stitching of any garments

**Unit I :**

1. Types of Yarn – Simple, novelty, textured yarns.Yarn twist,
2. Spinning Process- Mechanical- Ring spinning, Open-end spinning.
3. Chemical spinning – Dry, wet, melt.

**Unit II**

1. Introduction to Seams –Plain ,French, Lapped Flat fell, double channel,
2. Tucks-Pin ,Cord, Shell,Cross
3. Pleats – Knife, box, inverted , stitch down. ,
4. Gathers – Machine and hand gathers
5. Types of Sleeves

**Unit III :**

1. Trimmings : Types and uses of -Belts, Fringes, Frills, Ruffles
2. Typesand uses of –Yokes ,Collars ,Pockets,
3. Types of Fasteners –Zipper, Buttons, Hooks and loops, Velcro.

**Unit IV :**

1. Fashion accessories –Types and uses of-- Head gears, Foot wear, Hand bags, Types and use of jewelry

2. Surface ornamentation –Types and application of- Appliqué, Quilting, smoking, ribbon work, embroidery

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**

| **Total Marks** | **40+10** |
|---|---|
| Drafting r | 10 |
| Stitching-a c | 15 |
| Sample t | 05 |
| Record | 10 |
| IA | 10 |

1. Make samples of
   i. Surface ornamentation- Appliqué, Quilting, smoking,
   ii.Drafting cutting and stitching of :-Baba suit, Romper
   iii. Make any one fashion accessory-Head gears, Hand bags, Jewelry,
   iv. French seam, lapped seam, Flat fell seam, Double channel seam

**INTERNAL ASSESSMENT**

| **Total Marks** | **10** |
|---|---|

1. Preparation of sample book based on trimmings, fasteners.
2. Preparation of Charts/ Assignments.

**REFERENCE BOOKS:**


1. Aswani K.T. Fancy Weaving Mechanism, Mahajan Books, Ahmedabad.
2. DeulkarDurga - Household Textile and laundry work, Atmaram and sons, Delhi,
3. Dongorkemy Kamala S.- The Romance of Indian Embroidery, Thakur and Co. Bombay.
4. Dorothy Siegart, Lyle - Modern Textiles, John Wiley and Sons. Inc New York.
5. Nisbet H. - Grammer of Textile Design, Taraporwala and Sons, Bombay
6. PanditSavitri - Indian Embroidery, its variegated charms.
7. Complete Guide to Sewing-Readers Digest, The reader's digest association, 1976
8. Complete Book of Sewing, Alison Smith Dorling Kindersley, 1999
9. Singer Sewing Book, Gladys Cunningham, The Singer Company

**B.Sc. HOME SCIENCE SEMESTER II**
**PAPER – IV**
**Interior Decoration & Design**
**(2T-4)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 +20= 100 |
| Practical + IA | 40+10 = 50 |

**Objective:**
1) To develop skill in using colors to create different effects in space, with the use of various color schemes.
2) To leave techniques of using color in different media
3) To give knowledge of flowers / floral decoration and arrangement

**COURSE CONTENT: Theory**
**Unit I – Importance of colour in Interior Decoration**

**A. Detail Study of Prang colour system:**
i. Characteristics or dimensions of colour
a. Hue, b. Value, c. Intensity
ii. Classification of color
a. Primary, b. Secondary, c. Intermediate, d. Tertiary, e. Quaternary, f. Neutral
iii. Warm & cool colours
iv. Advancing & Receding colours
v. Colour wheel

**Unit: - II-Colour Schemes:**

A. Relatedcolour scheme:
a. Monochromatic, b. Analogous
B. Contrast colour scheme:
a. Complementary , b. Double complementary, c. Split complementary, d. Triad, e. Neutral
C. Colour schemes for different rooms
a. Kitchen and dining, b. Drawing room /Living room, c. Bed room

**Unit III – Decorating Interior & Exterior**

**A. Floral Decoration:**
a) Definition and Importance
b) Objectives
c) Material Required

**B. Flower Arrangement**

a) Application of Elements of Art in flower Arrangement
b) Application of Principles of Art in Flower Arrangement.

**C. Use of Flower arrangements:**

a) Personality
b) Occasion
c) Placement in rooms
d) Flowers as gift
    a) Bouquet
    b) Spray of flowers
    c) Potted

**Unit IV – Types of flower arrangement**

a) Traditional
b) Oriental / Japanese
c) Modern
d) Floating
e) Miniature
f) Dry

**B. Artificial Flower Arrangement:**

i. Method of making Artificial Flower
ii. Material required for artificial flower arrangement

**C. Do's & Don'ts in flower arrangement**

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Total Marks** | **20** |

**PRACTICALS**

1– Classes of colors
i) Primary ii) Secondary iii) Intermediate

2- Colour Wheel
3- Warm & cool colours
4- Value Scale
5- Monochromatic colour scheme
6- Analogous colour scheme
7- Complementary colour scheme
8- Double complementary colour scheme
9- Triad colour Scheme
10- Types of flower decoration / Arrangement
    i) Single stick ii) Small Bunch iii) Miniature iv) Modern

| **Total Marks** | **40+10** |
|---|---|
| Classes of Colours | 10 |
| Colour Scheme | 10 |
| Flower decoration | 10 |
| Record | 10 |
| IA | 10 |

**INTERNAL ASSESSMENT**

Accessories in interior (Any two)
1) Accessories in home decoration (Creative Art)
2) Floral Carpets
3) Artificial Flowers
4) Rangoli-Using various types of materials

| **Total Marks** | **10** |
|---|---|

**Note-Workshop to be conducted to teach new article.**

Books Recommended

1) Goldseiu H. &Goldstaia V –Art in Every day life,Machllian co, New york 4th Edition

2) Mann M- Home Management Kalyani Publishers, New Delhi

3) Soundaraj S - Text book of House hold Arts, orient Longman, Bombay.

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**B.Sc HOME SCIENCE SEMESTER II**

**PAPER - V**

**Social Survey and Community Development**

**(2 T-5)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 = 100 |
| Practical + IA | 40 + 10 =50 |

**OBJECTIVES :**

1. To impart knowledge of community development.
2. To develop awareness regarding community development programmes.
3. To assess the methods of social and social research.
4. To gain the knowledge about gender and development.

**Theory :**

**UNIT - I**

1. History of Community Development :
   Definition, objectives of community development programme, essential elements of community development, limitations of community development, Similarities and dissimilarities between community development and extension education.

2 Elements of community development :
Role of community development worker, major elements involved in India's community development and extension process, difference between an extension worker and a community development worker.

**UNIT – II**

1. Community development programmes :
   a) Shriniketan rural reconstruction
   b) Gurgaon experiment
   c) Marthandum project
   d) Gandhian constructive programme
2. History of extension activities :
   a) Etawah pilot project
   b) Indian village service
   c) Firka development scheme
   d) Nilokheri experiment

**UNIT - III**

1. Social Survey :
   Definition, importance of social survey, types of social survey, steps involved in social survey, variation between social survey and social research.
2. Social Research :
   Definition, importance of social research, tools of data collection- questionnaire, observation, interview and schedule methods

**UNIT - IV**

1. Gender and Development :

Sex ratio, Human resource development index, Barriers to women's access to inputs and services related to legal rights, employment and equal pay.

2. Poverty Alleviation Programmes : Efforts taken by Government agencies for eradication of poverty - a) National Rural Health Mission b) Integrated Child Development Services c) Efforts by Department of Women and Child Development

| **Total Marks** | **40+10** |
|---|---|
| Writing | 10 |
| Teaching Aid | 10 |
| Presentation | 10 |
| Record | 10 |
| IA | 10 |

**INTERNAL ASSESSMENT** (Refer Direction)

**Practicals :**

1. Framing of questionnaire to collect data on any developmental issue.
2. Preparation of handmade slides.
3. Handling and operation of slide projector for projection of slides.
4. Preparation of news story.
5. Preparation of 10 Pages album on rural development.

**INTERNAL ASSESSMENT**

| **Total Marks** | **10** |
|---|---|

**1. Report on socioeconomic survey of 5 families in rural /slum area**

**Books Recommended :**


1. Directorate of extension : Extension Education in Community Development.
2. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
3. Chandra. A., Shah. A. and Joshi. V.: Fundamentals of teaching Home Science, Sterling Publishers, New Delhi, 1989.
4. Devdas. R. P., Methods of teaching Home Science, National Council of Education.1978.
5. Singh. K., Rural Sociology, Prakashan Kendra, Lucknow.
6. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.

**B.Sc. HOME SCIENCE SEMESTER –II**
**PAPER –VI**
**Ecology & Environment - II**
**(2T-6)**

| **Total Marks** | **75** |
|---|---|
| Theory + IA | 40 + 10 = 50 |
| Practical + IA | 20 + 5 = 25 |

**Theory:**

**UNIT – I GARDENING**

1. Definition, types of garden, Importance of garden, Nursery Development and entrepreneurship and its importance. Common diseases and pests in garden plants and their control.
2. Ornamental garden – definition, important parts of garden, plan and layout of ornamental garden.
3. Kitchen garden – Definition, cultivation techniques of Brinjal, Tomato, chilli, cauliflower.

**UNIT –II PLANT PROPOGATION**

1. Definition, various methods used in plant propagation for some garden plants.
2. Garden Implements and accessories, Budding, Grafting and layering methods, selection of plants and their certification.
3. After care of budded and grafted plants. Fertilizers used in garden.

**UNIT- III MUSHROOM CULTIVATION**

1. Introduction of mushroom, types suitable for cultivation. Preparation and culture of spawn.
2. Cultivation technique of oyster Mushroom, cultivation technique of white Button Mushroom, cultivation technique of Paddy Straw Mushroom.
3. Economic importance of Mushroom cultivation as a small scale industry.

**UNIT – IV VERMICULTURE & VERMI COMPOSTING**

1. Introduction of earthworm, distribution and ecology
2. Vermiculture, food habits and uses of earthworm
3. Vermicompost, chemical composition of worm cast, economic importance of

Vermiculture

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **10** |
|---|---|

**Practicals**

1. Study of garden implements and accessories
2. Potting
3. Methods of plant propagation:
    1. Budding
    2. Grafting
4. Study and identification of common garden flowers and vegetables seeds.
5. Use of common fungicides and insecticides in garden
6. Detection of free $Co_2$ in given water sample
7. Detection of hardness of given water sample

| **Total Marks** | **20+5** |
|---|---|
| Experiment | 05 |
| Spotting | 05 |
| Propogation | 05 |
| Record | 05 |
| IA | 05 |

**INTERNAL ASSESSMENT**

| **Total Marks** | **05** |
|---|---|

Survey on Study of Ecosystem: Types of Plants, or Types of insects available in your surroundings.

**Books Recommended:**


1. Plant propogation (New age International Publisher) by M.K. Sandhu
2. Mushrooms for livelihood ( Kalyani Publisher) by Dr. Vijay Khader's
3. Plant Nursery Management: How to start and operate a Plant Nursery –Ray P.K.
4. The complete technology Book on Vermiculture&Vermicompost –NPCS Board of Consultants & Engineers
5. How to start a Worm farm:Guide to Vermiculture, Vermicomposting and worm farming – SolucinousTainas

**B.Sc. HOME SCIENCE - SEMESTER II**
**Paper VII**
**BASIC CHEMISTRY-II**
**(2T-7)**

| **Total Marks** | **75** |
|---|---|
| Theory + IA | 40+ 10 = 50 |
| Practical + IA | 20+05= 25 |

**COURSE CONTENT** **THEORY**

**Unit-**I

**a)** **Fuels:** Definition, classification, characteristics of good fuel, calorific value, preparation of Gobar gas.

**b)** Crude petroleum and its refining by fractional distillation, cracking of petroleum, composition and application of LPG, Precautions while using LPG

**Unit-**II

**a)** **Acid and base**: Concept of acid, base (Arrhenius theory and Lowry and Bronsted Theory), Conjugate pair, neutralization reaction.

**b)** pH and pH scale, Buffer solution -Defination ,types, preparation, properties and its applications in everyday life.

**Unit-**III

**a)** **Organic Compounds**: Definition, saturated and unsaturated hydrocarbon, classification of organic compounds based on their structure and functional groups. Definition of alkane, alkene and alkyne with examples.

**b)** Homologous series, IUPAC nomenclature of alkane, Laboratory preparation, chemical properties and uses of methane and ethylene.

**Unit-**IV

a) **Corrosion:** Definition, atmospheric corrosion (Corrosion by oxidation and by other gases). Factors causing atmospheric corrosion,

b) Methods for protection of metals from corrosion (Galvanizing, tinning and electroplating).

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **25** |
|---|---|
| Practical A | 5 |
| Practical B | 5 |
| Record | 5 |
| Viva Voce | 5 |
| Practical IA | 05 |

**Practical**

**Practical A**

1. Titration of strong acid vs. strong base (Acid-base double titration)
2. Determination of pH of different solutions by using pH meter/ pH paper.

**Practical B**

1. Detection of functional groups- Acids, Alcohols, Aldehydes and Ketones.
2. Preparation of acidic and basic buffer solution.

**INTERNAL ASSESSMENT**

| | |
|---|---|
| **Theory IA Marks** | **10** |

1. Assignment book/ workbook for topics from syllabus (all four units)

**BOOK RECOMMENDED:**


1. Text-Book of organic Chemistry: B; S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
2. Text Book of Physical Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
3. A Text Book of Engineering Chemistry, S.S. Dara and Suresh Umare, S. Chand Publication, New Delhi.
4. A Text Book of Basic and Applied Chemistry, P.C. Jain and Monica Jain.
5. Polymer Science by V.R. Gowarikar, Wiley Ester Ltd. 1987.
6. Text Book of Organic Chemistry by J. L. Finar, Longman Publication.


## B.Sc. HOME SCIENCE SEMESTER II

### PAPER -VIII
### Applied Physics and Basic Computer - II
### (2T-8)

| **Total Marks** | **75** |
|---|---|
| Theory + IA | 40 + 10 = 50 |
| Practical +IA | 20 + 5 = 25 |

**Objectives:** To revise concepts in Physics (Electricity, Optics) and Computers.

**Theory:**

**Unit-I**

**Basic Electricity:** Concept of electric charge, electric field, potential difference, current, resistance and statement of Ohm's law. Laws of series and parallel combinations of resistances (numericals based on Ohm's law and series and parallel combination of resistances) Examples of good and bad conductors of electricity.

**Unit-II**

**Light - I:** Nature of light as an electromagnetic wave, primary colors, velocity and wavelength of light, colors of objects. Concept of reflection, refraction of light and laws of reflection and refraction of light.Concept of dispersion of light in prism, Concept and definitions of refractive index of a

material (discuss any two definitions), concept of transparent, translucent and opaque materials with three examples each.

**Unit-III**

**Light - II:** Definition of lens, types of lens (convex, concave), concept of focus and focal length of lens, application of convex and concave lens, concept of power of lens and diopter.

**X-Rays:** Definition of x-rays, production, properties and their applications.

Definition of radioactivity: properties of $\alpha$, $\beta$ and $\gamma$ rays. Applications of radioactivity.

**Unit-IV**

**Computer Hardware:** Concept of Mother Board, Computer Memory: RAM, ROM, Cache, External memory devices: Hard Disk (magnetic disk), CD, DVD, Pen drive/flash drive. Printers: principle and working of impact printers (dot matrix) and non impact printers (Inkjet and LASER printer). Scanner (principle and working), Concept of USB and HDMI ports

**INTERNAL ASSESSMENT** (Refer Direction)

**Practicals**

| **Total Marks** | **20 + 5** |
|---|---|
| Experiment | 10 |
| Viva | 05 |
| Record | 05 |
| IA | 05 |

1. Measurement of Voltage at various points in a given DC electric circuit using dc voltmeter.
2. Measurement of Voltage at various points in a given DC electric circuit using multi-meter.
3. Verification of values of given resistances by using multi-meter.
4. Experimental verification of Ohm's Law.
5. Experimental verification of series and parallel combination of resistances using multi-meter.
6. Determination of refractive Index of a material of glass slab.
7. Determination of Focal Length of a given convex lens.
8. Determination of refractive index of a material of a prism.
9. Scan a document, save it in JPEG (Joint Photographic Experts Group) format and print it.
10. Scan a document, save it in PDF (Portable Document Format) and print it.

**INTERNAL ASSESSMENT**

| **Total Marks** | **10** |
|---|---|

1. Assignment book/ workbook for topics from syllabus (all four units)

**Reference Books:**

1. Principles of physics (vol. I & II) – Halliday &Resnik



2. Principles of physics – Subramanyam, Brijwal
3. How things work (vol. I & II ), INDUS (Harper Collins India)
4. Electrician Theory, A. K. Mittal, Arihant Publication, Merath.
5. Basic Electrical Engineering, M. L. Anwani, Dhanpat Rai & Co. (P) Ltd.
6. Elements of Computer Science, S. K. Sarkar, A. K. Gupta, S. Chand & Co., New Delhi
7. Fundamental of computers E. Balguruswamy, Mc Graw Hill Education Pvt. Ltd. New Delhi
8. Computer fundamental (concepts, system & application) Pradeep K. Sinha, Priti Sinha, Sixth edition 2011, B.P.B . Publication
9. Comdex computer course, Vikas Gupta, PM Publication, New Delhi.

## B.Sc. HOME SCIENCE SEMESTER - II

### PAPER - IX
### English and Communication Skills- II

**(2T-9)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |

**Objectives** :

1. To prepare the students to communicate effectively and fluently in English.
2. To enable students listening, speaking reading and writing.
3. To strengthen grammatical accuracy
4. To prepare the students to deal with customers, professional, counselors in correct grammatical, idiomatic English.
5. To provide personality development training through situational role play, interview techniques, group discussions, seminar presentation etc.

**Theory :**

**Unit I :**

1) Bio-data /Resume
2) Job Application
3) Tenses
4) Direct and Indirect Speech

**Unit II :**

1) Technical report writing

Official Report Writing

- Report on College Gathering
- Newspaper Report

2) Stress Management

**Unit III :**

1) Dialogue writing

2) Group Discussion
3) Role Playing
4) Degrees of Comparison
5) Transformation of Sentences
6) Health and Hygiene

**Unit IV :**

- Creating a write up for an event:

1) Notices
2) Press no

- Professional Manners and Etiquettes

1) Personal Interview Techniques
2) Meeting Agendas and
3) Minutes writing
4) Simple, Compound, Complex Sentences

**INTERNAL ASSESSMENT :** **Total Marks - 20**

a) Writing a Bio-data and Job Application
b) Grammar exercise
c) Report Writing
d) Dialogue writing
e) Group Discussion
f) Role Playing
g) Notices/Press Notes
h) Mock personal interviews
i) Mock Professional situations
j) Grammar exercise

**Reference Books**:


1. Professional Communication Skills : By Pravin S.R.Bhatia, A.M Sheikh: S.Chand and company
2. English Grammar Composition and Effective Business Communication By M.A. Pink, S.E.Thomas : S.Chand
3. You can Win Shiv Khera
4. 7 Habits of Highly effective people :Steven Corey
5. Enjoying EverydayEnglish ,A.Rama Krishna Rao. Sangam Publication
6. Applied English Grammar and Composition Dr. P.C.Das New Central Book Agency(P) Ltd
7. Malgudi Days by R.K. Narayan

**B.Sc. HOME SCIENCE**

**SEMESTER –III**

**B. Sc. HOME SCIENCE SEMESTER III**
**PAPER - I**
**Community Nutrition**
**(3T-1)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES:**
1) To orient students to the basic principles of nutritional assessment as applied to the study of community nutrition.
2) To understand the importance of nutrition education.
3) To develop an understanding the role of micro-organism in food.
4) To prepare standardized recipes for specific age groups and calculate the nutrients.

**THEORY**

**COURSE CONTENT:**
**UNIT-I**
**1**. **Malnutrition**
a) Definition and types of malnutrition
b) Causes and symptoms of malnutrition
c) Nutritional problems due to malnutrition
d) Prevalence of malnutrition in India
**UNIT -II**
**Nutritional Assessment**
**1.** Assessment of Nutritional Status:
a) Anthropometry
b) Diet Survey
c) Clinical Assessment
d) Laboratory methods (Biochemical)
Limitations and interpretation of all the above parameters
**2. Role of National organizationsand International organizations:** (ICAR, ICMR, NIN, CFTRI) and (FAO, WHO, UNICEF, CARE) in community nutrition and health

**UNIT - III**
**1. Nutrition Education**
a) Meaning, importance and objectives of nutrition education
b) Methods and evaluation of nutrition education
c) Problems involved in organizing nutrition education programme for the community and how to solve them
**2. National Nutrition Programme:** a) ICDS b) MDM Programme c) National Nutrition Anemia Prophylaxis Programme (NNAPP) and d) Vitamin A Prophylaxis Programme (VAPP) e) Goiter Control

**UNIT - IV**

**Principles underlying and food preservation**: Improving shelf life and nutritional quality of food

**1. Food Preservation**

A) Importance of food preservation.

B) General Principles and Methods of Food Preservation

a) High/Low temperature (pasteurization/refrigeration/deep freezing)

b) Drying (sun-drying / mechanical drying)

c) Radiation

d) Preservatives

**2. Food Fermentation**

Role of Microorganisms as food fermenting agent for products such as, Idli, Curd, Butter, Cheese and Bread. Nutritive value of fermented foods

**3. Leavening Agent**: Microbiological Chemical and Natural Leaveners

**4. Food Additives**

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Total Marks** | **20** |

**PRACTICALS**

1. Conversion of Weights and Volumes of raw foods to cooked food (any 5)
2. Weights and Measures - Standard and household measure for raw food
3. High calorie and High protein recipes (any 2)
4. Low calorie recipes (any 2)
5. Preparation and Calculation of nutritive value of:
   a) Fermented recipes-Idli, Dosa, Dhokla, Uttappam and Appe (any 2)
   b) Baked products: Cake, Biscuits, Nankhatai and Cookies (any 2)

**REFERENCES**

**1. Nutritive Value of Indian Foods:** Gopalan C, Rama Sastriand Balasubramanian S.C.National Institution,1993.

**2.Understanding Nutrition**:Whitney E.N. &Rolfes S.R. 8th Edition West/Wordsworth.1999.

**3.Dietetics**:B Srilakshmi, New Age International (P) Ltd., Publishers 3rd 2000.

**4.Nutrition and Dietetics** :ShubhanginiA.Joshi, Tata McGraw HillPublishing Co. Ltd., New Delhi,1992.

**5.Nutritional Research**: Current Scenario and Future Trends Editor:K,Krishnaswamy, Oxford and IBH Publication Co. Pvt. Ltd., 2000

**6.Nutritional Problems of India**:Shukla P.K., Prentice Hall of India Pvt.Ltd., Delhi1982

**7.The Science of Food**: An Introduction to Food Science, Nutrition andMicrobioloy: Gaman P.M. & Sherrington K.B. 2nd Edition. Pergamon Press, 1989.

**8.Indian Food Composition Tables**:.Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition, 2017.

## B.SC HOME SCIENCE SEMESTER - III
## PAPER -II
## Development in Late Childhood and Adolescence
## (3T-2)

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES :**

- To understand development in late childhood and adolescence
- To study significant changes during late childhood to adolescence
- To gain knowledge of issues concerning late childhood and adolescence.

**Theory :**

**Unit – I:-**

**IEarly Childhood Care and Education**

**1. Meaning, need and importance, aims and objectives, principles, scope of ecce.**

**2. Types of preschool programmes- play centres, day care, KG, balwadi, anganwadi, mobile crèche, Montessorie.**

**II) Late childhood:-Physical,Motor,social emotional development.**

- Developmental tasks of late childhood.Physical development – Changes in body size, nutrition and health, physical fitness
- Motors Skills, Factors influencing
- Changes in emotional development, coping with stress

Development of self- understanding, understanding others,self-esteem and self-concept,self - efficacy,self-regulation ,industry vs inferiority

- Relationships with family peers, teachers
- Influence of school and media.

**Unit II- Late Childhood : Cognitive and language**.

- Cognitive development - theoretical perspectives on cognitive development (Piagets and Vygotsky) factors influencing cognitive development
- Intelligence and creativity, influences on intelligence and creativity
- Development of language in late childhood, bilingualism / Multilingualism, influences on language development
- Moral development – Perspectives on morality, influences on moral reasoning and behaviour.

**Unit III - Early adolescence / Puberty (12-16 Years)**

- Puberty – Sub stages of puberty, primary sex characteristics
- and secondary sex characteristics, effects of puberty changes,
- sex education
- Adolescence :- Development tasks and theoretical perspectives.
- Physical and physiological changes .

**Unit IV** – **Adolescence :** Cognitive, Language & Moral Development.

- Perspective on cognitive development
- Development of intelligence and creativity
- Adolescent language
- Self and Identity at adolescence
- Family relationships – parents, grandparents & significant others
- Peer relationships.

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Total Marks** | **20** |

**Preparation of Workbook**
**Juvenile Delinquency**

**Practicals:**

**1. Participation in Nursery school ( With Lesson Plans)**



**2. Studying various hazards related to late childhood and adolescence.**

**3. Exercises on life skill development**

**References :**


- Berk, L.E. (2007). Development through the life span (4thed) Allyn &Bacon :
- Rice, E.P., (1999). The Adolescent : Development, Relationships & culture (9thed). Allyn & Bacon, Boston
- Santrock, J.B., (2006). Lifespan Development (10thed) . Mc. GrawHill.Sharma N.(1999). Understanding adolescence. New Delhi : NBT


## B.Sc. HOME SCIENCE SEMESTER – III
## Textile Design
## PAPER – III
## (3T-3)

| Total Marks | 100 |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives**

1. To acquire knowledge of various methods of fabric construction.
2. To develop creativity in designing for prints.
3. To impart knowledge of traditional textiles of India.
4. Create awareness of different dyeing and printing techniques.

**Theory**

**Unit I :**

1 Design – Types, Repeats of design, Types of motifs from India.

2 Elements of design and their effects- Line, shape, Color and Texture.

3 Principles of design and their effects- Proportion, Balance, Emphasis, Rhythm, Harmony

4 .Develop designs for saree, Dress material and dupatta, bedcover, curtain by using different designs.

**Unit II :**

1 Methods of fabric contractions : Weaving, - handloom, its parts and operation.
Types of weaves, basic weaves, decorative weaves.-Dobby,Jacquard, pile, Swivel, Lappet

2 Introduction to Knitting – Types of knitting, advantages and disadvantages of knitting.

3 Non wovens : Bonded fabric, Felt -types and manufacturing process and their uses.
4 Other methods of fabric constructions – Netting, lace making, braiding.

**Unit III :**

1. Finishes, Importance of finishes : General finishes – Scouring, bleaching, singing, sizing, mercerizing, tentering, calendaring.
2. Special finishes: Special calendaring, napping, flame proofing, water proof and water repellency, wrinkle resistances.

**Unit IV :**

1. Regional embroidery : History, stitches, Motifs, colour, material , threads used in Kantha of Bengal, Chamba of Himachal Pradesh, Kasuti of Karnataka, Kashida of Kashmir.
2. Phulkari of Panjab, Chikankary of Uttarpradesh, Manipuri from Manipur, Kathiyawadi of Gujrat

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical**

1. Make an embroidery album of Kantha of Bengal, Chamba of Himachal Pradesh, Kasuti of Karnataka, Kashida of Kashmir. Phulkari of Panjab,Chikankari of U.P Manipuri, Kathiawadi of Gujrat
2. Develop designs for saree, Dress material and dupatta, bedcover, curtain by using different design with different colours.

**B00KS RECOMMENDED**


- Chattopadhya, K., Handicrafts of India, All India Handicrafts Board, New Delhi, 1975.
- Ikat textiles of India Chelna Desai, Chronicle Books, San Francisco, 1988
- Silk Brocades YashodharaRoli& Janssen BV, New 2003
- Hand-woven Fabrics of India, JaslenDhamija and Jyotindra Jain, Mapin Publishing Pvt. Ltd. Ahmedabad, 1989
- Tie-Dyed textiles of India, Veronica Murphy & Rosemary Crill, Victoria & Albert Museum, London, 1991
- Traditional Indian costumes and Textiles, Parul Bhatnagar, Abhishek Publication, Chandigarh, 2004
- Designs for a life time Usha Shrikant, SamataEntreprise,Mumbai, 2002
- Marsh, J.T., An Introduction to Textile Finishing, B.I. Publishers, 1979
- Corbman,P.B., Textiles-Fibre to Fabric, Gregg Division/McGraw Hill Book Co.,US, 1985
- Potter MD and Corbman BP. Textiles: Fibres to Fabric – Published by McGraw Hill Inc. U.S.A
- Usha Shrikant - Ethinic Embroidery of India, SamaiaEnterprises , Mumbai.

William Watson - Textile Design and colour, Longman Green and Co. London.

**B.Sc. Home Science Semester III**
**PAPER – IV**
**Housing and Interior Decoration**
**(3T-4)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives**

1 To develop understanding regarding housing needs, Principles, Planning of house
2 To experiment with space, Preparing house plans .
3 To develop graphic skills to express ideas in design, forms, knowledge of landscaping and economic use of space.

**COURSE CONTENT: Theory**

**Unit I** a) Concept of Housing

b) Importance of Housing

c) Family Housing Needs – (i) Protection (ii) Economic Needs (iii) Affectional (iv) Social

(v) Standards of Living (vi) Housing Goals (vii) Style (viii) Function

(ix) Occupation (x) Physical and Mental Health

d) Selection of Site for House -(i) Physical features (ii) Type of soil (iii) Hygienic Conditions

(iv) Practical convenience (v) Legal point of view

(vi)Economic Conditions

e) Principles of house planning - (i) Orientation (ii) Aspect (iii) Prospect (iv) Privacy

(v) Grouping (vi) Roominess (vii) Furniture (viii) Sanitation

(ix) Circulation (x) Economy

**Unit II** a) Factors affecting house planning: (i) Income (ii) Occupation (iii) Size of the family(iv) Socio-economic status of the family

b) Study of various rooms in the house with respect to:

(i) Living area: (a) Verandah (b) Drawing room

(ii) Sleeping area: (a) Bedroom (b) Guestroom

(iii)Service area: (a) Staircase (b) Toilet (c) Dining room

(d) Store room

(e) Kitchen-Types of kitchen: (a)One wall

(b) Two wall (c) U-shape (d) L-shape

(f) Storage facility in different rooms

**Unit III- Arrangement of Furniture**

1.a)Selection of furniture: (i) Expressiveness (ii) Styles (iii) Beauty (iv) Utility (v) Comfort (vi) Flexibility (vii) Durability (viii) Cost
b) Material Required for construction: (i) Wood (ii) Metal and alloy (iii) Plastic (iv) Glass (v) Willow, ratton, cane.
c) Care of furniture

2. (a) application of art elements and principles in arrangement.
(b) Various kinds of Architectural symbols used in scale drawing.
(c) Arrangement in different rooms- (i) Living (ii) Dining (iii) Bedroom

**Unit IV** (a) Bonsai- (i) History (ii) Preparation of soil (iii) Selection of plants (iv) Potting and repotting(v) Different styles (vi) Selection of containers (vii) Care
(b) Landscaping- (i) Importance (ii) How a professional landscape design can enhance home
(iii) Selecting landscape plants (iv) Selecting landscape structures/materials
(v) Installing driveways and walkways (vi) Lighting (Outdoors) (vii) Garden ornaments

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical**

Exp. No. 1: Symbols of various kinds of furniture used in scale drawing.
Exp. No. 2: Arrangement of furniture with the help of symbol in Drawing room.
Exp. No. 3: Arrangement of furniture with the help of symbol in Bed room.
Exp. No. 4: Cleaning of different metals copper, silver, iron, brass, Aluminium.
Exp. No. 5: Care and cleaning of furniture
Accessories in Home Decoration (any two)

1) Articles made out of low cost / waste material
   (a) Fabric painting, oil, water, nib, knife, sand, glass, stain glass etc.
   (b) Wax work / candles etc.
2) Preparation of bonsai.
3) Visit to Landscape /rock garden.

**Books Recommended**:

1. Agan T. C. –'The House' Oxford and I. B. H. publishing Co.
2. Ann Reilly; Susan A. Roth – 'The Home Landscape', Home planners Inco. Tucson, Arizona.

3. Deshpande R. S. – 'Modern Indian Homes in India', United Book Corporation, Poona, 2nd Edition.
4. Deshpande R. S. – 'Build your own Home', United Book Corporation, Poona, 4th Edition.
5. Deshpande R. S. –'Low Cost Housing', United Book Corporation, Poona, 4th Edition.
6. Goldstin H. / Goldstein V. – 'Art in Everyday Life' MacMillan Co., New York, 4th Edition.
7. Pak – Tin &HelanYeap – 'Feng Shui – Health Harmony' B.Jain Publishers Pvt Ltd., New Delhi, 1998.
8. Rutt A. – 'Home Furnishing', Wiley Eastern Pvt.Ltd., New Delhi, 2nd Edition.

## B.Sc HOME SCIENCE SEMESTER - III
## PAPER – V
## Extension Communication Techniques

**(3T-5)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives:**

1. To impart knowledge of extension teaching.
2. To develop awareness about extension learning.
3. To assess the extension teaching methods and approaches.
4. To gain the knowledge about art of presentation and devices useful in effective communication.

**Theory:**

**UNIT - I**

1. Extension teaching :

   Definition of extension teaching, steps involved in extension teaching, factors contributing to extension teaching, principles of extension teaching and desirable traits of a teacher for effective extension work.

2. Extension teaching process :

   Teaching plan, Role of teacher in different levels, functions of teaching in extension education.

**UNIT - II**

3. Extension learning process:

   Definition of extension learning, Learning experience, Laws of learning, principles of learning, factors affecting learning, ideal learning situation to achieve success.

4. Psychology of learning :

   Types of learning, Group psychology and its effect on learning, Principles of group dynamics, Psychological factors in adult learning.

**UNIT - III**

5. Extension teaching methods :

   Meaning, importance, functions, classification of various extension teaching methods, factors to be considered in selection and use of extension teaching methods.

6. Approaches in Extension :

   Meaning, Strong and weak points of interpersonal, group and mass approach.

   a) Interpersonal approach : Home visit, office call, personal letter and telephone call.
   b) Group approach : Demonstrations, field trips, group discussions.
   c) Mass approach : Campaign, Exhibition, Television, Radio.

**UNIT IV**

7. Art of Presentation :

   Meaning, five basic steps of presentation and equipment of campaign work.

8. Selection of teaching aids : Selection, preparation and use of various teaching aids.

   Devices useful for effective communication: Over Head projector, opaque projector, DVD, LCD,

| **Total Marks** | **20** |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

**Practicals**

1) Preparation and presentation of flannel cutouts for effective communication.
2) Method demonstration for communication.
3) Preparation of Poster on home science aspects.
4) Handling and operation of opaque projector for teaching.
5) Study of Mahila Mandal or MahilaBachatGhat (SHG) to analyze working pattern, and submission of report.

**Books Recommended :**


1. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
2. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.
3. Reddy Adivi. A. Extension Education, Shree Laxmi Press, Bapatla, Guntor, A.P.

4. Singh J. K., Mass Media and Information Technology, Mangaldeep Publication, Jaipur.
5. Kumar K. J. L., Mass Communication in India, Jaico Publishing House, Mumbai.
6. Audio Visual Aids for Co-operative Education and Training, FAO Publications.

## B.Sc. (HOME SCIENCE) SEMESTER- III

### PAPER VI
### Applied Physiology- I
### (3T-6)

| Total Marks | 50 |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**Objectives :**

1. To understand the structure and function of various organs of human body.
2. To promote the basic knowledge of first aid.

**UNIT-I**

1. Animal Cell- Definition, structure & function in brief.
2. Tissue- Classification, Definition and function.

**UNIT-II**

1. Locomotor System- Definition, classification and functions of bones, types of joints.
2. Sense Organs- Definition, structure and functions of eye, ear, tongue, nose and skin.

**UNIT-III**

1. The Blood-
   a. Definition, composition and functions of blood.
   b. Clotting of blood.
   c. Common blood groups, 'Rh' factor and its importance.
2. Lymphatic system- Structure & functions of organs of Lymphatic system, lymph.

**UNIT-IV**

1. Nervous system- Definition, structure and functions of Central Nervous System.
   i. The synapse and neurotransmitters.
   ii. Functions and Autonomic Nervous System and Peripheral Nervous System.
2. First Aid- Definition of First Aid, First Aid Kit, Importance of First Aid. First Aid in some accidental conditions- Snake bite, Dog bite, Drowning, Burns, Electric Shock.

**INTERNAL ASSESSMENT** (Refer Direction)

| Total Marks | 10 |
|---|---|

**PRACTICALS**

1. Study of Microscope.
2. Identification of bones, their joints and its classification.
3. Application of Triangular Bandage and Roller Bandage.
4. Artificial Respiration.

**REFERENCES-**


1. Community Health and Nursing- BasavanPhappa B.T.
2. Practical Pathology- Chaturvedi O.U.
3. Human Anatomy- Chaurasia
4. Medical Physiology- Guyton
5. Hygiene and Public Health- Ghosh P.
6. A.B.C. of Nursing in the Home- Gravelious E.M.
7. Manual of First Aid- Gupta
8. Nursing- George
9. Anatomy and Physiology for Nurses- Jain A.K.
10. Practical Guide to First Aid- Keech P.
11. Anatomy and Physiology for Nurses- Pearce
12. Essentials of Community Health Nursing- J.E. Park
13. Practical First Aid- Park
14. Home Nursing- Prabhu V.
15. Anatomy for Nurses- Prasad
16. Anatomy and Physiology in Health and Nurses- Ross & Wilson


## B.Sc. HOME SCIENCE SEMESTER III

## PAPER –VII

## APPLIED CHEMISTRY-I

**(3T-7)**

| **Total Marks** | **50** |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**THEORY**

**Unit-I**

a) **Carbohydrates:** Definition, classification, open chain structure of glucose and fructose. Manufacture of cane sugar, optical isomerism of asymmetric carbon atom, plane polarised light, dextro and leavo rotatory compounds.

b) **Lubricants:** Introduction, function of lubricant, Classification of lubricants: Liquid lubricant (animal and vegetable oil, mineral or petroleum oil, blended oil), Semisolid lubricant (greases), Solid lubricant (graphite).

**Unit-II**

a) **Fermentation:** Definition, ideal conditions for fermentation, application of fermentation.

b) Preparation of vinegar and ethanol by fermentation process.

**Unit-III**

a) **Oils and Fats:** Definition, difference between oils and fats, saponification value, iodine value, rancidity and hydrogenation of oils.

**b)** Refining of edible oil, naturally occurring fatty acids (saturated and unsaturated), essential and non essential fatty acids. Omega names of MUFA and PUFA.

**Unit-IV**

**a) Soap :** Definition, types of soap, Industrial method of preparation of soap, cleansing action of soap.

**b) Detergent:** Introduction and Definition, classification, composition of common detergent (solid and liquid), Difference between soap and detergents.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Theory IA Marks** | **10** |
|---|---|

**PRACTICALS**

**Practical A**.

1 Preparations of cosmetics: i) Shampoo (simple and herbal) ii) Perfumes

2 Preparation of dyes and drug:

a.Methyl salicylate from salicylic acid.

b.Orange dye from beta naphthol and aniline or p-toluidine

3.Use of physical balance.

**Practical B**

1. Determination of total fatty acid present in given sample of soap.
2. Determination of total alkali present in given sample of soap

**BOOK RECOMMENDED:**


1. Text Book of Organic Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
2. Text Book of Physical Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
3. A Text Book of Engineering Chemistry, S.S. Dara and Suresh Umare, S. Chand Publication, New Delhi.
4. A Text Book of Basic and Applied Chemistry, P.C. Jain and Monica Jain.
5. Polymer Science by V.R. Gowarikar, Wiley Ester Ltd 1987.
6. Text Book of Organic Chemistry by J. L. Finar, Longman Publication,
7. Synthetic Dyes by G R Chatwal, Himalaya Publishing House, New Delhi.
8. Synthetic Drug by G R Chatwal and Anand, Himalaya Publishing House, New Delhi.
9. Organic Chemistry of Natural Products Vol. I and II, by G. R. Chatwal, Himalaya Publishing House, New Delhi.
10. Perfumes, Cosmetics, Soaps Vol. I, II and III by W. A. Poucher, Ninth Edition, Chapman and Hall Publication (1975)
11. New Cosmetic Science by Takeo Mitsui, Elsevier, 1997.

**PAPER –VIII**
**Applied Physics & Computer Application -I**
**(3T-8)**

| **Total Marks** | **50** |
|---|---|
| Theory | 40 |
| Internal Assessment | 10 |
| Practical | - |

**Theory:**
**Objectives:** To learn about electrical safety , Heat , Appliances and Operating systems and word processing software (MS WORD) and database creation and management software (MS EXCEL)

**Unit-I**
**Electricity and personal safety:** Concept of ac and dc voltage, frequency and voltage of ac supply in India, Electrical Safety and Precautions, Safety devices in use of electricity : fuse, earthing, earthing methods, circuit breakers, MCBs (Miniature Circuit Breakers for domestic electric supply), lightning conductor), Management of electrical hazards (shocks, burns, fire).

**Unit-II**
**Transmission of Heat:** Concept of Heat, Modes of heat transfer: conduction, convection and radiation (with at least three examples each). Concept of Temperature; Fahrenheit, Celsius and Kelvin) and Conversion of temperature among them. Examples of good and bad conductors of heat(at least three each)

**Unit –III**
**Appliances:** Principle, construction and working of: pressure cooker, thermos flask, solar cooker, Mercury thermometers (laboratory thermometer, clinical thermometer).
Heating effect of electric current, thermostatic control and automation with bimetallic strip, principle, construction and working of immersion heater, storage type geyser, and electric press.

**Unit- IV**
**Computer Applications:** Concept of operating system, important features of popular operating systems (WINDOWS, UNIX and LINUX).
**Microsoft WORD**: Applications of MS-Word, Study of different commands: Open a new document, Open a saved document, Typing text, selecting text, copy-paste, cut-paste, saving file, closing file, renaming a file, page layout (margin, orientation, page size), creating header & footer, applying fonts, font size, Bold, Italic and Underline, preview document, printing a page/printing a document.
**Microsoft EXCEL**: Applications of MS-Excel, Opening of worksheet, selecting cells, entering and editing text, entering numbers, Entering and editing formulas, inserting rows and columns in worksheet, create database.



**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **10** |
|---|---|

**Practicals**

1. Use of multi-meter to measure voltage and frequency of ac supply.
2. Measurement of temperature and it's inter-conversion in other scales.
3. To find the efficiency of an electric heater.
4. Calibration of bimetallic strip and verification of automation.
5. Open MS-Office, create file in MS Word and perform various operations in it
6. Open MS-Office, create file in MS Excel and enter given data in it, creating a worksheet in excel
7. Visit to science center.
8. Visit to industries making/repairing home appliances.

**Reference Books:**


1. Principles of physics (vol. I & II) – Halliday &Resnik
2. Principles of physics – Subramanyam, Brijwal
3. How things work (vol. I & II ), INDUS (Harper Collins India)
4. Study of electrical appliances and devices, K. B. Bhatia, Khanna Publishers, New Delhi.
5. Electrician Theory, A. K. Mittal, Arihant Publication, Merath.
6. Basic Electrical Engineering, M. L. Anwani, Dhanpat Rai & Co. (P) Ltd.
7. Elements of Computer Science, S. K. Sarkar, A. K. Gupta, S. Chand & Co., New Delhi
8. Fundamental of computers E. Balguruswamy, Mc Graw Hill Education Pvt. Ltd. New Delhi
9. Computer fundamental (concepts, system & application) Pradeep K. Sinha, Priti Sinha, Sixth edition 2011, B.P.B . Publication
10. Comdex computer course, Vikas Gupta, PM Publication, New Delhi**.**
11. Operating System, Dr. S. B. Kishor, Das GanuPrakashan, Nagpur.

**B.Sc. HOME SCIENCE**

**SEMESTER –IV**

## B. Sc. HOME SCIENCE - SEMESTER IV

### PAPER - I
### Nutrition for Life Span
### (4T-1)

| Total Marks | 150 |
|---|---|
| Theory + IA | 80 + 20 |
| Practical + IA | 40+10 |

**OBJECTIVES:**
1) To learn principles of meal planning.
2) To plan and calculate balanced diets for family members.

### THEORY

**COURSE CONTENT:**
**UNIT-I**
**Family Meal Management** 1) **Meal Planning:**
a) Definition of RDA , Recommended set- up , Reference persons and RDA
b) Use and importance of RDA and Food Value Tables in meal
c) Principles and advantages of meal planning
d) Factors affecting meal planning
e) Food fads and fallacies.
**Diet planning with reference to special individual requirements:**
2) **Nutrition during adulthood:**
a) Balanced diet for Adult man and women.
b) Nutritional requirements
c) Dietary guidelines for adults
**UNIT-II**
**1) Nutrition during pregnancy:**
a) Physiological changes during pregnancy
b) Desirable weight gain
c)Nutritional requirements
d) Diet during pregnancy
e)Complications during pregnancy
f) Dietary guidelines for pregnancy
**2) Nutrition during lactation:**
a) Nutritional requirements of a lactating mother, factors affecting milk secretion, galactogogue foods.
b) Diet during lactating period.

**UNIT - III**
**1) Nutrition during infancy:**
a) Growth and development during infancy b) Nutritional requirements

c) Types of milk fed to infants

d) Advantages of breast feeding

d) Bottle feeding

e) Weaning

f) Supplementary foods

**2) Nutrition during: 1. Preschool children 2. School going children**

a) Growth and development b) Nutritional requirements c) Dietary guidelines for children d) Packed Lunches

**UNIT - IV**

1) **Nutrition during Adolescence:** a) Growth and Development during adolescence.

b) Nutritional requirements.

c) Dietary guidelines for adolescent.

2) **Geriatric nutrition (age over 60 years) :**a) Changes occurring during ageing

b) Nutritional requirements

c) Diet during old age

d) Dietary guidelines for old age

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**

**Meal Planning for various groups**

Planning ,Calculation and Preparation of a whole days model meal for

Adult Women/Man
Pregnant women
Lactating women
Weaning recipes for Infants (any five)
Preschool children
School going children
Adolescent girl/boy
Old Person

| **Total Marks** | **40+10=50** |
|---|---|
| Planning | 10 |
| Calculation | 10 |
| Cooking | 10 |
| Presentation | 05 |
| Record | 05 |
| IA | 10 |

b) Planning, calculation and preparation of Packed Lunch for a school going children (any five)

**INTERNAL ASSESSMENT**

| **Total Marks** | 10 |
|---|---|

Any one of the following:



1) Visit to Balwadi to record anthropometric measurements and write a report (Sample Size: 25)

2) Conduct nutrition education programme in school (any one Class) .

3) Conduct a survey to check the school lunches/ mid-day meals.

4) Conduct a survey of adult man/women and maintain record of BMI (Sample size:50).

5) To run a canteen.

6) Certificate course in food preservation.

**References**


1. **Nutritive Value of Indian Foods:** Gopalan C, Rama Sastri&Balasubramanian S.C.National Institution,1993.
2. **Understanding Nutrition**:Whitney E.N. &Rolfes S.R. 8thEdition West/Wordsworth.1999
3. **Dietetics**:B Srilakshmi, New Age International (P) Ltd., Publishers 3rd
4. **Nutrition and Dietetics** :ShubhanginiA.Joshi, Tata McGraw HillPublishing Co. Ltd., New Delhi,1992
5. **Nutritional Research**: Current Scenario and Future Trends Editor:K,Krishnaswamy, Oxford and IBH Publication Co. Pvt. Ltd., 2000
6. **Nutritional Problems of India**:Shukla P.K., Prentice Hall of India Pvt.Ltd., Delhi1982
7. **The Science of Food**: An Introduction to Food Science, Nutrition andMicrobioloy: Gaman P.M. & Sherrington K.B. 2nd Edition. Pergamon Press, 1989.
8. **Indian Food Composition Tables**:.Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition, 2017.

**B.SC HOME SCIENCE SEMESTER - IV**
**PAPER -II**
**Development in Adulthood**
**(4T-2)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 |
| Practical + IA | 40+10 |

**Objectives :**

- To understand the dimensions of development in adulthood.
- To reflect on the concerns of the family and society with respect to the individual in adult hood.
- To develop awareness of diversity in adult life styles in different socio-cultural contexts.

**Theory :**

**Unit I : Introduction to Adulthood**

1. Concept and sub divisions of adulthood
2. Adult roles and expectations in different cultures
3. Diversity in adult life style.

**Early Adulthood**

**1.** Developmental tasks of early adulthood
**2.** Physical changes
**3.** Cognitive development
**4.** Psycho-social development– self, identity, marriage and family, parenthood, work and gender relations.

**UNIT II : Middle Adulthood**

1. Physical development. Changing physiology and health. Adapting to physical changes, midlife changes/crisis, menopause in women, health concerns
2. Cognitive development – attention, memory, cognitive skills in middle age, experience and expertise, adult intelligence
3. Psycho-social changes-Issues of middle age- generativity vs. stagnation, concerns in middle age, career development and planning for retirement, civic roles and responsibilities .

**Unit III : Late Adulthood**

**1.** Physical Development in late adulthood and physiological aspects of aging: health concerns; Disability during old age
**2.** Cognitive changes in late adulthood, understanding dementia and other concerns of the elderly
**3.** Psycho-social development, adjustment to aging, changing economic situation, occupational continuity and change, Leisure and recreation.

4. Perspectives on death.

**Unit IV: Elderly in India**

1. Magnitude of elderly in India
2. Problems of elderly.
3.Retirement ,types and its impact, Retirement homes
4.Provisions,Policies and Programmes for the elderly.

**Internal Assessment (Refer Direction) 20 marks**

**Preparation of Workbook**
**• Hazards of Adulthood**

**Practicals:**

| **Total Marks** | **40 + 10** |
|---|---|
| Psychological Testing | 15 |
| 2 Questions | 20 |
| Record | 05 |
| Internal Assessment | 10 |

**Psychological testing: Introduction to psychological testing, characteristics, reliability, validity, norms and standardization. Types of tests, and uses of tests**

- **Psychological tests : personal stress inventory, vocational interest inventory, emotional maturity scale and adjustment inventory.**
- **Visits to settings such as homes for senior citizens .**

**Internal Assesment**

**Preparation of work book (any one)**

**Problems of menopausal women.**

**Adjustments and problems of elderly.**

**References :**


- Lefrancois, G. R. (1996). The Life Span. Wadsworth Publication Company: USA: California.
- Rice, F. (1992). Human Development: A Life Span Approach. Prentice Hall.
- Rutter, M. and Rutter, M. (1992) Developing Minds. Challenge and continuity across the life span. London: Penguin
- . Santrock, J. W. (1997). Life Span Development. NewYork: Brown &Benchmark .

**B.SC. HOME SCIENCE SEMESTER – IV**
**PAPER – III**
**SURAFACE ORNAMENTATION TECHNIQUES**
**(4 T-3)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 =100 |
| Practical + IA | 40+10= 50 |

**OBJECTIVES-**

- To provide comprehensive knowledge about the concepts of dyeing and printing of textiles.
- To foster understanding of traditional Indian embroideries-motifs used, colour combinations used etc.

**Unit I :**

1. Dyes : Classification- Natural and synthetic ,different types of dyes – direct, acid, basic, reactive, sulpher, vat, azo and natural dyes (vegetable, animal, mineral and mordents used) .
2. Dyeing- Introduction, classification, Methods of dyeing: stock, yarn, piece and union and cross dyeing ,garment dyeing ,Common dyeing defects

**Unit II :**

1. Difference between Dyeing and Printing
1. Styles of printing – Direct, Resist, Discharge
3. Methods of printing – Block, stencil, Roller, Screen, Digital, Flock
4. Common printing defects and their remedy

**Unit III :**

1. Preparation of cloth for printing, types of ingredients used in printing, types of different thickeners , After treatment of printed goods,.
2. Paitnings: Kalamkari, Madhubani, Warli.
3. Prints : Sanganeri print fabrics, bagru print fabrics

**Unit IV : Traditional textiles of India**

3. Traditional Indian Textiles -Sarees :Bandhani, Patola, Chanderi, Paithani, Dacca, Brocades, Kashmiri Shawls.
4. Costumes of different states of India – Maharashtra, Punjab, Gujrat, Rajasthan,

**INTERNAL ASSESSMENT** (Refer Direction)



| Total Marks | 20 |
|---|---|

**PRACTICAL**

| Total Marks | 40+10 |
|---|---|
| Design | 15 |
| Printing | 10 |
| Embroidery | 05 |
| Record | 10 |
| IA | 10 |

1. Dyeing with direct dyes- cotton
2. Tie and dye technique
3. Make sample and article of screen, block, stencil and batik

**INTERNAL ASSESSMENT**

1. Preparation of sample book based on syllabus.

**BOOKS RECOMMENDED**


1 Potter MD and Corbman BP. Textiles: Fibres to Fabric – Published by McGraw Hill Inc. U.S.A
2 Usha Shrikant - Ethinic Embroidery of India, SamaiaEnterprises , Mumbai.
3 William Watson - Textile Design and colour, Longman Green and Co. London.
4 Vastrashilpvigyan by Vimla Sharma. Loyal Book Depot Meerut.
5 Vastrashastra: Prof. VimalAdhau Maharashtra VidhyapeethGranthNirmitMandalasathi, Vidhya Books Aurangabad.
6 VastravigyanavamParidhan - Dr. Vrunda Singh PanchsheelPrakashan Jaipur.
7 VastravigyanavamParidhan - Dr. PrarnilaVermaBihaar Hindi Granth Academy Bhopal.
8 VasiraShilpVigyan :Vimla Sharma ,.
9 VastravigyanKeMulSiddhant- Dr. G.P. Sheeri - Vinod PustakMandir Agra

**B.Sc. HOME SCIENCE SEMESTER IV**

**PAPER – IV**

**Housing and Home Furnishing**

**(4 T-4)**

| **Total Marks** | **150** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | 40 |
| Internal Assessment of practical | 10 |

**Objective**

1. To gain knowledge about the role of internal amenities in contributing for satisfying family living
2. To learn technique that will help one to construct some furnishing items, relativeto their function and beauty.

**COURSE CONTENT THERORY**

**UNIT I -Waste management**

A) Meaning&Importance, ii. Need, iii. Types of waste, iv. Preparation of manure from household waste, v. Preparation of vermi-compost

**Internal Amenities**

A. House Drainage – Bath water, Laundry water, House cleaning water.

B. Methods of house drainage – Dilution, Purification, Soakage pits.

C. Waste Disposal –

i. Types of Refuse – Dry, Solid, Liquid

D. Methods of waste disposal – Tipping or dumping, Taking in to the sea, Compost formation, Burning, Conservancy system

E. Use of drainage water for kitchen garden

**UNIT II –Lighting**

A. Natural Lighting

B. Artificial Lighting – Candles, Oil Lamp, Kerosene Lamp, Gas Lighting, Electric Lighting.

C.Principles of Lighting – Intensity, Steady, Glare, Colour, Safety, Economy.

D. Types of Lighting – Direct, Semi-direct, Indirect, Semi-indirect

**Unit III- House planning**

A. Different symbols used in house plans

B. House plans for different income levels-

i. Higher, ii. Middle, iii. Lower

C.Vastushastra-

i. Importance, ii. Placements of rooms, iii. Location of well, Placements of Doors

**Unit IV –Home Furnishing and Floor Coverings**

**A. HomeFurnishing –**

i. Necessity of curtains , ii. Types of curtains, iii. selection of curtains, iv. Making and Hanging of curtains, v. Care and maintenance of curtain

**B. Carpet and Rugs –**

a) Factor affecting the selection of carpets and rugs-

i. Character, ii. Styles, iii. Pattern, iv. Texture , v. Durability, vi. Cost, vii. Colour, viii. Size.

b) Types of carpets and rugs.

c) Care of carpets and rugs.

**C. Wall Treatment –**

i. Wallpapers, Paints, ii. Tiles

**D. Accessories in Interior –**

i. Hanging of pictures, ii. Relation of pictures to room, iii. Other Accessories

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**

| **Total Marks** | **40+10** |
|---|---|
| Floor Plans | 10 |
| Draw kitchens | 10 |
| Landscape Drawing | 10 |
| Record | 10 |
| IA | 10 |

01: Drawing of Architectural symbols for house Plan.
02: Drawing of floor Plan for low income group.
03: Drawing of Floor Plan for middle income group.
04: Drawing of Floor Plan for high income group.
05: Draw one wall kitchen.
06: Draw two wall kitchen.
07: Draw 'U' shaped kitchen.
08: Draw 'L' shaped kitchen.
09: Working drawing of landscape design.
10: Preparation of manure from green waste
11: Preparation of vermi-compost

**INTERNAL ASSESSMENT**

Any two of the following
(a)Accessories in Home Decoration (any two)
Ceramic work / Clay Modeling /Pottery painting
(b)Visit to ideal house/ideal kitchen



(c) Preparation of sample book on furnishing materials and types of curtains

**Books Recommended:**


Agan T. C. –'The House' Oxford and I. B. H. publishing Co.
Ann Reilly; Susan A. Roth – 'The Home Landscape', Home planners Inco. Tucson, Arizona.
Deshpande R. S. – 'Modern Indian Homes in India', United Book Corporation, Poona, 2nd Edition.
Deshpande R. S. – 'Build your own Home', United Book Corporation, Poona, 4th Edition.
Deshpande R. S. –'Low Cost Housing', United Book Corporation, Poona, 4th Edition.
Goldstin H. / Goldstein V. – ' Art in Every day Life' MacMillan Co., New York, 4th Edition.
Pak – Tin &HelanYeap – 'Feng Shui – Health Harmony' B.Jain Publishers Pvt Ltd., New Delhi, 1998.
Rutt A. – 'Home Furnishing', Wiley Eastern Pvt.Ltd., New Delhi, 2nd Edition.
Shrivastav – 'Remedial Vastu Shastra', Manoj Publication, Delhi, 2001


## B.Sc HOME SCIENCE SEMESTER - IV
## PAPER - V
## Media In Extension

**(4 T -5)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20= 100 |
| Practical + IA | 40+10=50 |

**Objectives :**

1. To develop understanding regarding communication techniques.
2. To develop concept and learn process of communication.
3. To understand the concept of mass communication.
4. To comprehend the concept of advertisement in extension.
5. To develop the understanding of journalism.

**Theory:**

**UNIT – I**

1 Communication Techniques :

Meaning, Definition of Communication, Functions of Communication, Importance of effective communication, Key elements involved in effective Communication process, Critical factors affecting Communication process.

2. Mass Communication and media:

Meaning and importance of mass Communication, Barriers in mass communication, Characteristics of mass

Media.

**UNIT – II**

1. Media in Extension :

Meaning of media, Cone of experience, Classification of media- Electronic media, print media, Folk media.

2. Electronic media :

Radio as mass medium, Impact of Radio, Advantages and limitations of radio. Television as mass medium for education and development, Impact of television, advantages and limitations of Television .

**UNIT - III**

i. Print media :

Types of print media, Impact of print media, Advantages and limitations of print media. Techniques of effective writing. Written communication- Newspaper, script writing.

ii. Folk media.

Folk forms as mass media, Indian folk forms- folk songs, folk dramas, puppets. Impact of folk media.

**UNIT IV**

1. Advertisement as Mass Media.

Meaning and scope of Advertisement, Planning of Advertisement layout, Format of advertisement, Role of Advertisement and its impact on consumers.

2. Journalism in Extension.

Meaning of news, Principals of news, Methods of collecting news, Qualities and duties of Editors and Reporters.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical :**

1. Preparation of radio script.
2. Preparation and presentation of flash cards for communication.
3. Preparation of handmade puppets.
4. Preparation of computerized or handmade advertisement on any issue
5. Report of a pilot survey on women's problems.

| **Total Marks** | **40 +10** |
|---|---|
| Spotting | 10 |
| Teaching Aid | 10 |
| Presentation | 10 |
| Record | 10 |
| IA | 10 |

**INTERNAL ASSESSMENT**

**Report on survey of media availability in 5 households of rural/slum areas.**

**Books Recommended :**



1. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
2. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.
3. Reddy Adivi. A. Extension Education, Shree Laxmi Press, Bapatla, Guntor, A.P.
4. Singh J. K., Mass Media and Information Technology, Mangaldeep Publication, Jaipur.
5. Kumar K. J. L., Mass Communication in India, Jaico Publishing House, Mumbai.
6. Mehta D. S., Mass Communication and Journalism in India, Allied Publishers Pvt. Ltd., Chennai.

## B.Sc. (HOME SCIENCE) SEMESTER- IV

### PAPER VI
### Applied Physiology -II
### (4T-6)

| **Total Marks** | **75** |
|---|---|
| Theory + IA | 40 + 10 = 50 |
| Practical +IA | 20 + 05 = 25 |

**Objectives :**

1. To understand the structure and function of various organs of human body.
2. To promote the basic knowledge of first aid.

**UNIT-I**

Heart-

i. Structure of Heart.
ii. Functions of valves.
iii. Coronary blood supply.
iv. Structure and function of artery, vein and capillaries.

**UNIT-II**

Respiratory System-

i. Structure and functions of respiratory system.
ii. Mechanism of Respiration.
iii. Transport of oxygen in brief.

**UNIT-III**

1. Digestive System-
   i. Brief study of alimentary canal.
   ii. Accessory glands of digestion.
   iii. Process of digestion and absorption.
2. Excretory System-
   i. Structure and functions of excretory organs.
   ii. Formation of Urine.

**UNIT-IV**

1. Reproductive System-
   i. Male and Female reproductive organs, their structure and functions.
   ii. Physiology of Menstrual cycle.
2. Endocrine Glands- Structure and function of pituitary gland, thyroid gland and adrenal gland in brief.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **10** |
|---|---|

**PRACTICALS-**

| **Total Marks** | **20 + 5** |
|---|---|
| Experiment -1 | 04 |
| Experiment -2 | 03 |
| Spotting | 06 |
| Bandage Demo | 02 |
| Record | 03 |
| Viva Voce | 02 |
| IA | 05 |

1. Study of Microscopic slides of common organs-
   T.S. of Liver, Pancreas, Intestine, Lungs, Testis,
   Ovary, Kidney, V.S. of Skin, T.S. of Artery and Vein.
2. Determine Blood Group and 'Rh' type by slide method.
3. Preparation of blood slide and staining by Leishman's stain.
4. Measurement of pulse rate and temperature by using clinical thermometer.
5. Study of different systems by charts or models.
6. Determination of bleeding time and clotting time.

**INTERNAL ASSESSMENT**

Preparation of Drawing Charts on any four systems.

**REFERENCES-**


- Community Health and Nursing- BasavanPhappa B.T.
- Practical Pathology- Chaturvedi O.U.
- Human Anatomy- Chaurasia
- Medical Physiology- Guyton
- Hygiene and Public Health- Ghosh P.
- A.B.C. of Nursing in the Home- Gravelious E.M.
- Manual of First Aid- Gupta
- Nursing- George
- Anatomy and Physiology for Nurses- Jain A.K.

- Practical Guide to First Aid- Keech P.
- Anatomy and Physiology for Nurses- Pearce
- Essentials of Community Health Nursing- J.E. Park
- Practical First Aid- Park
- Home Nursing- Prabhu V.
- Anatomy for Nurses- Prasad
- Anatomy and Physiology in Health and Nurses- Ross & Wilson

## B.Sc. HOME SCIENCE SEMESTER IV

## PAPER VII

## APPLIED CHEMISTRY-II
**(4T-7)**

| **Total Marks** | **75** |
|---|---|
| Theory + IA | 40 +10 =50 |
| Practical +IA | 20+05=25 |

**COURSE CONTENT:** **THEORY**

**Unit-I**

a) **Polymers:** Definition, addition and condensation polymerization, preparation and uses of polyethylene, PVC, Nylon-6, Nylon-66 and polyester.

b) Rubber: Definition, chemical nature and vulcanization, synthetic rubber (Buna-S) and uses.

**Unit-II**

**a)** **Dyes :** Definition, Witt's theory of colour and constitution, classification of dyes based on their functional group- i) Nitro ii) Nitroso and iii) Azo.

**b)** **Aromatic Chemistry:** 1) Benzene (Kekule structure of benzene, prepration from petroleum, Chemical properties: Nitration, Sulphonation, Friedel-Craft Alkylation, catalytic halogenations, formation of BHC and uses)

2) Nitrobenzene: (Laboratory method of prepration, Chemical properties: Reduction, Nitration, Sulphonation, and uses)

3)Aniline:( Laboratory method of prepration, chemical properties: Salt formation, diazotization, carbyl amine reaction, Nitration, Sulphonation, halogenation and uses)

4) Phenol: ( Prepration from Cumene, chemical properties: Salt formation, Fries migration, Catalytic hydrogenation, Condensation, Condensation with formaldehyde, nitration, halogenations, and uses)

**Unit-III**

**a)** **Cosmetics:** Definition, functions and ingredients of shampoo, face powder, cold cream, lipstick, hazards of cosmetics.

**b)** **Drugs:** Preparation and uses of following drugs: i) Aspirin ii) Paracetemol and iii) oil of winter green.

**Unit-IV**

**a) Essential oils:** Definition, occurrence and methods of extraction of essential oils. Eucalyptus oil, Rose oil, Lavender essential oil

**b) Perfumes:** Definition, characteristics of perfume, composition of perfumes, formulation of any two perfumes.

| **Total Marks** | **10** |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20+05** |
|---|---|
| Practical A | 05 |
| Practical B | 5 |
| Viva | 5 |
| Record | 5 |
| Practical IA | 05 |

**PRACTICAL**

**Practical A**

1. Preparation of Soap
2. Preparation of liquid detergent
3. Preparation of solid detergents
4. Preparation of phenyl

**Practical B**

Identification and colour reactions of Carbohydrates: Glucose, fructose, sucrose and starch

**INTERNAL ASSESSMENT**

Any one of the following :

1. Educational visits to various factories and chemical laboratories in India.
2. Assignment book/ workbook for topics from syllabus (all four units)

**BOOK RECOMMENDED:**


1. Text Book of Organic Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
2. Text Book of Physical Chemistry: B.S. Bahl and G.D. Tuli, S. Chand Publication, New Delhi.
3. A Text Book of Engineering Chemistry, S.S. Dara and Suresh Umare, S. Chand Publication, New Delhi.
4. A Text Book of Basic and Applied Chemistry, P.C. Jain and Monica Jain.
5. Polymer Science by V.R. Gowarikar, Wiley Ester Ltd 1987.
6. Text Book of Organic Chemistry by J. L. Finar, Longman Publication,
7. Synthetic Dyes by G R Chatwal, Himalaya Publishing House, New Delhi.
8. Synthetic Drug by G R Chatwal and Anand, Himalaya Publishing House, New Delhi.
9. Organic Chemistry of Natural Products Vol. I and II, by G. R. Chatwal, Himalaya Publishing House, New Delhi.
10. Perfumes, Cosmetics, Soaps Vol. I, II and III by W. A. Poucher, Ninth Edition, Chapman and Hall Publication (1975)
11. New Cosmetic Science by Takeo Mitsui, Elsevier, 1997.

**B.Sc. HOME SCIENCE SEMESTER IV**

**PAPER –VIII**
**Applied Physics & Computer Application -II**
**(4 T-8)**

| Total Marks | 75 |
|---|---|
| Theory + IA | 40 +10 =50 |
| Practical + IA | 20+05=25 |

**Objectives:** To learn about electricity, effects of electric current, electrical appliances and MS power point and internet.

**Theory**

**Unit- I**

**Electromagnetic Induction and its Application:** Concept and statement of Faraday's laws of electromagnetic induction, Transformer (working principle and construction), transformation ratio (turns ratio, Voltage ratio and Current ratio), efficiency of transformer, types of transformer and applications of transformer. Electricity from generator to home, Definition of kilowatt hour unit for consumption of electricity.

**Unit -II**

**Home Appliances:** Motor based appliances: Principle, construction, working, defects and remedies of: mixer- grinder, fan, cooler, hair dryer, vacuum cleaner, washing machine, and refrigerator.
Microwave oven: concept of microwave heating, principle and working of Induction Cooker.

**Unit- III**

**Chemical effect of electric current:** Chemical effect of electric current, electrolyte, electrolysis, electrolysis of copper sulphate and water, Faraday's law of electrolysis, relation between chemical equivalent and electrochemical equivalent, uses of electrolysis, primary cells, (Daniel cell, Leclanche cell), secondary cells (Lead acid accumulator).

**Unit- IV**

**Computer Applications:**

**MS Power point**:- applications of MS Power point, creating presentation, adding slides in presentation, deleting slide, creating masters, formatting text, color to fonts, inserting auto-shapes, inserting pictures, inserting sound, inserting videos, slide show.



**Internet:-** Internet, Internet connection (Broadband, Dial-up and wireless connection), Web browsers (Internet explorer, Mozilafirefox, Google chrome and Opera), World Wide Web, Search engine, E-mail.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **10** |
|---|---|

**Practical**

| **Total Marks** | **20+5** |
|---|---|
| Experiment | 10 |
| Viva | 05 |
| Record | 05 |
| IA | 05 |

1. Study of transformer and determination of turn's ratio
2. To measure power of an appliance and calculate time for 1 kWh unit of electric energy consumption.
3. To determine electrochemical equivalent (ECE) of copper using copper voltameter.
4. To find $E_1/E_2$ of two cells by potentiometer.
5. Measurement of voltages of given dry batteries of different voltages.
6. Creating e-mail id and use of internet to send/ receive e-mails.
7. Creating and enhancing Power Point Presentation
8. Create slides using different slide layouts
9. Working with shapes, lines, text and objects: creating rectangles, squares, circles, ellipse, polygon etc.

**INTERNAL ASSESSMENT**

| **Total Marks** | **05** |
|---|---|

1. Assignment book/ workbook for topics from syllabus (all four units)

**Reference Books:**


1. Principles of physics (vol. I & II) – Halliday &Resnik
2. Principles of physics – Subramanyam, Brijwal
3. How things work (vol. I & II ), INDUS (Harper Collins India)
4. Study of electrical appliances and devices, K. B. Bhatia, Khanna Publishers, New Delhi.
5. Electrician Theory, A. K. Mittal, Arihant Publication, Merath.
6. Basic Electrical Engineering, M. L. Anwani, Dhanpat Rai & Co. (P) Ltd.
7. Elements of Computer Science, S. K. Sarkar, A. K. Gupta, S. Chand & Co., New Delhi
8. Fundamental of computers E. Balguruswamy, Mc Graw Hill Education Pvt. Ltd. New Delhi
9. Computer fundamental (concepts, system & application) Pradeep K. Sinha, Priti Sinha, Sixth edition 2011, B.P.B . Publication
10. Comdex computer course, Vikas Gupta, PM Publication, New Delhi.

**B.Sc. HOME SCIENCE**

**SEMESTER –V**

**B.Sc. HOME SCIENCE SEMESTER V**
**PAPER-I**
**DIET THERAPY -I**
**(5 T-1)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES:**

1. To provide knowledge about the causes and symptoms of various diseases.
2. To understand the role of diet in the management of these conditions.
3. To plan, calculate and prepare diets for various diseases.

**COURSE CONTENT: THEORY**
**UNIT-I**
**Diet Therapy**
**1. Introduction to diet therapy:**
**1) Applications of principles of diet therapy:**
a) Diet counselling
b) Role of dietician in health care
c) Dietetic care in hospital patients: its importance
**2) Therapeutic adaptations of the normal diet:**
a) Soft diet b) Clear Liquid diet c) Liquid diet
d) Bland diet e) Low fibre diet f) High fibre diet
**3) Modes of feeding**:
a) Enteral b) Parenteral

**UNIT-II**
**Weight Management: Overweight and Obesity**
Causes, symptoms and principles of dietary management of overweight and obesity
**1) Obesity**
a) Types and causes of obesity
b) Assessment for obesity
c) Dietary management of obesity
d) Complications of obesity
e) Role of exercise
**2) Underweight**
a) Definition
b) Causes of underweight
c) Dietary management of underweight

**UNIT-III**

**1) Gastrointestinal disorders**:

Causes, symptoms and principles of dietary management of gastro- intestinal disorders

a) Peptic ulcer

b) Diarrhoea

c) Constipation

d) Ulcerative colitis

**UNIT-IV**

**1) Liver disorders and Gall bladder disorders:**

Causes, symptoms and principles of dietary management of liver disorders

a) Functions of the liver

b) Viral Hepatitis

c) Cirrhosis of liver

d) Hepatic coma

**2)** Functions gall bladder

a) Cholecystitis

b) Cholelithiasis

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Total Marks** | **20** |

**PRACTICALS**

Preparation and Evaluation of Therapeutic adaptations of the Normal Diet

Liquid Diets (Full Clear)

Soft Diet

Planning, Calculation and Preparation for the following disorders:

**1) Weight Management**:

a) Obesity

b) Underweight

**2) Gastrointestinal Disorders:**

a) Peptic Ulcer

b) Diarrhoea

c) Constipation

**3) Liver Disorders**:

Jaundice: Mild to Moderate



**REFERENCES**

**1. Nutritive Value of Indian Foods**:Gopalan C, Rama Sastri&Balasubramanian, S.C.National Institute of Nutrition, 1993.

**2. Krause's Food Nutrition and Diet therapy**:L Kathleen Mahan,Sylvia Escottstump.19th edition, W.B. Saunders Co.1996.

**6. Normal & Therapeutic Nutrition**:Corinne H. Robinson & M.R Lawer,15thEdition1997.

**4. Clinical Dietetics**:F.P. Antia, 2ndEdition. Oxford University Press 1973.

**5. Text book of Human Nutrition**: Editors:Bamji M.S. Rao N.P Reddy V. Oxford &IBH pub. Co. pvt.Ltd.1996.

**6. Dietetics**:Srilakshmi B, 3rdEdition, New Age International (p) Ltd., 2000.

**7. Manual of Nutrition and diet Therapy**:Grills &Bosscher, Macmillan Pub.Co. Inc.1981.

**8. Essentials of Nutrition and Diet Therapy:** Williams S.R. Times Mirror/ MosbyCollege Pub.1990.

**9. Nutrition & Dietetics**:Shubhangini A. Joshi. Tata McGraw - Hill Pub. Co. Ltd.,New Delhi 1992.

**10. Indian Food Composition Tables**:.Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition, 2017.

## B.SC HOME SCIENCE SEMESTER - V
## PAPER -II
## Family Dynamics and Developmental Assessment
## (5T-2)

| Total Marks | 100 |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives :**

- To make students aware of importance of family & marriage
- To introduce to the students concept of developmental assessment.

**Theory :**

**Unit I - Marriage**

- Meaning and definition,
- Marriage as an institution : goals, rituals, philosophy and functions
- Readiness for Marriage : Psychological, Social, Physiological and Economical
- Preparation for Marriage
- Selecting a suitable partner
- Premarital association
- Premarital guidance and counselling

**Unit II - Family**

- Meaning definition and structure of family.
- Changing trends in family constitution, roles, demand and responsibilities.
- Nuclear and joint families - Structure, role, interaction and hierarchy of dominance in joint and nuclear families.
- Influence of different disciplinary patterns, maternal deprivation, and overprotection in child development.
- Areas of adjustment within the family at different stages of family life cycle.
- Crisis in family life – unemployment, prolonged illness, death, separation, desertion, divorce, violence and distress and birth of handicapped child.

**Unit III - Developmental assessment**

- Definition, purpose and importance of assessment
- Sources of information :Interview,case study,check list,rating scales and observation
- Developmental milestones – definition and developmental milestones of children from 0 to 6 years.
- Assessment below 2 years
- Tools & techniques used for assessment- TDSC, DASII, DDST, DOC,
- Neurological evaluation
- Assessment of visual & hearing impairment.

**Unit IV- Early Developmental Stimulation**

- Definition, aims, importance,
- Role of parents.
- Newborn stimulation in NICU & at Home.
- Sensory training, early stimulation programmes
- Developmental delay – meaning and risk factor
- Early intervention for the developmental delay.

**INTERNAL ASSESSMENT** (Refer Direction)

A small project on assessment of stress of adolescents of working and non- working women.

| | |
|---|---|
| **Total Marks** | **20** |

**Practical**

- Observation of milestones in a child (0 to 6 years) and the identification of developmental status and presentation in workbook format
- Learning and preparation of different activities for stimulation - tactile auditory, motor, language, visual & cognitive
- Psychological test (marriage attitude scale , parent child relationship scale, CPM and SFBT).



**References :**

**s**


- Corsor, Rose (1975); The family, its structure and functions, New York, Mac Publishing Co.
- Guppy, G R (1976) ; Family and social change in Modern India, New Delhi, Vikas pu.co.
- Rao P & Rao V N ( 1982), Marriage – The family & women in India, New Delhi, Vikas pu.co.
- Shrivastava, Ak (1986); Social class & Family life in India.
- Freeman, Theory & practice of psychological testing, Oxford & IBH pu.co. New Delhi.
- Anna Anastasi, Psychological testing .


## B.Sc. HOME SCIENCE SEMESTER-V
## PAPER-III
## Advanced Pattern Making
## (5T-3)

| Total Marks | 100 |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES-**

1. To develop skill in designing and making paper pattern for different garment.
2. To orient students in detail the principles of draping fabric on the dress form.

**UNIT-I:**

- Introduction to methods of pattern- Drafting, flat pattern and Draping with its advantages and disadvantages.
- Darts – Definition, Terminology and Types of darts.
- Methods of dart manipulation-slash and spread, method and pivot method.

**UNIT-II:**

- Application of elements of design(shape, line, colour and texture) and principles (Balance, Rhythm, Proportion, Emphasis & Harmony) of design on dress.(Silhoutte)
- Fit-Definition of fit, principles of fit (Ease, grain, line set & balance)
- Fitting problems and their remedies on different body parts viz. Bust, waist, Hips, Neck and Shoulder.

**UNIT-III**

- Pattern Grading – Definition, terminology, Principles & Methods of pattern grading – Nested, Track and Computerised. Pattern marking.
- Pattern envelope-front of envelope, back of envelope and inside envelope.
- Pattern layout-definition, importance of layout and types of layout.

**UNIT- IV**

Creation of following parts of garment using basic block of skirt, sleeves and collar.

- Skirts – pleated, gathered, circular and flared.
- Collars – Peterpan, Mandarin, Shirt Collar and Sailor Collar
- Sleeves –Puff Sleeve, Bell Sleeve and Leg-o-mutton

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical**

1. Drafting cutting stitching and designing of following garments by using different types of fabric.
   a) Casual wear (Skirt and Top)
   b) Saree blouse plain / katori

2. Draping on dress form
   a) Basic front and back bodice of skirt.
   b) Dart manipulation
   c) Yokes and collars.
   d) Flared, pleated and hip yoke skirt.

**BOOKS RECOMMENDED**


- Bains, S. and Hutton, J., Singer Sewing Book, Hamlyn, London, 1972
- Patternmaking for Fashion Designers, Lori A. Knowles, 2006, Fairchild Publications Inc.
- Principles of Flat Pattern Design, 4th Edition, Nora M. MacDonald, Fairchild Publications Inc.,2009.
- Armstrong, Helen.,Pattern Making for Fashion Design,Harper Collins Publishers.,1997.
- Verma, Gayatri,Cutting and Stitching Pratical,AsianPublishers,Darya
- Gang, New Delhi,2007.( Hindi Book)
- Armstrong, H.J. (2009), Pattern Making for Fashion Design, Harper Collins Publishers, INC, New York.
- Constantino, M, Fashion Marketing, BT Batsford, London, 199

**B.Sc. HOME SCIENCE SEMESTER V**
**PAPER – IV**
**Resource Management - I**
**(5T-4)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | 50 |

## Objective

1. To recognize the importance of wise use of resources in order to reach personal and family goals.
2. To make students realize the importance of motivating factors in management –values, goals and standards.
3. To give opportunity to develop ability to take rational decisions.

## COURSE CONTENT THERORY

### UNIT I - Management

A. The Management Process:-
   i. Definition, Importance and Scope
   ii. Planning –
      a. Importance & need for planning
      b. Types: - 1) Use- Single, Repeat 2) General, Specific
      c. Levels – 1) Master planning 2) Operational Planning 3) Day to day planning
      **4)** Sequencing & Ordering

B. Implementation -
   i. Controlling/ Execution of plan
   ii. Energizing- checking the progress
   iii. Adjusting the plan

C. Evaluative feedback
   i. Importance
   ii. Types-
      a. Formal
      b. Informal
      c. Self
   iii. Methods of evaluation

D. Relation between planning, controlling & evaluation

E. Principles of Management-

i. Division of Work, ii. Authority and Responsibility, iii. Discipline, iv. Unity of Command, v. Unity of Direction , vi. Interest, vii. Fair Remuneration, viii. Centralization, ix. Scalar Chain, x. Work Order, xi. Equality, xii. Stability,
xiii. Co-operation, xiv. Initiative

UNIT II Family Resources

A. Resources -
   i. Definition, ii. Role of resources, iii. Scope of resources
   iv. Classification –
      a. Human Resources
         1) Time
         2) Energy
         3) Interest
         4) Ability or skill
         5) Knowledge
         6) Attitude
b. Non-human –
         1) Money
         2) Material goods
         3) Community Facilities

B. Factors affecting family resources.
C. Characteristics of resources.

UNIT III Decision Making –

A. Definition and Importance
B. Role and scope of decision making
C. Process of decision making
D. Types –i. Individual, ii. Group, iii. Habitual, iv. Intellectual
E. Factors affecting decision making

UNIT IV-Time Management

A. Definition
B. Nature & Importance of time
C. Specific aids or tools of time management – i. Work Production Curves, ii. Rest and sleep periods
D. Process of managing time – i. Planning, ii. Implementation, iii. Evaluative feedback
E. Leisure – i. Meaning, ii. Importance, iii. Activities



**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical**

Diagrammatic Representation of the following:

a) Management Process
b) Family Resources
c) Decision Making
Arrange exhibition/Visit to exhibition / Trade show – Report

2. Giving seminars on related topics

3. Recycling of old clothes
   a) Traveling Bags
   b) Purses
   c) Door mats
   A. Assignment on related topics

**Books Recommended:**


1. Good year &Klohar 'Managing for effective living' John Wiley and Sons.
2. Gross-crandall-knoll 'Management for Modern families' Prentice Hall, Inc. New Jersey.
3. Nickell- Rice- Tucker, 'Management in family living' John Wiley & Sons.
4. Swanson Bettye 'Introduction to Home Management McMillan Pub. House. Inc. New York.
5. BorkarSunita' Introduction to Resource Management', Himalaya Publishing House.
6. Sounderaraj Stella 'A textbook of Household Arts' Orient longman.
7. Rudramurthy B., Extension in Planned Social Change, Allied Publishers Pvt. Ltd., Chennai.

**B. Sc HOME SCIENCE SEMESTER – V**

**PAPER – V**

**Programme Planning And Building In Extension**

**(5T-5)**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**Objectives :**

1. To develop understanding about Programme planning.
2. To understand the need for programme planning.
3. To develop understanding of community organization.
4. To know the significance of adoption process in community development.
5. To comprehend the communication of innovations.

**Theory :**

**Unit - I**

1. Programme planning for extension work :
   Definition, characteristics of programme planning process, importance of extension programmes, Steps in programme planning process.
2. Programme building in extension :
   Principles of programme planning, professional abilities needed by programme planners, role of officials and
   non-officials in programme planning

**Unit - II**

1. Community organization :
   Definition and concept of community organization, principles of community organization, methods of community organization.
2. Communication of innovations:
   The SMCRE model, Diffusion, Relation between Communication and diffusion, definition of innovation, characteristics of innovations.

**Unit - III**

1. Innovation decision process :
   Innovation Decision Process, Innovativeness, Stages involved in adoption process, Classification of adopters, Characteristics of Adopters, Rate of adoption.
2. Information from communication media:
   Sources of information regarding communication media, adoption stages and information sources, important factors related to adoption of practices.

**Unit IV**

1. Group Mobilization :
   Definition of groups, occasions of group association, groups in rural communities, principles of working with groups.



2. Change agent :

Meaning, traits of change agents, role of change agents working towards ensuring change.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practical**

1. Report on assessment of working pattern of change agent.
2. Power point presentation on any home science aspect.
3. Programme planning for one day event.
4. Survey on comparative study of household practices .e.g. difference between old and new innovation in nutrition, health, textiles, child rearing practices.
5. Organizing Exhibition for display of articles related to home science.

**Books Recommended :**


1. Directorate of extension : Extension Education in Community Development.
2. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
3. Chandra. A., Shah. A. and Joshi. V.: Fundamentals of teaching Home Science, Sterling Publishers, New Delhi, 1989.
4. Waghmare S. K., Teaching Extension, Prashant Publishers, Vallabh Vidyanagar.
5. Singh. K., Rural Sociology, Prakashan Kendra, Lucknow.
6. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.


## B.Sc. Home Science Semester V

### PAPER- VI

### Nutritional Biochemistry- I

### (5T-6)

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES**

This course will enable the students to :

1. Develop an understanding of the principals of biochemistry (as applicable to human nutrition)
2. Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
3. Understand the biological processes and systems as applicable to human nutrition.
4. Apply the knowledge acquired to human nutrition and dietetics.

**COURSE CONTENT: Theory**

**UNIT I: Carbohydrates**

**1.** Definition and Classification: Mono, Di, Oligo, and Polysaccharides with at least two examples of each class.

**Monosaccharides –**

1) based on number of carbon atoms (Triose, Tetrose, Pentose, Hexose) ,
2) based on functional group (Aldo and Keto derivatives)

**2. Structure and sources of**

- Monosaccharides : glucose, fructose, galactose.
- Disaccharides – maltose, lactose, sucrose.

**3. Reducing and Non reducing Sugars**

**4. Polysaccharides –Classification:** Homopolysaccharides&Heteropolysaccharides
Sources, structure, physical properties and uses of starch, glycogen, cellulose and difference between them.

5. **Asymmetric Carbon Atom. D and L configuration reference compound glyceraldehydes.**
6. **Formation of Glycoside bonds in glucose and fructose.**
7. **Alpha and Beta structure of glucose and fructose.**
8. **Pyranose structure of glucose and fructose.**

**UNIT II: Proteins**

1. **Amino Acids :** Basic Structure of Amino Acid and formation of peptide bond
Classification : 1) Polar , Non-polar.
2) Essential and Non-essential amino acid
3) Glucogenic and Ketogenic

2. **Proteins**: 1. Definition and classification of proteins (based on solubility, based on functions)
2. Structure : Basic idea of primary, secondary and tertiary structure of protein.

**Unit III : Lipids**

1. Fatty Acids **:**Essential and non essential fatty acids
Types of Fatty Acids **:** SFA, MUFA, PUFA, Omega -3 and Omega -6 Fatty Acids.
Cis Fatty Acids and Trans Fatty acids**.**
2. Lipids **:** Definition and Classification

**Unit IV**

1. **Nucleic Acids**
Structure of a mononucleotide. Bases found in nucleic acids. Difference between RNA and DNA and their functions.Structures of DNAs & RNAs. Base pairing rule.
2 **Protein synthesis:- Mechanism of protein synthesis (i) Transcription (ii) Translation.**
3 **Difference between m-RNA, r-RNA, t-RNA and their functions.**
4 **Introduction and Definition of :**
a. High Energy compounds :a] ATP b] ADP
b. Inborn errors of metabolism : a]Sickle cell anemia b]Gout

**INTERNAL ASSESSMENT** (Refer Direction)

| | |
|---|---|
| **Total Marks** | **20** |

**PRACTICALS**

**I. QUALITATIVE ANALYSIS**

1. Colour Reactions of Carbohydrates.
    1. Fructose
    2. Maltose
    3. Sucrose
2. Colour Reactions of Cholesterol

**II. QUANTITATIVE ANALYSIS**

1. Estimation of Glucose by Benedict's Method.

**III. SMALL EXPERIMENT**

1. Isolation of Casein from Milk.

**IV. EXPERIMENTS WITH ENZYMES**

1. Inversion (Hydrolysis) of Sucrose by Yeast Invertase.

**References :**


1. West E. S., Todd W.R., Mason H.S. & Van Bruggen J.T. (1974) : 4th Ed. Text book of biochemistry, Amerind Pub Co Pvt Ltd.
2. White A., Handlar P., Smith E.L, Stelten, D.W. (1959) : 2nd Ed. Principles of Bio-chemistry, McGraw Hill Book Co.
3. Murray R K Granner, D.K., Mayes, P.A. &Rodwell V.W.(1993) : 23rd Ed. Harper's Biochemistry. Lange medical book.
4. Lehninger, A.L, Nelson D.L. & Cox M.M. (1993) : 2nd Ed. Principles of Bio-chemistry, CBS Publishers & distributers.
5. Devlin, T.M. (1986) : 2nd Ed. Text book of biochemistry with Clinical correlations, John Wiley and sons.
6. Stryer, L. (1995) : Biochemistry, Freeman WH and Co.
7. U. Satyanarayan and U Chakrapani : 2008 Fundamentals of Biochemistry, Books & Allied Pvt. Ltd, Calcutta Trueman R. Patricia 2007 Nutritional Biochemistry MJP Pub, Chenna

**B.Sc. (HOME SCIENCE) SEMESTER- V**
**PAPER VII**
**(5T-7)**
**Health Science and Hygiene**

| **Total Marks** | **100** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | - |

**OBJECTIVES**

1. To understand basic concept of microorganisms
2. To impart knowledge of measures taken for prevention and control of diseases.
3. To promote basic knowledge of role of disinfection in health

**UNIT-I**

Infectious disease Epidemiology-

i. Definition of Infection, contamination, host, communicable and non-communicable diseases, source of infection, Incubation period, types of communicable and non-communicable diseases.
ii. Modes of transmission of disease- Direct and Indirect.
iii. Measures of Disease Prevention and Control.

**UNIT-II**

A. Health Education- Aims, Objectives, Principles, Role of Communication in Health Education.
B. Disinfection-
   i. Definition of disinfection, sterilization, disinfectant, antiseptic, deodorant.
   ii. Types of disinfection.
   iii. Types of disinfectants-a. Natural agents
   b. Physical agents
   c. Chemical agents

   **Chemical agents-** Phenyle, Savlon, Bleaching Powder, Potassium Permanganate, Lime, Spirit, Iodine, Dettol.

   **Insecticides-** DDT, BHC powder.

**UNIT-III**

1. International Health Organisation- WHO, UNICEF
2. Implication of drug addiction, Narcotics, Alcoholism, smoking, their control and prevention.

**UNIT-IV**

Family planning and demography.

a. Definition, necessity, advantages, and methods of family planning.
b. Birth rate, Death rate and Census.
c. Geriatrics.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|



**PRACTICALS**

1. Study of common insecticides and disinfectants- Phenyle, Dettol, DDT, BHC powder, Potassium Permanganate, Bleaching Powder.
2. Identification of RBC and WBC by using Leishman's stain.
3. Demonstration of RBC & WBC count by using Hemocytometer.

**REFERENCES-**


1. Textbook of Paediatrics- Aghor
2. Community Health and Nursing- BasavanPhappa B.T.
3. Textbook Microbiology for Nurses- Baveja C.P.
4. Practical Pathology- Chaturvedi O.U.
5. Textbook of Medicine- P.C. Das
6. Handbook of Paediatrics- Desai
7. Hygiene and Public Health- Ghosh P.
8. Textbook of Preventive and Social Medicine- K. Park
9. Textbook of Preventive and Social Medicine- J.E. Park
10. Essentials of Community Health Nursing- J.E. Park
11. Textbook of Obstetrics and Gynaecology- D.C. Dutta
12. Textbook of Medical Microbiology- Anantnarayan

**B.Sc. HOME SCIENCE**

**SEMESTER –VI**

**B.Sc. HOME SCIENCE SEMESTER VI**
**PAPER-I**
**Diet Therapy-II**
**(6T-1)**

| **Total Marks** | **150** |
|---|---|
| Theory +IA | 80 +20 |
| Practical+IA | 40+10 |

**OBJECTIVES:**
1. To provide knowledge about the causes and symptoms of various diseases.
2. To understand the role of diet in the management of these conditions.
3.To plan, calculate and prepare diets for various diseases.

**COURSE CONTENT: THEORY**

**UNIT-I**

**1. Conditions Requiring Nutritional Support:**
Causes, symptoms and principles of dietary management of some of the special conditions requiring Nutritional support:
a) Fevers: Short and long
b) Anaemia: Types
c) Surgery: Pre and postoperative care
d) Burns: Types, degree
e) Cancer: Types of Cancer, carcinogens
**2. Food Allergy:**Common food allergens

**UNIT-II**

**1) Diabetes Mellitus:**
Causes, symptoms and principles of dietary management of diabetes mellitus:
a) Normal blood glucose level
b) Types of diabetes mellitus
c) Treatment: Oral Hypoglycemic drugs and Insulin
d) Role of diet in the management of IDDM and NIDDM
e) Complications of diabetes mellitus
**2) Food Exchange List-**Use of food exchange list in meal planning of diabetic people

**UNIT- III**

**Hypertension:**
Causes, symptoms and principles of dietary management of hypertension
a) Normal blood pressure and types of hypertension
b) Role of sodium/ salt in hypertension
c) Role of diet in management of hypertension

**Coronary Heart Diseases:**
Causes, symptoms and principles of dietary management of coronary heart diseases:
a) Risk factors for CHD
b) Dietary principles of CHD
c) Atherosclerosis
d) Lifestyle modification

**UNIT- IV**

**Renal Disorders:**
Causes, symptoms and principles of dietary management of some of the special conditions requiring nutritional support:
a) Glomerulonephritis
b) Nephrotic syndrome
c) Acute and chronic Renal failure
d) Importance of dialysis.
e) Renal calculi

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS**
Planning, Calculation and Preparation for the following disorders:
1) Fever: Short and long duration
2) Anaemia: Iron Deficiency
3) Diabetes (NIDDM)
4) Hypertension
5) Coronary Heart diseases
6) Kidney disorders
a) Nephritis
b) Nephrosis

| **Total Marks** | **40+10** |
|---|---|
| Planning | 10 |
| Calculation | 10 |
| Cooking | 10 |
| Viva | 05 |
| Record | 05 |
| IA | 10 |

**INTERNAL ASSESSMENT**
Any one of the following
1. Seminar on any one topic from syllabus
2. Preparation of scrap Book
3. Power point presentation
4. To run a canteen
5. Visit to Health club

| **Total Marks** | **10** |
|---|---|

**REFERENCES**

**1. Nutritive Value of Indian Foods:**Gopalan C, Rama Sastri&Balasubramanian, S.C.National Institute of Nutrition, 1993.
**2. Krause's Food Nutrition and Diet therapy**: L Kathleen Mahan, Sylvia Escottstump. **19th edition, W.B. Saunders Co.1996.**
6. Normal & Therapeutic Nutrition: Corinne H. Robinson & M.R **Lawer,15th Edition 1997.**
**4. Clinical Dietetics:** F.P. Antia, 2nd Edition. Oxford University Press 1973.
**5. Text book of Human Nutrition:** Editors:Bamji M.S. Rao N.P Reddy V. Oxford & IBH pub. Co. pvt.Ltd.1996.
**6. Dietetics:**Srilakshmi B, 3rd Edition, New Age International (p) Ltd., 2000.
**7. Manual of Nutrition and diet Therapy**: Grills &Bosscher, **Macmillan Pub.Co. Inc. 1981.**
**8. Essentials of Nutrition and Diet Therapy:** Williams S.R. Times Mirror **/ Mosby** College Pub.1990.
**9. Nutrition & Dietetics:**Shubhangini A. Joshi . Tata McGraw - Hill Pub. Co. Ltd., New Delhi 1992.
**10. Indian Food Composition Tables**:.Longvah T, AnanthanR,Bhaskarachary K and Venkaiah K. National Institute of Nutrition, 2017.

**B.SC HOME SCIENCE SEMESTER - VI**

**PAPER -II**
**Care and well-being in Human Development**
**(6T-2)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 +20 |
| Practical + IA | 40+10 |

**Objectives :**

- To understand the significance of care and well-being in human development
- To understand the concerns at different stages of life
- To explore the availability of services and institutions that promote care and wellbeing.

**Theory :**

**Unit I : Care and Human Development**

1. Definition, concept and relevance of care
2. Vulnerable periods in life that require care
3. Principles of care giving
4. Holistic concept of well-being
5. Promoting well-being
6. Relationship between care and well-being
7. Subjective well- being.

**Unit II : Care and Well-being in Childhood**

**1.** Critical issues during infancy(preterm birth, feeding problems, ,congenital disabilities,sleep problems, colicky,constipation,developmental delay etc)

**2.** Critical issues during early childhood years (sleeping concerns, eating concerns, behavioural concerns, emotional concerns, speech concerns, caries, infections and illness, autism, anemia, Developmental delay etc)

**3.** Critical issues during middle childhood (school concerns, behavioural concerns, peer concerns, emotional concerns, risk taking behavior, weight/height concerns, tics,etc)

**4.** Critical issues during adolescence(school concerns, social concerns,vocational concerns ,emotional concerns, substance abuse, dangerous behaviour ,excessive risk taking, body image, eating disorders,obesity, chronic illness etc ).

**5.** Health care; nutritional and psychological counseling acrossthe childhood stages.

**Unit III : Care and Well-being in Adulthood**

1. Adults as caregivers and their needs
2. Wellness model by Bill Hettler.
3. Experiencing wellness at different stages and work domains of adulthood
4. Care needs of elderly

5. Health and nutritional care across adulthood stages
6. Spiritual and psychological well-being.

**Unit IV : Policies, Services and Programmes**

1. Community resources for well-being
2. Provisions, and services that promote well-being
3. School health programmes
4. Counselling services for individuals and families

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practicals**

| **Total Marks** | **40 +10** |
|---|---|
| Psychological Testing | 15 |
| 2 Questions | 15 |
| Record Book | 05 |
| Viva | 05 |
| Internal Assessment | 10 |

1. Observation of an infant in natural settings to understand their care needs
2. Interview of a young mother of a preschool child as a caregiver.
3. Visits to :
   A counseling centre/clinic,
4. Psychological tests (self- concept inventory, behaviour orientation scale and 16 PF).

**INTERNAL ASSESSMENT**

**1 . Preparation of workbook on any one :**

- Spiritual and psychological well being
- Disciplinary patterns of child rearing

**2. Oral presentation on any given topic :**

**References :-**


- Chelsea, C., Fielder, D., Komilzoda, S. &Pathmanathan, I. ( 2009). Child health policy and programming for marginalized communities. New Delhi: UNICEF
- Davar, B.V. (Ed.) ( 2001). Mental health from a gender perspective. New Delhi: Sage.
- Ghosh, S. (1981). The Feeding & Care of Infant & Young Children. New Delhi: Voluntary Health Association of India.
- Swaminathan, M. (1985). Who cares? : A study of child care facilities for low income working women in India. New Delhi: Centre for Women's Development Studies.

**B.Sc. HOME SCIENCE SEMESTER-VI**
**PAPER-III**
**Fashion Designing**
**(6T-3)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 |
| Practical +IA | 40+10 |

**Objectives**

- To understand the concept related to elements and principles of design.
- To understand terminology related to fashion.
- To acquaint the students with the basic factors influencing fashion.
- To foster an understanding of international designers and their work. To learn basic fashion designing process and apparel manufacture,
- To gain Knowledge of fashion marketing and merchandising.

**UNIT-I**

- Origin of clothing, theories of clothing-Modesty, Protection, Adornment, Identification, Religious.
- Definition of fashion, History of fashion, Terminology of fashion, Origin of fashion designing.
- Principles of fashion movement, classification of fashion, Theories of fashion adoption-Trickle up, Trickle down and Trickle across.

**UNIT-II**

- Fashion cycle and its stages, flow chart of fashion design process.
- Role of fashion professionals –( i) Fashion designers, (ii) Fashion Technologist, (iii) Fashion Merchandiser
- Factors influencing fashion-Economic factor, Psychological factors, Social factors, cultural factors, geographical factors and technological factors.

**UNIT-III**

- Fashion leaders, Fashion Followers, Fashion Victims, Fashion Innovators, Fashion motivators.
- Fashion Forecasting
- Study of different departments of garment industry and their working.

**UNIT-IV**

- Fashion Marketing- Introduction, definition & importance of fashion marketing.
- Fashion Merchandising- Introduction, definition & importance of fashion merchandising.
- Market Trends, Sources of Fashion Inspiration, Fashion Advertising and its medias.

| Total Marks | 20 |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

**PRACTICAL**

| Total Marks | 40+10 |
|---|---|
| **Drafting** | 10 |
| Stitching | 20 |
| Record Book | 10 |
| IA | 10 |

**1.** Drafting cutting stitching and designing of following garments by using different
types of fabric.
**2.** Evening wear (Salwar / Chudidar/ Plazzo& kurta)
3.Cocktail wear
4. Use of computer in fashion designing.

**INTERNAL ASSESSMENT**

i) Designing and making one fashion accessories (Purse/Belts/Fashion Jewellery / Scarves/Stole etc.)
ii) Visits to fashion institute, export house and study tour.

**BOOKS RECOMMENDED:**


**Kaur Navneet,comdex Fashion Design vol 1 Fashion concept SDR Printer Delhi**

- Armstrong, H.J. (2009), Pattern Making for Fashion Design, Harper Collins Publishers, INC, New York.
- Fringes, G.S. (1999), Fashion from Concept to Consumer, 6th edition, NJ, Prentice Hall.
- Jarnow, J. Dickerson Kitty G (1987), Inside the Fashion Business, New Jersey, Merrill, Prentice Hall.
- Mc. Kelvey, K., Muslow, J., Fashion Forecasting (2008) Wiley Blackwell
- Tate, S.L. and Edwards, M.S.(1982) The Complete Book of Fashion Design, New York, Harper & Row Publication.
- Stephens Frings Gini, 2007, Fashion: From Concept to Consumer (9th Edition), Prentice Hall
- Genova Aneta 2011, Accessory Design, Fairchild Pubns; 1 edition
- Schaffer Jane, Saunders Sue 2012, Fashion Design Course: Accessories: Design Practice and Processes for Creating Hats, Bags, Shoes, and Other Fashion Accessories, Barron's Educational Series
- Lau John 2012, Basics Fashion Design 09: Designing Accessories: Exploring the design and construction of bags, shoes, hats and jewellery, A Publishing; 1 edition
- The Dynamics of Fashion, Elaine Stone, Fairchild Publication, 2008
- Frings Gini, Fashion From Concept to Consumer, (5th Edition), Prentice Hall

**B.Sc. HOME SCIENCE SEMESTER VI**
**PAPER – IV**
**Resource Management -II**
**(6T-4)**

| **Total Marks** | **150** |
|---|---|
| Theory | 80 |
| Internal Assessment | 20 |
| Practical | 40 |
| Internal Assessment of practical | 10 |

**Objective**

1. To give opportunity to develop ability to manage various resources.
2. To develop ability to apply management principles in experimental house and in day today life experience and various small events.
3. To develop ability to apply work simplification techniques.
4. To make them aware of intelligent choice of consumer goods.

**UNIT – I : Energy Management**

A. Energy Management Meaning, Importance
B. The efforts used in Home making activities
C. Energy requirements for household tasks
D. Forms and effects of fatigue
E. Process of managing energy -
   i. Planning
   ii. Implementing
   iii. Evaluating feedback

**UNIT – II**

**A. Work Simplification**

1. Definition and Importance
2. Techniques – i. Process chart, ii. Operation chart, iii. Pathway char

**B. Ergonomics –**

i. Meaning and importance, ii. Definition, iii. Role and scope of ergonomics in home,
iv. Anthropometric dimension

**UNIT – III - Finance / Money Management**

A. Concept of Income
B. Planning – i. Definition, ii. Importance of family finance plan/Budget – steps in making budget

C. Implementing
D. Evaluative feedback
E. Account keeping
   i. Definition & Importance
   ii. Types of account keeping
F. Consumer
   i. Definition and roles
   ii. Intelligent choice of consumer goods
   iii. Consumer credit-credit purchase
   iv. Consumer protection

**UNIT – IV**

**A) Event Management**

1) Meaning and importance
2) Definition
3) Planning implementation and review of –
   a. Family function – Birthday, Engagement, Anniversaries, Wedding reception
   b. Formal meeting – Seminar, Conference
   c. Exhibition/ trade show
   d. Product launch meeting – product display
   e. Theme special

**B) Entrepreneurship**

1) Meaning and definition
2) Concept and importance
3) Women entrepreneurship
4) Types of women entrepreneurship

| **Total Marks** | **20** |
|---|---|

**INTERNAL ASSESSMENT** (Refer Direction)

**Practical**

1. Time plan for college going students, working and non-working women.
2. Work simplification techniques applied to any activity – Pathway – process – Operation chart.
3. Establishing Budget making & actual spending (for any event)
4. Account keeping – ( any event)

| **Total Marks** | **40 +10** |
|---|---|
| Time plan | 10 |
| Work simplification techniques | 10 |
| Budget making | 10 |
| Record Book | 10 |
| IA | 10 |



**INTERNAL ASSESSMENT**

a) Arrange any one Event
b) Project report on self-employment

**Books Recommended:**


1. Good year &Klohar 'Managing for effective living' John Wiley and Sons.
2. Gross-crandall-knoll 'Management for Modern families' Prentice Hall, Inc. New Jersey.
3. Nickell- Rice- Tucker, 'Management in family living' John Wiley & Sons.
4. Swanson Bettye 'Introduction to Home Management McMillan Pub. House. Inc. New York.
5. BorkarSunita' Introduction to Resource Management', Himalaya Publishing House.
6. Neeta Baporikar "Entrepreneurship Development & Project Management" Himalaya Publishing House
7. Successful Event Management by Anton Shone, Bryn Parry II Edition Cangage Learning Pvt.Ltd.

.


**B.Sc HOME SCIENCE SEMESTER VI**
**PAPER V**
**Community Development and Management**
**(6 T-5)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 |
| Practical + IA | 40 + 10 |

**Objectives :**

1. To understand the importance of leadership in extension work.
2. To developed the concept of teaching methods.
3. To understand the necessity of co-ordination in extension work.
4. To understand the concept of development communication.
5. To understand administration, supervision and evaluation for extension work.

**Theory :**

**Unit - I**

1. Leadership in Extension :
   Definition of leadership, Methods of selecting local leaders for extension work, traits of leaders, role of local leaders in extension work.
2. Motivation for extension work

Definition of motivation, importance of motivation for extension work, basic elements to motivate home makers, techniques of motivation,

**Unit - II**

1. Extension Training :
   Meaning & Importance of training, need of training, Types of training for extension workers, principles of training.
2. Coordination for extension work :
   Importance of coordination, necessity of team work, aspects of coordination, practical difficulty of team work and its solutions.

**Unit III**

**1.** Development communication :
Meaning and definition of development communication, approaches for development communication, constraints in development communication.

**2.** Participatory Approach in Development Communication :
Meaning of PADC, types of participation of people in development process, participatory approaches, PRA and RRA techniques.

**Unit - IV**

1. Extension Administration and Supervision :
   Meaning of administration and supervision, concept, principles of good administration, necessity of administration, traits desirable in extension administrators or supervisors.
2. Extension monitoring evaluation :

Meaning of monitoring evaluation, Importance of monitoring evaluation, types of evaluation, methods of evaluating extension programmes.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**Practicals**:

Practice of public speaking.

1. Preparation of Television script.
2. Handling and operation of Overhead Projector.
3. Preparation and presentation of computerized transparency.
4. Organizing and conducting seminar on home science aspects.

| **Total Marks** | **40+10** |
|---|---|
| Spotting | 10 |
| Teaching Aid | 10 |
| Presentation | 10 |
| Viva | 05 |
| Record | 05 |
| IA | 10 |

**INTERNAL ASSESSMENT**

Report on Survey of Health & hygiene conditions of 5 households of rural/ slum areas.



**Books Recommended :**


1. Directorate of extension : Extension Education in Community Development.
2. Supe. S. V. An Introduction to Extension Education – Oxford Publishing Company, New Delhi & Kolkata.1999.
3. Chandra.A., Shah. A. and Joshi. V.: Fundamentals of teaching Home Science, Sterling Publishers,
   New Delhi, 1989.
4. Devdas. R. P., Methods of teaching Home Science, National Council of Education.1978.
5. Singh. K., Rural Sociology, Prakashan Kendra, Lucknow.
6. Dahama. O. P. and Batnagar O. P. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi, 1977.
7. Rudramurthy B., Extension in Planned Social Change, Allied Publishers Pvt: Ltd, Chennai.




**B.Sc. Home Science Semester VI**
**PAPER- VI**
**Nutritional Biochemistry-II**
**(6 T-6)**

| **Total Marks** | **150** |
|---|---|
| Theory + IA | 80 + 20 |
| Practical + IA | 40+10 |

**OBJECTIVES**

This course will enable the students to :

1. Develop an understanding of the principals of biochemistry (as applicable to human nutrition)
2. Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
3. Understand the biological processes and systems as applicable to human nutrition.
4. Apply the knowledge acquired to human nutrition and dietetics.

**COURSE CONTENT: Theory**

**Unit I Metabolism**

1. **Metabolism :** Introduction to Anabolism and Catabolism & its relation to nutrition.
2. **Carbohydrate Metabolism :**Absorption, transport and assimilation of Carbohydrates.
3. **Protein Metabolism** : Absorption, transport and assimilation of Proteins.
4. **Lipid Metabolism** : Absorption, transport and assimilation of Lipids.

**Unit II Carbohydrate Metabolism**

1. Introduction, definition and significance of intermediary metabolism :
    1. Glycolysis,
    2. Kreb's cycle ( Detail process of energy and enregetics.)
    3. Glycogenesis,
    4. Gluconeogenesis.
2. **Definition :** Blood sugar regulation : hypoglycemia, hyperglycemia and renal threshold. Glucose Tolerance Test.

**Unit III. Protein Metabolism**

1. Introduction, definition, process and importance of:-
    i) Transamination
    ii) Oxidative Deamination,
    iii) Urea Formation.

2. Enzymes : Classification according to IUB system. Effect of temperature and pH on the activity of enzymes

**Unit IV: Lipid Metabolism :**

1. Lipid profile (Cholesterol, Bile acids, Trigylcerides) & Health status.
2. Definition of : Lipogenesis and Hyperlipidemia.
3. Formation of Ketone bodies in diabetics.
4. Elementary idea of Beta Oxidation

**INTERNAL ASSESSMENT** (Refer Direction)

| Total Marks | 20 |
|---|---|

**PRACTICALS**

| Total Marks | 40+10 |
|---|---|
| Qualitative | 10 |
| Quantitative | 10 |
| Small experiment | 10 |
| Record | 05 |
| Viva | 05 |
| IA | 10 |

**I. QUALITATIVE ANALYSIS**

a. Colour Reactions of Carbohydrates.
   1. Glucose
   2. Lactose
   3. Starch

b. Colour Reactions of Proteins.
   1. Albumin
   2. Casein
   3. Gelatin

**II. QUANTITATIVE ANALYSIS**

1. Sorenson's Amino Acids Titration (Formol Titration)

**III. SMALL EXPERIMENT**

1. Preparation of Potato Starch :
   Solubility test and Colour Reactions

**IV EXPERIMENTS WITH ENZYMES**

1. Action of Ptyalin (Salivary Amylase) on Starch.

**INTERNAL ASSESSMENT**

Any one of the following :
1. Seminar on any one topic
2. Preparation of Drawing Book based on any one topic
3. Power Point Presentation

**References :**


1. West E. S., Todd W.R., Mason H.S. & Van Bruggen J.T. (1974) : 4th Ed. Text book of biochemistry, Amerind Pub Co Pvt Ltd.
2. White A., Handlar P., Smith E.L, Stelten, D.W. (1959) : 2nd Ed. Principles of Bio-chemistry, McGraw Hill Book Co.
3. Murray R K Granner, D.K., Mayes, P.A. &Rodwell V.W.(1993) : 23rd Ed. Harper's Biochemistry. Lange medical book.
4. Lehninger, A.L, Nelson D.L. & Cox M.M. (1993) : 2nd Ed. Principles of Bio-chemistry, CBS Publishers & distributers.
5. Devlin, T.M. (1986) : 2nd Ed. Text book of biochemistry with Clinical correlations, John Wiley and sons.
6. Stryer, L. ( 1995) : Biochemistry, Freeman WH and Co.

7. U. Satyanarayan and U Chakrapani : 2008 Fundamentals of Biochemistry, Books &Allied Pvt Ltd, Calcutta
8. Trueman R. Patricia 2007 Nutritional Biochemistry MJP Pub, Chennai

## B.Sc. (HOME SCIENCE) SEMESTER- VI

### PAPER VII
### Public Health
### (6T-7)

| Total Marks | 150 |
|---|---|
| Theory + IA | 80 + 20 |
| Practical + IA | 40+10 |

**Objectives :**

1. To understand basic concept of microorganisms
2. To impart knowledge of measures taken for prevention and control of diseases.
3. To promote basic knowledge of role of disinfection in health

**UNIT-I**

a. General concept of Bacteria and viruses-
   i. Structure of bacterial cell, classification of bacteria.
   ii. Structure of virion and types of viruses.
b. Grain staining.
c. Non-communicable diseases-
   - Diabetes mellitus
   - Nephrotic syndrome

**UNIT-II**

Diseases caused by bacteria, viruses and protozoa.

1. Water, food and milkborne diseases.-Hepatitis, Cholera, Typhoid, Dysentry.
2. Airborne diseases- Tuberculosis, poliomyelitis, measles.

**UNIT-III**

Parasitic infections-

a. Mode of infection, life cycle, harmful effects, prevention and control of following infections-
   i. Amoebiasis (Entamoeba Histolytica)
   ii. Ascariasis (Roundworm)
b. Mode of infection, life cycle, harmful effects, prevention and control of diseases caused by insects.
   i. Malaria (Plasmodium vivax and Plasmodium falciparum)
   ii. Filaria (WuchereriaBancrofti)

**UNIT-IV**

Immunity-

a. Definition

b. Classification- Natural and Acquired Immunity, Active and Passive Immunity.
c. Mechanism Of Immunity (in brief)- Humeral and cellular Immunity.
d. Vaccines, Routine immunization schedule.
e. Antibiotics- Definition and classification of antibiotics.

**INTERNAL ASSESSMENT** (Refer Direction)

| **Total Marks** | **20** |
|---|---|

**PRACTICALS-**

| **Total Marks** | **40 + 10** |
|---|---|
| Experiment -1 | 10 |
| Experiment -2 | 10 |
| Spotting | 10 |
| Record | 05 |
| Viva | 05 |
| IA | 10 |

1. Examination of slides of microorganisms- Staphylococci, Streptococci, Mycobacterium Tuberculosis, E-coli, Malarial Parasite, Filarial Parasite.
2. Urine examination- Physical and Chemical examination like sugar, Albumin,Acetone & bile salts.
3. Estimation of Haemoglobin percentage by Sahli's and Haemometer.
4. Study of life cycle of parasites by charts. (Entamoeba Histolytica, Roundworm, Plasmodium vivax and Plasmodium falciparum, WuchereriaBancrofti)

**INTERNAL ASSESSMENT**

| **Total Marks** | **10** |
|---|---|

Survey on communicable or non-communicable diseases in your locality.

**REFERENCES-**


1. Textbook of Paediatrics- Aghor
2. Community Health and Nursing- BasavanPhappa B.T.
3. Textbook Microbiology for Nurses- Baveja C.P.
4. Practical Pathology- Chaturvedi O.U.
5. Textbook of Medicine- P.C. Das
6. Handbook of Paediatrics- Desai
7. Hygiene and Public Health- Ghosh P.
8. Textbook of Preventive and Social Medicine- K. Park
9. Textbook of Preventive and Social Medicine- J.E. Park
10. Essentials of Community Health Nursing- J.E. Park
11. Textbook of Obstetrics and Gynaecology- D.C. Dutta
12. Textbook of Medical Microbiology- Anantnarayan.

# RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

# Scheme of Teaching and Examination for Master of Science (M.Sc.) in Mathematics

**Two Year (Four Semester) Post Graduate Choice Based Credit System Degree Program in Mathematics as per NEP-2020 with effect from Academic Year 2023-24**

2/8/2023

## Credit distribution structure for two years Post Graduate Program in Mathematics*:

| Year (2 Yrs. PG) | Level | Sem. (2 Yr) | Major | | RM | OJT/FP | RP | Cum. Cr. | Degree |
|---|---|---|---|---|---|---|---|---|---|
| | | | Mandatory | Electives | | | | | |
| I | 6.0 | Sem. I | 14 (3 Theory + 1 Practical) | 4 | 4 | -- | -- | 22 | PG Diploma (After 3 Yr Degree) |
| | | Sem. II | 14 (3 Theory + 1 Practical) | 4 | -- | 4 | -- | 22 | |
| Cum. Cr. For PG Diploma/ I year of PG | | | 28 | 8 | 4 | 4 | - | 44 | |
| Exit option: PG Diploma 44 credits after three-year degree | | | | | | | | | |
| II | 6.5 | Sem. III | 14 (3 Theory + 1 Practical) | 4 | -- | -- | 4 | 22 | PG Degree (After 3 Yrs. UG or PG degree after 4-Yrs UG) |
| | | Sem. IV | 12 (3 Theory) | 4 | -- | -- | 6 | 22 | |
| Cum. Cr. For II year of PG | | | 26 | 8 | -- | -- | 10 | 44 | |
| Cum. Cr. For 2 year of PG degree | | | 54 | 16 | 4 | 4 | 10 | 88 | |

***Source:** शासन निर्णय क्रमांक :एनईपी-२०२२/प्र. क. ०९/विशि-३ शिकाना दिनांक १६ मे ,२०२३

# Table I: Scheme of Teaching and Examination for First Semester M.Sc. Mathematics (CBCS) Program

| Structure and Credit distribution for M.Sc. Mathematics Semester-I | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Category | Code | Title of Course | Teaching Scheme (Hours /Week) | | | Credits | Examination Scheme | | | | | | |
| | | | | | | | Duration (hrs.) | Maximum Marks | | Total Marks | Minimum Passing Marks | | |
| | | | Theory | Practical/Project | Total | | | Semester End Examination (SEE) | Continuous Internal Evaluation (CIE) | | Theory | Practical | |
| Mandatory (DSC) | MMT1T01 | Paper M1: Algebra | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT1T02 | Paper M2: Topology | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT1T03 | Paper M3: Ordinary Differential Equations | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT1P01 | Practical 1: Computation with C/C++ | -- | 4 | 4 | 2 | 3 | 50 | 50 | 100 | -- | 50 | |
| Elective 1 (DSE) | **Select any one** | | | | | | | | | | | | |
| | MMT1T04 | Paper M4: (A) Integral Equations | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | | Paper M4: (B) Fuzzy Mathematics | | | | | | | | | | | |
| | | Paper M4: (C) Equivalent MOOC Course | | | | | | | | | | | |
| RM | MMT1T05 | Paper M5: Research Methodology in Mathematics | 3 | -- | 3 | 3 | 3 | 60 | 15 | 75 | 30 | --- | |
| | | Practical on Research Methodology | -- | 2 | 2 | 1 | 2 | -- | 25 | 25 | -- | 10 | |
| | | **Total** | **20** | **4** | **24** | **22** | **--** | **430** | **170** | **600** | **190** | **60** | |

# Table II: Scheme of Teaching and Examination for Second Semester M.Sc. Mathematics (CBCS) Program

| Structure and Credit distribution for M.Sc. Mathematics Semester-II | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Category | Code | Title of Course | Teaching Scheme (Hours / Week) | | | Credits | Examination Scheme | | | | | | |
| | | | | | | | | Maximum Marks | | | Minimum Passing Marks | | |
| | | | Theory | Practical/Project | Total | | Duration (hrs.) | Semester End Examination (SEE) | Continuous Internal Evaluation (CIE) | Total Marks | Theory | Practical | |
| Mandatory (DSC) | MMT2T06 | Paper M6: Real Analysis | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT2T07 | Paper M7: Differential Geometry | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT2T08 | Paper M8: Advance Numerical Methods | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT2P02 | Practical 2: Numerical solutions with Computer Programming | -- | 4 | 4 | 2 | 3 | 50 | 50 | 100 | -- | 50 | |
| Elective 2 (DSE) | **Select any one** | | | | | | | | | | | | |
| | MMT2T09 | Paper M9: (A) Classical Mechanics | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | | Paper M9: (B) Operation Research | | | | | | | | | | | |
| | | Paper M9: (C) Equivalent MOOC Course | | | | | | | | | | | |
| OJT/FP | MMT2P03 | Practical 3: On Job Training/FP | -- | 8 | 8 | 4 | 6 | 50 | 50 | 100 | -- | 50 | |
| | | **Total** | **16** | **12** | **28** | **22** | **--** | **420** | **180** | **600** | **160** | **100** | |

*Exit option: One year PG Diploma will be awarded (44 credits) after three-year UG degree course subject to the completion of 4 credits on Job training/Internship in major subject during summer break after M Sc Semester-II.*

# Table III: Scheme of Teaching and Examination for Third Semester M.Sc. Mathematics (CBCS) Program

| Structure and Credit distribution for M.Sc. Mathematics Semester-III | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Category | Code | Title of Course | Teaching Scheme (Hours /Week) | | | Credits | Examination Scheme | | | | | |
| | | | | | | | | Maximum Marks | | | Minimum Passing Marks | |
| | | | Theory | Practical/Project | Total | | Duration (hrs.) | Semester End Examination (SEE) | Continuous Internal Evaluation (CIE) | Total Marks | Theory | Practical |
| Mandatory (DSC) | MMT3T10 | Paper M10- Complex Analysis | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- |
| | MMT3T11 | Paper M11- Functional Analysis | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- |
| | MMT3T12 | Paper M12- Advance Mathematical Methods | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- |
| | MMT3P04 | Practical 4: Python Programming | -- | 4 | 4 | 2 | 3 | 50 | 50 | 100 | -- | 50 |
| Elective 3 (DSE) | **Select any one** | | | | | | | | | | | |
| | MMT3T13 | Paper M13: (A) General Theory of Relativity | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- |
| | | Paper M13: (B) Fluid Dynamics | | | | | | | | | | |
| | | Paper M13: (C) Equivalent MOOC Course | | | | | | | | | | |
| Research Project | MMT3P05 | Research Project (Minor) | -- | 8 | 8 | 4 | 6 | 50 | 50 | 100 | -- | 50 |
| | | **Total** | **16** | **12** | **28** | **22** | **--** | **420** | **180** | **600** | **160** | **100** |

# Table IV: Scheme of Teaching and Examination for Fourth Semester M.Sc. Mathematics (CBCS) Program

| Structure and Credit distribution for M.Sc. Mathematics Semester-IV | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Category | Code | Title of Course | Teaching Scheme (Hours /Week) | | | Credits | Examination Scheme | | | | | | |
| | | | | | | | Duration (hrs.) | Maximum Marks | | Total Marks | Minimum Passing Marks | | |
| | | | Theory | Practical/Project | Total | | | Semester End Examination (SEE) | Continuous Internal Evaluation (CIE) | | Theory | Practical | |
| Mandatory (DSC) | MMT4T14 | Paper 14: Dynamical System | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT4T15 | Paper 15: Measure and Integration Theory | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | MMT4T16 | Paper 16: Partial Differential Equations | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| Elective 4 (DSE) | **Select any one** | | | | | | | | | | | | |
| | MMT4T17 | Paper 17: (A) Cosmology | 4 | -- | 4 | 4 | 3 | 80 | 20 | 100 | 40 | -- | |
| | | Paper 17: (B) Number Theory | | | | | | | | | | | |
| | | Paper M17: (C) Equivalent MOOC Course | | | | | | | | | | | |
| Research Project | MMT4P06 | Research Project (Major) | -- | 12 | 12 | 6 | 6 | 100 | 100 | 200 | -- | 100 | |
| | | **Total** | **16** | **12** | **28** | **22** | **--** | **420** | **180** | **600** | **160** | **100** | |

## Elective Papers:

In addition to the mandatory theory papers, the student has to opt for ONE elective paper in each semester from the basket of elective papers mentioned in the following table.

**Basket for Elective Courses (4 Credits each)**

| Semester | Course Category | Name of the course | Course Code |
|---|---|---|---|
| I | Elective | M4: (A) Integral Equations<br>M4: (B) Fuzzy Mathematics<br>M4: (C) Equivalent MOOC Course | MMT1T04 |
| II | Elective | M9: (A) Classical Mechanics<br>M9: (B) Operation Research<br>M9: (C) Equivalent MOOC Course | MMT2T09 |
| III | Elective | M13: (A) General Theory of Relativity<br>M13: (B) Fluid Dynamics<br>M13: (C) Equivalent MOOC Course | MMT3T13 |
| IV | Elective | M17: (A) Cosmology<br>M17: (B) Number Theory<br>M17: (C) Equivalent MOOC Course | MMT3T17 |

The students can opt either the elective paper taught in the college in offline mode or any other equivalent online course of at least 4 credits offered by MOOC or any other such GOI platform. The equivalence of such courses will be decided by "Select Committee" of the BOS in Mathematics comprising "Chairman and at least Two members of BOS.

## Instructions for On Job Training/Field Project:

On job training or a Field Project is a skill based practical program. The objective of this program is to allow the student to gain vocational training in academics/ research/industry based on mathematical concepts. It is also aimed to encourage the student to take-up a life-time vocation based on the program he/she is pursuing. On-job training/field work will also allow the student to work in team and gain experience, which will be helpful in his/her future endeavors.

This program can be carried out in two ways:

**(A)** Training in external research Institute/ National Institute/ Industry/ Company based on mathematical applications. This program can be carried out with one External Mentor from the sponsoring Institute and Internal Mentor from the Department of Mathematics of the

College during M.Sc. Sem-II program. However, this should be not at the cost of the attendance in the regular classes and other departmental activities during the session.

**(B)** Alternatively, the student can take-up a field-based project that can be assigned by the Internal Mentor from the Department only during M.Sc. Sem-II program. However, such project will be based on field activity that will lead to skill enhancement. The work carried out by the student has to be submitted to the HOD of the Department in the form of Project Report duly signed by the Internal Mentor.

In any case, the student will complete the on-job training/field project during the vacation after the examination of M.Sc. Semester-II but before the commencement of Semester III.

In order to earn credits, the total duration of on-job training/field project will be 120 hours, which normally can be completed in twenty days by working for 6 hours per day. At the end of the on-job training/field project, the student will submit a report containing the details of the work carried out during the current session. The report will be signed by the student, his/her immediate Internal/External mentor during the tenure and the Head of the institute/organization. The report should contain a certificate (printed on the letter head of the institute/organization) issued by the Head of the institute/organization substantiating that the student has worked for 120 hours as an on-job trainee/undertook a field project. The student will be evaluated for the completion of on-job training/field work on the basis of report submitted by him/her and the power point presentation made by him/her in the presence of internal and external examiner during the semester end examination.

## Research Project Scheme / Guidelines for the Students and Supervisor:

Every student is required to carry out a research project related to any topic/application/ extended topic of the syllabus of Mathematics. It may be in the form of *a new research work* or *review of the topic based on research publications*. Student shall refer peer reviewed original research publications and based on findings, write a summary/Abstract of the same. On the basis of this work, student must submit the Project work must be submitted in the form of spiral/hard bound book, typed on one side of the paper containing at least 80 (Eighty) pages. The project work shall comprise of Introduction, Review of literature, Significance and Objective of the study, Methodology, Discussion, Conclusion and References along with the declaration by the candidate that the work is original and not submitted to any University or Organization for award of the degree and certificate by the supervisor and forwarded through Head / Course-coordinator of Centre or the Principal of the College.

**Research Project Supervisor:**

A person selected by the duly constituted Selection Committee in mathematics and approved by the University, exclusively for P.G. course. OR A person selected by the duly constituted Selection Committee in the relevant subject and approved by the University as a full-time regular teacher at U.G. level with Ph. D. OR a Scientist of government or private research laboratory appointed by university as a contributory teacher and having Ph. D. degree in Mathematics can supervise the research project of the student. The topic for the project work shall be assigned to the student by supervisor at the beginning of the respective semester.

## Scheme of Evaluation and Distribution of Marks:

**(1) Continuous Internal Evaluation (CIE) in Theory: Total Maximum Marks 20/ (15 for RM)**

(A) **Unit Tests**: Maximum Marks 12 / (10 for RM). Duration of Examination: One Hour.
Pattern of Question Paper: Two offline descriptive Unit Tests each of 12 marks, One Multiple Choice Questions (MCQs) Online/Offline Test of 12 marks, their average be awarded to students.

(B) **Overall Participation**: Maximum Marks 08 / (05 for RM)

- Attendance in theory classes: 04/ (03 for RM),
- Seminar/Assignment/Power Point Presentation/Paper presentation in Conference/Workshops: 04/ (02 for RM).

**Note:** A student must have to secure minimum 50% marks in CIE. Failing so, he/she shall not be allowed to appear in Semester End Examination.

**(2) Semester End Examination (SEE) in Theory: Maximum Marks 80 / (60 for RM)**

**Theory Paper**: Maximum Marks: 80 / (60 for RM). Duration of Examination: Three Hours/ (Two Hours for RM).

- There shall be Four units in each theory paper.
- There shall be total Nine questions in each paper. Out of these Nine, there shall be Eight questions on Four units with alternative choice from the same unit and one compulsory question based on all four units i.e., Solve FIVE questions, choosing ONE from each unit and Question No. 9 is compulsory. Each question will carry 16 marks (12 marks for RM).

- Layout of the question paper

| Type of questions | | Pattern and Content | Marks allotted | Total maximum marks |
|---|---|---|---|---|
| Long answer/proof type questions | Question No. 1 or 2 | Either/Or (On Unit-I) | 16 | **80** |
| | Question No. 3 or 4 | Either/Or (On Unit-II) | 16 | |
| | Question No. 5 or 6 | Either/Or (On Unit-III) | 16 | |
| | Question No. 7 or 8 | Either/Or (On Unit-IV) | 16 | |
| Short answer/proof type questions | Question No. 9 | Based on all 4 units. [4 Sub questions: One from each unit] | 16 [4 marks for each sub-question] | |

**(3) Continuous Internal Evaluation (CIE) in Practical: Total Maximum Marks 50/ (25 for RM)**

| | | |
|---|---|---|
| College Practical Test | 30 Marks / (15 for RM) | - Evaluated by Internal |
| Internal Viva-Voce | 05 Marks / (03 for RM) | - Evaluated by Internal |
| Attendance in Practical | 05 Marks / (02 for RM) | - Evaluated by Internal |
| Practical Record | 10 Marks / (05 for RM) | - Evaluated by Internal |
| **Total** | **50 Marks/ (25 for RM)** | |

**(4) General Scheme for Distribution of Marks in Semester End Practical Examination**

| | | |
|---|---|---|
| Maximum Marks: | 50 | Time: 3 Hours |
| Exercise-1 | 20 Marks | - Evaluated jointly by Internal and External Examiner |
| Exercise-2 | 20 Marks | - Evaluated jointly by Internal and External Examiner |
| Viva-Voce | 10 Marks | - Evaluated by External |
| **Total** | **50 Marks** | |

**(5)General Scheme for Distribution of Marks in Semester End Research Project (RP) Examination**

The research project work will carry total 100/200 marks and will be evaluated by both external and internal examiner in the respective Department / Center / Affiliated College. The total 100 marks will have the following four components:

| | | |
|---|---|---|
| 1. Written Project work – | 30/60 marks | - Evaluated jointly by External and Internal |
| 2. Presentation of RP – | 10/20 marks | - Evaluated jointly by External and Internal |
| 3. Viva voce examination- | 10/20 marks | - Evaluated by External Examiner |
| 4. Internal Assessment- | 50/100 marks | - Evaluated by Internal Examiner |
| **Total** | **100/ 200 Marks** | |

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# RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

## As per National Education Policy 2020

# M.Sc. Mathematics

## Syllabus for Four Semester

## Post Graduate Degree Course in Mathematics

**M.Sc. Part I (Semester I and II)**

**With effect from**
**the Academic Year 2023-24**

# PROGRAM: M. Sc. Mathematics

***Program Outcome:***

***PO1. Critical Thinking:*** *Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.*

***PO2. Problem Solving:*** *Solve problems from the disciplines of concern using the knowledge, skills and attitudes acquired from mathematics/ sciences/social sciences/humanities.*

***PO3. Individual and Team Work:*** *Function effectively as an individual, and as a member or leader in diverse teams, and in wide variety of settings.*

***PO4. Ethics:*** *Understand multiple value systems including your own, the moral dimensions of your decisions, and accept responsibility for them.*

***PO5. Self-directed and life-long learning:*** *Demonstrate the ability to engage in independent and life-long learning in the broadest context socio-technological changes.*

***PO6. Design/Development of Solutions:*** *Design solutions for complex science problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.*

***PO7. Computational Thinking:*** *Understand data-based reasoning through translation of data into abstract concepts using computing technology-based tools.*

***PO8. Aesthetic Engagement:*** *Demonstrate and master the ability to engage with the arts and draw meaning and value from artistic expression that integrates the intuitive dimensions of participation in the arts with broader social, cultural and theoretical frameworks.*

***Program Specific Outcome****:*

*PSO1:* ***Rational Thinking****: Students be able to formulate and develop Mathematical arguments in a logical manner to unravel the gist hidden in the problem at hand.*

*PSO2:* ***Problem solving ability****: Student should be able to think in a critical manner to process the data, and develop Mathematical problem-solving ability.*

*PSO3:* ***Revisiting the question****: Students should be able to recall basic facts, important milestones, discoveries in Mathematics and inculcate habit of rational thinking by which the problem at hand can be revisited, time and again, that helps in solving it.*

*PSO4:* ***Analytical ability****: In the growing field of research, it is necessary for students to learn to use some packages like Matlab, Scilab, Mathematica, Maxima, etc, so that analytical tools be available to investigate the functions, problems through graphs,*

*programming, etc.*

*PSO5:* ***Numerical Ability****: Using packages, students can make programs to solve some problems of which exact solutions are not available, using tools of Numerical analysis.*

*PSO6:* ***Simulation Ability****: The problems that cannot be solved directly, can at times be solved through techniques of simulation by students.*

*PSO7:* ***Research****: Students thus motivated would prepare themselves for research studies in Mathematics and related fields.*

*PSO8:* ***Application****: Student will be able to apply their skills and knowledge in Mathematics to various fields of studies including, science, engineering, commerce and management etc.*

| M.Sc. Semester I (MATHEMATICS)<br>M1: ALGEBRA | | |
|---|---|---|
| Sem I<br>Paper - I<br>DSC<br>(Core)<br>Code:<br>MMT1T01 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be able to update their basics of Group Theory, Discuss on various topic of group in algebra.*<br>*CO2:* ***Elementary Skills****: Students will be able to understand the importance of Solvable and Nilpotent, Alternating groups.*<br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to equip students with necessary basic analytic skills for problem solving on Sylow theorems.*<br>*CO4:* ***Application****: By applying the principles of basic theorems of Algebra through the course curriculum, students can solve a variety of logical problems in science and engineering.* | Credit: 4<br><br>No. of hours 60 |

**SYLLABUS: ALGEBRA**

**Unit I – Structure theorem of groups:** Direct product of groups. Finitely generated abelian groups. Invariants of a finite abelian group. Sylow Theorems. Groups of order $p^2$ and pq.

**Unit II - Unique factorization domains and Euclidean domains:** Unique factorization domain. Principal Ideal domains. Euclidean domains. Polynomial rings over unique factorization domains.

**Unit III – Normal and Separable Extensions:** Irreducible polynomials and Eisenstein criterion. Adjunction of roots. Algebraic extensions. Algebraically closed fields. Splitting fields. Normal extensions. Multiple roots. Finite fields. Separable extensions.

**Unit IV – Galois theory and its application:** Automorphism groups, and fixed fields. Fundamental theorem of Galois theory. Fundamental theorem of algebra. Roots of unity and Cyclotomic polynomials. Cyclic extensions. Polynomials solvable by radicals. Ruler and compass constructions.

**Reference Books:**

**1.** Basic Abstract Algebra: Bhattacharya, Jain, and Nagpal, Second Edition, Cambridge University Press.
**2.** Topics in Algebra, I. N. Herstein, Second Edition, John Wiley. .
**3.** Abstract Algebra: David S.Dummit and Richard M. Foote, John Wiley.
**4.** Contemporary Abstract Algebra by J.A. Gallian, 4th Ed., Narosa, 1999.
**5.** Algebra by M. Artin, Prentice Hall Inc 1994.
**6.** Algebra, 3rd Edition by S. Lang, Addison-Wesley, 1999.

Suggested digital platform: NPTEL/SWAYAM/MOOCs

| M.Sc. Semester I (MATHEMATICS)<br>M2: TOPOLOGY | | |
|---|---|---|
| Sem I<br>Paper - II<br>DSC<br>(Core)<br>Code:<br>MMT1T02 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge:*** ***S****tudents will learn the basic concepts of topological space, metric spaces, product topology, closed sets, limit points and continuous function. Students will also get to know about interrelating these concepts with one another.*<br><br>*CO2:* ***Elementary Skills****: Students will study about the connectedness of topological spaces. They will get to know about connectedness on real line with standard examples*<br><br>*CO3:* ***Basic Analytic skills****: Students will study about covering spaces and relate it with compactness of the spaces. Students will gain analytical skill to relate compactness on real line, limit point compactness and local compactness.*<br><br>*CO4:* ***Application****: Students will be able to think critically and apply the knowledge of topological spaces in the study of analysis and will be able to prove the standard results regarding countability and separation axioms.* | Credit: 4<br><br>No. of hours 60 |

**SYLLABUS: TOPOLOGY**

**Unit I – Topological Spaces and Continuous functions** – Topological spaces, Basis for a topology, the product topology on X x Y, subspace topology, closed sets and limit points, Continuous functions, Product topology, The metric topology.

**Unit II - Connectedness**: Connected spaces, connected subspaces of the Real line, Components and local connectedness.

**Unit III – Compactness:** Compact spaces, compact subspaces of the Real line, limit Point Compactness, Local Compactness.

**Unit IV – Countability and separation axioms:** The Countability axioms, The Separation axioms, Normal spaces, The Urysohn Lemma, The Urysohn Metrization Theorem, The Tietze Extension theorem

**Reference Books:**

1. Topology: J. R. Munkres, (second edition), Prentice Hall of India, 2002.
2. Foundations of General Topology: W. J. Pervin, Academic press, 1964.
3. Topology by Dugundji, Prentice Hall of India, New Delhi, 1975.
4. Introduction to Topology and Modern Analysis: G. F. Simmons, Mc Graw Hill 1963.

5. General Topology: J. L. Kelley, Van Nostrand, 1995.
6. Introduction to general Topology: K. D. Joshi, Wiley Eastern Ltd. 1983
7. Counter Examples in Topology by L. Steen and J. Subhash, Holt, Rinehart and Winston, New York, 1970.
8. General Topology by S. Willard, Addison - Wesley, Mass., 1970

Suggested digital platform: NPTEL/SWAYAM/MOOCs

| M.Sc. Semester I (MATHEMATICS)<br>**M3: ORDINARY DIFFERENTIAL EQUATION** | | |
|---|---|---|
| Sem I<br>Paper - III<br>DSC (Core)<br>Code:<br>MMT1T03 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be able to study basic notions in Differential Equations and use the results in developing advanced mathematics.*<br><br>*CO2:* ***Elementary Skills****: Students will able to solve problems modeled using linear differential equations having ordinary points and regular singular points and solve them by method of power series.*<br><br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to equip students to develop techniques to solve differential equations that would help students sharpen their understanding of the Mathematical solutions with their characteristics.*<br><br>*CO4:* ***Application****: By applying the principles of basic tools through the course curriculum, students can solve a variety of practical problems involving ordinary differential equations in science and engineering.* | Credit: 4<br><br>No. of hours 60 |

**SYLLABUS: ORDINARY DIFFERENTIAL EQUATION (ODE)**

**Unit I – Linear Equations with variable coefficients**: Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The non-homogenous equations, Homogeneous equations with analytic coefficients, The Legendre equations.

**Unit II - Linear Equations with regular singular points**: The Euler equations, Second order equations with regular singular points, The Bessel equation, Regular singular points at infinity.

**Unit III – Existence and uniqueness of solutions to first order equations**: The method of successive approximations, The Lipschitz condition of the successive approximation. Convergence of the successive approximation, Approximations to solutions and uniqueness of solutions.

**Unit IV - Existence and Uniqueness of Solutions to System of first order ODEs**: An example- Central forces and planetary motion, Some special equations, Systems as vector equations, Existence and uniqueness of solutions to systems, Existence and uniqueness for linear systems, Green's function, Sturm Liouville theory.

**Reference Books:**


1) An introduction to ordinary differential equations by E. A. Coddington, (2012), Prentice Hall of India Pvt. Ltd. New Delhi.
2) Ordinary Differential equations by G. Birkoff and G. G. Rota, John Willey and Sons
3) Partial differential equations and boundary-value problems with applications by Mark Pinsky, AMS, 3rd edition (2011).
4) Differential Equations with Applications and Historical note by G. F. Simmons, McGraw Hill, Inc. New York. (1972)
5) Theory of ordinary differential equations by E. A. Coddington and Levinson, McGraw Hill, New York (1955)
6) Elementary differential equations by E. D. Rainvills, The Macmillan company, New York. (1964)


Suggested digital platform: NPTEL/SWAYAM/MOOCs

| M.Sc. Semester I (MATHEMATICS) PRACTICAL - I<br>**COMPUTATION WITH C /C++** | | |
|---|---|---|
| Sem I<br>Practical – 1<br><br>Code:<br>MMT1P01 | *Course Outcomes:*<br>*Upon successful completion, students will have the knowledge and skills to:*<br>*CO1. Execute C /C++ programs involving logical statements.*<br>*CO2. Operate Mathematical operations and Logical operators in determining the general output of the problem.*<br>*CO3. Determine roots of a cubic equation in general perspective.*<br>*CO4. Understand in depth nuances of programming that would help them gain confidence and avail them job opportunities.* | Credit: 2<br><br>No. of hours<br>60 |

(Minimum **15** programs be executed using C /C++ programming in Math Lab)

**List of topics for practical problems with C / C++ programming:**

*Write a C / C++ Program to:*

1. Calculate area of a Circle, Surface area and volume of a sphere
   when its radius (integer value) is given (floating point number with two decimal places).
   $\pi$ = 3.14 approx.
2. Check if a given Number is zero or positive or negative using if...else statement
3. Verify Wilson's theorem that a natural number $p > 1$ is a prime number if and only if
   $(p-1)! \equiv -1\ (mod\ p)$. Take $p$ as an input.
4. Find the Largest and Smallest Number (integer) among Three Numbers (integers) using IF. . . Else statement and Logical operator
5. Find whether a given character is a Vowel or Consonant. A character is taken as input.
   The character may be in Upper Case or in Lower Case.
6. Calculate the Sum of First and the Last Digit of a given Number.
7. Verify Fermat's Little Theorem: If $n$ is a prime number, then for every $a,\ 1 \leq a < n$,
   $a^{n-1} \equiv 1\ (mod\ n)$ .
8. Count total number of digits in a given Integer (N)
9. Write a C program to find sum of following series where the value of N is taken as input
   1+ 1/2 + 1/3 + 1/4 + 1/5 + . . . 1/N
10. Check whether the given number N can be expressed as Power of 2 or not.
    For example 32 can be expressed as 2^5.
11. Print the following Pyramid pattern up to Nth row. Where N (number of rows to be printed) is taken as input. For example, when the value of N is 5 the pyramid will be printed as follows

```
*****
****
***
**
*
```

12. Find prime numbers between 1 and 200.
13. Find the Fibonacci Sequence 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, ….
    and hence show ratio B/A converges to Golden ratio.
14. Read Two One Dimensional Arrays of same data type (integer type) and merge them
    into another One-Dimensional Array of same type.
15. Delete duplicate elements from an array of integers.
16. Print lower and Upper triangular matrices of a given square matrix.
17. Find roots of a quadratic equation, $a\,x^2 + b\,x + c = 0, a \neq 0$ with $a, b, c$ as input.

18. Find roots of a cubic equation, $a\,x^3 + b\,x + c = 0, a \neq 0$ with $a, b, c$ as input.
19. Find value of a determinant when 3×3 matrix is given as an input.
20. Find sum of all elements of each row of a matrix and trace of a diagonal matrix.

**Reference Books:**


1. Mathematical Algorithms:
   www. https://www.geeksforgeeks.org/mathematical-algorithms/

**2.** Let Us C : Authentic guide to C programming language (18th Edition) by Yashvant Kanetkar

**3.** Let Us C++ by Yashavant Kanetkar


| M.Sc. Semester I (MATHEMATICS) (ELECTIVE – I)<br>**M4: INTEGRAL EQUATIONS** (Option – A) | | |
|---|---|---|
| **Sem I**<br>**Paper - IV**<br>**DSE (Elective 1)**<br>**Code: MMT1T04** | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: The new concept of 'Integral Equations' will be introduced to students in which they will study different types of integral equations and various methods to solve them. Also, they will be taught integral transforms such as Hilbert transform.*<br><br>*CO2:* ***Elementary Skills****: Students will be able to understand integral equations with different types of kernel and will be able to recognize their solving methods.*<br><br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to teach student about integral equations and solving them using various transforms such as Laplace transform, Fourier transform, Hilbert transform, etc.*<br><br>*CO4:* ***Application****: By applying the solving techniques, students can solve Fredholm Integral equations, Volterra Integral equations, Non-linear Integral equations and Integro-differential equations.* | **Credit 4**<br><br>**No. of hours**<br>60 |

**SYLLABUS: INTEGRAL EQUATIONS**

**Unit I – Integral equations**: Preliminary concepts of integral equations. Some problems which give rise to integral equations. Conversion of ordinary differential equations into integral equations. Classification of linear integral equations. Integro-differential equations.

**Unit II – Solution of Integral equations:** Fredholm equations. Degenerate kernels. Hermitian and symmetric kernels. The Hilbert- Schmidt theorem.

Hermitization and symmetrization of kernels. Solutions of integral equations with Green's function type kernels.

**Unit III – Types of Integral equations:** Types of Volterra equations. Resolvent kernel of Volterra equations, Convolution type kernels. Some miscellaneous types of Volterra equations. Non-linear Volterra equations. Fourier integral equations. Laplace integral equations.

**Unit IV – Integral Transforms:** Hilbert transform. Finite Hilbert transforms. Miscellaneous integral transforms. Approximate methods of solutions for linear integral equations. Approximate evaluation of Eigen values and Eigen functions.

**Reference Books:**


1) Integral Equations: A short course: L. G. Chambers: International text book company Ltd, 1976.W. Klingenberg (Springer).
2) Linear integral equation, Theory and techniques, Academic press, New York 1971.
3) Linear Integral Equation, Theory and Techniques by R.P. Kanwal, Academic Press, N.Y. (1971).
4) Linear Integral Equations by S.G. Mikhlin, Hindustan Book Agency, (1960).
5) A First Course in Integral Equations by A.M. Viazwaz, World Scientific (1997).
6) Integral Equation: A Short Course by L.I.G. Chambers, International Text Book Company Ltd. (1976).
7) Integral Transform for Engineers by Larry Andrews, Bhimsen Shiramoggo,, Prentice Hall of India (2003).
8) Integral equations and boundary value problems by M. D. Raisinghania, S. Chand publication.


Suggested digital platform: NPTEL/SWAYAM/MOOCs

| M.Sc. Semester I (MATHEMATICS) (ELECTIVE – I)<br>**M4: FUZZY MATHEMATICS** (Option -B) | | |
|---|---|---|
| Sem I<br>Paper - IV<br>DSE<br>(Elective 1)<br>Code:<br>MMT1T04 | *Course Outcomes:*<br>*Upon successful completion, students will have the knowledge and skills to:*<br>*CO4. Interpret problems involving uncertainty and its quantification.*<br>*CO5. Understand fuzzy numbers and fuzzy arithmetic.*<br>*CO6. Implement fuzzy logic in various problems involving uncertainty.*<br>*CO4. Understand fuzzy systems and fuzzy control.* | Credit<br>4<br><br>No. of hours<br>60 |

**SYLLABUS: FUZZY MATHEMATICS**

**Unit I: Fuzzy Sets:**
Uncertainty, Imprecision and Vagueness, Fuzzy systems, Fuzzy Sets, Fuzzy Vs crisp set, Types of fuzzy sets, Operations on fuzzy sets, Extension principle of fuzzy sets.

**Unit II: Fuzzy equations:** Fuzzy numbers and arithmetic, Fuzzy equations, Lattice of fuzzy numbers, Fuzzy relations and fuzzy graphs, Fuzzy morphisms.

**Unit III: Fuzzy Inference:**
Fuzzy logic, Fuzzy connectives, Fuzzy inference, Fuzzy propositions, Fuzzy quantifiers, Inference from conditional fuzzy propositions.

**Unit IV: Fuzzy Control:**
Fuzzy systems and fuzzy control, Fuzzy rule-based system, Fuzzification and Defuzzification, Design of fuzzy controllers, Examples of fuzzy systems.

**Reference Books:**

1) Mathematics of Fuzzy Sets and Fuzzy Logic. Barnabas Bede, Springer.
2) Fuzzy Sets and Fuzzy Logic, theory and applications. George J. Klir and Bo Yuan,
Prentice Hall India.
3) Timothy J. Ross, Fuzzy Logic with Engineering Applications (Third Edition), Wiley, 2010.
4) Henri Prade, Fuzzy Sets and Systems Theory and Applications: Didier Dubois, Academic Press,1980.

| . Semester I (MATHEMATICS)<br>**M5: RESEARCH METHODOLOGY IN MATHEMATICS** | | |
|---|---|---|
| **Sem I**<br>**Paper - V**<br>**Research Code: MMT1T05**<br><br>(Mandatory) | Course Learning Outcomes:<br>*Upon successful completion, students will have the knowledge and skills to:*<br>*CO1. Recall and describe the fundamental concepts and principles of mathematics. Understand the research approaches and their significance in various fields and the different types of research designs and their characteristics.*<br>*CO2. Apply research methods and approaches to investigate mathematical phenomena.*<br>*CO3. Analyze the effectiveness and clarity of scientific communication and presentations.*<br>*CO4. Describe the roles and dynamics within a group process, including teamwork and collaboration.*<br>*CO5. Explain the concept of sponsored research and its implications for research ethics.* | **Credit 3**<br><br>**No. of hours**<br>45 |

| | | |
|---|---|---|
| | *CO6. Explain the basic principles of intellectual property rights (IPR) and their relevance in research* | |

**SYLLABUS: RESEARCH METHODOLOGY**

**Unit I: Research Process:**
Introduction, Philosophy of Mathematics, Pure Mathematics, Applied Mathematics. The current state and Prospects of Geometry and Nonlinear differential equations. Meaning, objective and motivation in research. Types of research. Research approaches and significance. Research process, criteria of good research, Challenges for research in India. Defining research problem. Research design, Hypothesis: Formation – Techniques – Testing, Methods of theoretical research. Scientific communication, Presentations.

**Unit II**: **Research Project**:
Problem and project-based learning, the group process. The project work process. Structure of Project report. Sponsored research, Ethics of research.

**Unit III: Intellectual Property Rights** (IPR): Types of IPR: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resource and Traditional Knowledge – Trade Secrets. IPR in India: Genesis and development. IPR in abroad - Major International Instruments concerning IPR: Paris Convention, 1883.

**Unit IV: Use of tools / techniques for Research**

Methods to search required information effectively, MS Word, MS Excel, Graph and chart preparation, MS Power Point, Software for paper formatting, LaTeX, Beamer presentation, Preparation of bibliography database, Software for detection of Plagiarism.

**Reference Books:**

1. Rama Nand Singh, *Research Methodology and Techniques in Mathematics*, Centrum Press,
New Delhi, India.
2. C.R. Kothari, *Research Methodology*, New Age International (P)Ltd., India.
3. John Kuda, *Research Methodology*: A Project Guide for University Students,
Samfunds Litterature.
4. B.L. Wadera, *Patents, trademarks, copyright, Designs and Geographical Judications*.
5. P. Narayanan (Eastern Law House), *Intellectual Property Law*.
6. Nithyananda, K V. (2019). *Intellectual Property Rights: Protection and Management in India*:
Cengage Learning India Private Limited.
7. Neeraj, P., & Khusdeep, D. (2014). *Intellectual Property Rights in India*:
PHI learning Private Limited.
8. Ahuja, V K. (2017). *Law relating to Intellectual Property Rights in India*:
Lexis Nexis.
9. *Journal of Intellectual Property Rights (JIPR): NISCAIR*

| M.Sc. Semester I: **PRACTICAL ON RESEARCH METHODOLOGY** | | |
|---|---|---|
| **Sem I Practical**<br><br>**Code: MMT1T05 P**<br>(Mandatory) | **Course Outcomes:** *Upon successful completion, students will have the knowledge and skills to:*<br>*CO1: Demonstrate installation and compilation of free Miktex software and Tex studio.*<br>*CO2: Implement their knowledge of Latex in preparing Tex documents which can be converted into .pdf or .dvi files*<br>*CO3: Prepare question papers of the examination*<br>*CO4: Develop research article as per the learnings from research methodology.* | **Credit 1**<br><br>**No. of hours**<br>15 |

**Syllabus for Practical II**

**RESEARCH METHODOLOGY IN MATHEMATICS**

(Note: **All** listed practical problems must be conducted in Mathematics Laboratory)

**List of topics for practical problems:**

Initially installation of Miktex, Tex Studio (or similar Latex software) and compilation of Tex document should be carried out.

1) Essay writing in Latex and developing its pdf
2) Writing 10 Mathematical formulas in Latex and its compilation
3) Preparing Resume in Latex for job prospects
4) Preparing question paper for examination
5) Beamer presentation on Intellectual Property Rights
6) Beamer presentation on Ethics of Research and research process
7) Latex document on Bibliography
8) Preparing Latex document with images
9) Preparing Latex document of research paper that includes section, subsection and bibliography
10) Preparing Latex document of research paper as per the requirement of the journal
11) Beamer presentation of Mathematical research paper

## MSc Sem – II (Mathematics) Syllabus follows:

| M.Sc. Semester II (MATHEMATICS)<br>**M6: REAL ANALYSIS** | | |
|---|---|---|
| Sem II<br>Paper - I<br>DSC (Core)<br>Code:<br>MMT2T06 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be able to update their basics knowledge in sequence, series, limit, continuity and differentiability.*<br><br>*CO2:* ***Elementary Skills****: Students will be able to understand the importance of uniform convergence and topological manifold.*<br><br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to equip students with necessary basic analytic skills for problem solving with functions of several variables.*<br><br>*CO4:* ***Application****: By applying the principles of basic tools through the course curriculum, students can solve a variety of practical problems involving Manifold, sub-manifold and differentiable manifold.* | Credit<br>4<br><br>No. of hours<br>60 |

**SYLLABUS: REAL ANALYSIS**

**Unit I – Sequence and Series of Function:** Uniform convergence. Uniform convergence
and continuity. Uniform convergence and integration. Uniform convergence and differentiation. Equi continuous families of functions. The Stone-Weierstrass theorem.
Algebra of functions.

**Unit II – Functions of Several Variables:** Differentiation. The Contraction Principle. The Inverse Function Theorem. The Implicit Function Theorem. The Rank Theorem. Partitions of unity.

**Unit III – Introduction of Manifold and Functions of Mapping:** The space of tangent vectors at a point of $R^n$. Another definition of Ta ($R^n$). Vector fields on open subsets of $R^n$. Topological manifolds. Differentiable manifolds. Real Projective space. Grassman manifolds. Differentiable functions and mappings.

**Unit IV – Differentiable Manifolds and Submanifolds:** Rank of a mapping. Immersion.
Sub manifolds. Lie groups. Examples of Lie groups. The action of a lie group on a manifold, Transformation groups. The action of a discrete group on a manifold, Covering manifold.

**Reference Books:**

1. Principles of Mathematical Analysis (Third Edition): Walter Rudin Mc GRAW – HILL Book Company.

**2.** An Introduction to Differentiable Manifolds and Riemannian Geometry: W. Boothby, Academic Press, 1975.
**3.** Methods of Real Analysis: R. R. Goldberg, John Wiley.
**4.** Introduction to Topological Manifolds (Second Edition): John M. Lee.
**5.** Mathematical Analysis by T. M. Apostal, Narosa.
**6.** Real and complex analysis by Walter Rudin.
**7.** Real analysis by Royden and Fitzpatrick.
**8.** Introduction to Smooth Manifolds by John M. Lee.
**9.** Structure and Geometry of Lie groups by Joachim Hilgert and Kari-Hermann Neeb

Suggested digital platform: NPTEL/SWAYAM/MOOC

| M.Sc. Semester II (MATHEMATICS)<br>**M7: DIFFERENTIAL GEOMETRY** | | |
|---|---|---|
| Sem II<br>Paper - II<br>DSC (Core)<br>Code:<br>MMT2T07 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be introduced to the fundamentals of Differential Geometry primarily by focusing on the theory of curves and surfaces in three-dimensional space.*<br>*CO2:* ***Elementary Skills****: Students will be study about the curves and their global properties. Students will get to know about Geodesic curve and its existence conditions.*<br>*CO3:* ***Basic Analytic skills****: Students will get the knowledge of fundamental quadratic forms of a surface, intrinsic and extrinsic geometry of surface, problem of Metrization and Triangulation.*<br>*CO4:* ***Application****: By applying various definitions, theorems and formulas, students can solve different problems based on curved surfaces and their curvatures. It can be further used to analyse shapes and data on non-flat surfaces.* | Credit<br>4<br><br>No. of hours<br>60 |

**SYLLABUS: DIFFERENTIAL GEOMETRY**

**Unit I –** Definition of surface. Curves on a surface. Surfaces of revolution. Helicoids.
Metric. Direction coefficients. Families of curves. Isometric correspondence. Intrinsic properties. Geodesics. Canonical geodesic equations.

**Unit II -** Normal property of geodesics. Existence theorems. Geodesic parallels. Geodesic curvature. Gauss Bonnet theorem. Gaussian curvature. Surfaces of constant curvature. Conformal mapping. Geodesic mapping.

**Unit III –** Second fundamental form. Principal curvatures. Lines of curvature. Developable. Developable associated with space curves. Developable associated with curves on surfaces. Minimal surfaces and ruled surfaces. Fundamental equations of Surface theory. Parallel surfaces.

**Unit IV -** Compact surfaces whose points are umbilics. Hilbert's lemma. Compact surfaces of constant Gaussian or mean curvature. Complete surfaces. Characterization of complete surfaces. Hilbert's theorem. Conjugate points on geodesics. Intrinsically defined surfaces. Triangulation. Two dimensional Riemannian manifolds. Problem of Metrization. Problem of continuation.

**Reference Books:**


1) An introduction to Differential Geometry by T. J. Wilmore; Oxford University Press.
2) A course in Differential Geometry by W. Klingenberg (Springer)
3) Geometry of curves and surfaces by do Carmo, Academic Press.
4) Riemannian Geometry and Tensor Calculus by Weatherburn C.,
   Schaum's Outline of trigonometry: Robert Moyer, Frank Ayres, 2012.
5) Differential Geometry a first course by D. Somasundaram, Narosa Publishing House, 2008.


| M.Sc. Semester II (MATHEMATICS)<br>**M8: ADVANCE NUMERICAL METHODS** | | |
|---|---|---|
| Sem II<br>Paper - III<br>DSC<br>(Core)<br>Code:<br>MMT2T08 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge: S****tudents will learn the basic methods and tools of numerical methods in root finding for linear and non-linear equations. They will learn about Newton's method, Muller's method and System of non-linear equations.*<br><br>*CO2:* ***Elementary Skills****: Students will develop skills in analysing the methods of interpolation for a given data using polynomial interpolation, Newton's divided difference, forward differences and Hermite interpolation.*<br><br>*CO3:* ***Basic Analytic skills****: Students will develop skills to approximate a function using appropriate theorems and numerical methods as a solution to the problems.*<br><br>*CO4:* ***Application****: Students will be able to think critically to use Trapezoidal rule, Simpson's rule and Newton cotes integration formula for solving Mathematics modelling problems. They will be able to compare results of the problems by different methods.* | Credit<br>4<br><br>No. of hours<br>60 |

Suggested digital platform: NPTEL/SWAYAM/MOOCs

**SYLLABUS: ADVANCE NUMERICAL METHODS**

**Unit I – Solution of Algebraic and Transcendental equations:**
Absolute, relative and percentage errors. Method of False position, Rate of convergence of Regula-Falsi Method. Newton-Raphson Method for non-repeated real roots and for real multiple roots, and near multiple roots, Rate of convergence of Newton-Raphson formula.
Generalized Newton's method. Ramanujan's Method. Graffe's root-squaring method. Birge-Vieta Method. Lin-Bairstow Method for finding complex roots of a polynomial.

**Unit II – Interpolation Theory:** Finite differences: Forward, backward and central, Difference of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae: Gauss's, Stirling's, Bessel's, Everett's formula. Relation between Bessels' and Everett's formulae. Practical interpolation. Interpolation with unevenly spaced points: Lagrange's and Hermite's interpolation formula. Newton's general interpolation formula. Inverse interpolation. Method of successive approximation. Double interpolation.

**Unit III – Least squares, Splines, Numerical Integration:** Least square curve fitting procedures: Fitting a straight line, multiple linear least square, curve fitting by polynomials and sum of exponentials. Spline functions: Linear splines, Quadratic splines, cubic splines. Numerical Integration: The Trapezoidal rule and Simpson's $1/3^{rd}$ and $3/8^{th}$ rule, Romberg Integration, Newton- Cotes integration formulae.

**Unit IV – Numerical Solution of Differential Equations:** Ordinary Differential Equations: Euler's method, Error estimates for Euler's method, Modified Euler's method, Runge-Kutta $2^{nd}$ and $4^{th}$ order methods. Predictor-Corrector methods: Adams-Moulton method, Milne's method, Simultaneous and higher order differential equations. Partial differential equations: Solution of Laplace's equation by Jacobi's method and Gauss-Seidel method, heat equation in one dimension.

**Reference Books:**

1. Finite Differences and Numerical Analysis by H. C. Saxena, S, Chand and Company Ltd, New Delhi.
2. Introductory methods of Numerical Analysis by S. S. Sastry, fifth edition, 2012, PHI Learning private limited, New Delhi.
**3.** An Introduction to Numerical Analysis by K. E. Atkinson, Johan Wiley and sons, Inc.
4. An introduction to numerical Methods and Analysis, by James F. Epperson

5. Schaum's Outline of Numerical Analysis by Francis Scheid.

Suggested digital platform: NPTEL/SWAYAM/MOOCs

| MSc Semester- II: PRACTICAL: 2<br>**NUMERICAL SOLUTIONS WITH COMPUTER PROGRAMMING**<br>( MATLAB / R PROGRAMMING / PYTHON, etc.) | | |
|---|---|---|
| Sem II<br>Practical - III<br><br>Code:<br>MMT2P02 | **Course Outcomes:** *Students will able to:*<br>*CO1: Learn about the application of numerical method.*<br>*CO2: Understand Newton's method, Muller's method and solve System of linear and non-linear equations.*<br>*CO3: Find the errors in the solution so obtained by various methods.*<br>*CO4: Derive Numerical integration using Trapezoidal rule, Simpson's rule, Newton-Cotes formulae.*<br>*CO5: Apply approximate numerical methods to solve the problems with more accuracy.*<br>*CO6: Learn how to obtain solution of ordinary and partial differential equations numerically.*<br>*CO7: Compare different methods in numerical analysis efficiently.* | Credit<br>2<br><br>No. of hours<br>60 |

**SYLLABUS FOR PRACTICAL – III:**
**NUMERICAL SOLUTIONS WITH COMPUTER PROGRAMMING**
(Minimum **15** programs be executed in Math Lab using one of the software MATLAB / R PROGRAMMING / PYTHON, etc.)

**List of topics for practical problems:**

*Write a computer program to*:

1. Find a real root of the equation $2x = log_{10}x + 7$ between 3 and 4 correct to 3 decimal places by regula-falsi method. Then generalize the program for any equation whose real root lie between a and b.
2. Find a real root of a cubic equation using Newton-Raphson method, correct to four decimal places.
3. Find a double root of the equation $x^3 - x^2 - x + 1 = 0$ by generalized Newton's formula.
4. Compare Newton-Raphson method and regula-falsi method for finding a root of the same equation in terms of rate of convergence.
5. Evaluate $\sqrt{12}$ by applying Newton's formula correct to three decimal places. Generalize the program.
6. Obtain cube root of positive integer N and verify it for 12 by Newton's formula.

7. Find the smallest root of the equation $x^3 - 9\,x^2 + 26x - 24 = 0$ , by Ramanujan's method, generalize the program.
8. Develop Forward Difference Table 3.2 as suggested in Reference 1.
9. Find the cubic polynomial which takes the values: $y(1) = 24, y(3) = 120, y(5) = 336$ and $y(7) = 720$, and hence in particular find $y(8)$ by Newton's interpolation formula.
10. Fit a curve of the form $y = \frac{x}{a+b\,x}$ to the following data $(3, 7.148), (5, 10.231), (8, 13.509), (12, 16.434)$. Generalize the program with input of data set.
11. Fit a straight line of the form $Y = a_o + a_1\,x$ to the data $(x_i, y_i)$:
$x_i = 1, \quad 2, \quad 3, \quad 4, \quad 5, \quad 6$
$y_i = 2.4, 3.1, 3.5, 4.2, 5.0, 6.0$
12. Evaluate $I = \int_0^1 \frac{1}{1+x^2}\,dx$ correct to 3 decimal places by Trapezoidal and Simpson $1/3^{rd}$ rule with $h = 0.5, 0.25, 0.125$ respectively.
13. Evaluate $I = \int_0^1 \frac{1}{1+x}\,dx$ correct to 3 decimal places by Romberg's method
14. Match $I = \int_0^1 \sqrt{1 - x^2}\,dx = \frac{\pi}{4} = 0.785398163$ (approx.) by Trapezoidal and Simpsons rules (both) with number of subintervals 10, 20, 30, 40, 50.
15. Determine the value of $y$ when $x = 0.1$, given that $y(0) = 1$ and $y' = x^2 + y$ by Modified Euler's method.
16. Find $y(0.1)$ and $y(0.2)$ correct to 4 decimal places when $\frac{dy}{dx} = y - x$ and $y(0) = 2$ by $2^{nd}$ and $4^{th}$ order Runge-Kutta (R-K) methods, compare results.
17. Find $y(0.2)$ when initial value problem is given: $y' = 3x + \frac{y}{2}$; $y(0) = 1$ with h = 0.2, 0.1, 0.05 by Euler, Modified Euler and $4^{th}$ Order R-K method. Compare the results.
18. Find $y(0.8)$ and $y(1.0)$ by solving $y' = 1 + y^2$ with $y(0) = 0$ by $4^{th}$ order R-K method and correct these values by Milne's method.
19. Solve numerically the equation $y' = y + x$ with initial condition $y(0) = 1$ by Milne's method from $x = 0$ to $x = 0.4$ (Refer book by H. C. Saxena, Reference 2)
20. Solve $y' = xy$ for $x = 1.4$ when initially $y(1) = 2$ by $4^{th}$ order R-K method.

**Reference Books:**


1. Introductory methods of Numerical Analysis by S. S. Sastry, fifth edition, 2012, PHI Learning private limited, New Delhi.
2. Finite Differences and Numerical Analysis by H. C. Saxena, S. Chand and Company Ltd, New Delhi.
3. An Introduction to Numerical Analysis by K. E. Atkinson, Johan Wiley and sons, Inc.
4. An introduction to numerical Methods and Analysis, by James F. Epperson Schaum's Outline of Numerical Analysis by Francis Scheid.

| M.Sc. Semester II (MATHEMATICS) (Elective-II)<br>**M9: CLASSICAL MECHANICS (Option A)** | | |
|---|---|---|
| Sem II<br>Paper - IV<br>DSE<br>(Elective-2<br>MMT2T09 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be able to update their basics of variational principle.*<br><br>*CO2:* ***Elementary Skills****: Students will be able to understand the importance of Lagrange's equation of motion.*<br><br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to equip students with necessary basic analytic skills for problem solving using Lagrange's and Hamilton's equations of motion.*<br><br>*CO4:* ***Application****: By applying the course curriculum, students can solve a variety of practical problems in research.* | Credit<br>4<br><br>No. of hours<br>60 |

**SYLLABUS: CLASSICAL MECHANICS**

**Unit I: Variational principle and Lagrange's Equations**: Hamilton's principle, some techniques of the calculus of variations. Derivation of Lagrange's Equations from Hamilton's Principle. Extension of principle to nonholonomic systems. Conservation theorems and symmetry properties.

**Unit II: Hamilton's Equations of motion:** Legendre transformations and the Hamilton equations of motion, cyclic coordinates and conservation theorems, Routh's equations, Derivation of Hamilton's equations from a variational principle, the principle of least action.

**Unit III: Canonical transformations**: The equations of Canonical transformation, examples of canonical transformations. Symmetric approach to Canonical Transformation, Poisson's bracket and other canonical invariants.

**Unit IV: Hamilton-Jacobi theory:** Equations of motion. Infinitesimal canonical transformations and conservation theorems in the Poisson bracket formulation, the angular momentum poisson bracket relations. Hamilton-Jacobi theory for Hamilton's principle, and Hamilton-Jacobi theory for characteristic functions.

**References:**

1. Classical Mechanics, H. Goldstein, Second edition, Narosa Publishing House, New Delhi

2. Dynamics Part-II, A. S. Ramsey, the English Language Book Society and Cambridge University Press.

3. Classical Mechanics, Gupta, Kumar and Sharma

4. Classical Mechanics, N. C. Rana & P. S. Joag , Tata Mc Graw Hill

**5.** Classical Mechanics, L. M. Katkar, Shivaji University Kolhapur, 2007

| M.Sc. Semester II (MATHEMATICS) (Elective-II)<br>**M9: OPERATION RESEARCH** | | |
|---|---|---|
| Sem II<br>Paper - IV<br>DSE<br>(Elective-2)<br>Code:<br>MMT2T09 | *Course Outcomes:*<br>*CO1:* ***Foundational Knowledge****: Students will be able to update their basics of computational procedures of Linear Programming Problem.*<br><br>*CO2:* ***Elementary Skills****: Students will be able to understand the importance of efficient computational procedures. Revised simplex method is a modification of the simplex method and students would know that it is economical on computer as it computes only relevant information.*<br><br>*CO3:* ***Basic Analytic skills****: The main outcome of the course is to equip students with necessary basic analytic skills for problem solving using a modified computational procedure.*<br><br>*CO4:* ***Application****: By applying the Revised simplex method and Network techniques through the course curriculum, students can solve a variety of practical problems in business, research and development, production & investment Marketing and engineering.* | Credit<br>4<br><br>No. of hours<br>60 |

**SYLLABUS: OPERATION RESEARCH**

**Unit I – <u>Linear Programming Problem-Advanced Techniques</u>:** Simplex Method, Revised Simplex Method (with and without artificial variables). Post optimality Analysis by changes in (i) objective function, (ii) requirement vector, (iii) coefficient matrix. Addition and deletion of variables, addition of constraints.

**Unit II - <u>Integer programming</u>:** Pure and mixed integer programming problem. Gomory's cutting plane algorithm. Fractional cut method-All integer L. P. P. and mixed integer L. P. P. algorithms. Branch and Bound method.

**Unit III – <u>Bounded variables in LPP</u>:** Bounded variable techniques for L. P. P., unconstrained optimization. Constrained optimization with equality constraints-Lagrange's multiplier method. Interpretation of Lagrange multiplier. Constriained optimization with inequality constrained-Kuhn-Tucker conditions.

**Unit IV - <u>Network Scheduling by PERT/CPM</u>:** Network flow problems. Minimal spanning Tree problem. Shortest Route problems. Network basic components. Logical sequencing. critical path analysis. Program Evaluation and Review technique (PERT) and Critical Path Method (CPM).

**<u>Reference Books:</u>**


1) Operations Research: Kanti Swarup, P. K. Gupta and Man Mohan: S. Chand and Sons, New Delhi

2) Operation Research: Theory and Applications, by J. K. Sharma, Macmillan, 1997.

3) Introduction to Operations Research, by F. S. Hillier, G. J. Lieberman, McGraw-Hill, 2001

4) Operations Research: Theory, Methods and Applications, by S. D. Sharma, H. Sharma, Kedar Nath, Ram Nath, 1972


Suggested digital platform: NPTEL/SWAYAM/MOOCs

| M.Sc. Semester II (MATHEMATICS) PRACTICAL - 3<br>**ON JOB TRAINING / FIELD PROJECT** | | |
|---|---|---|
| Sem II<br>Practical -IV<br><br>Code:<br>MMT2P03 | *Course Outcomes:*<br>*On completion of course, Students will be able to:*<br>*CO1: Acquire hands on training*<br>*CO2: Know different aspects of the Institute/Industry involved in it*<br>*CO3: Learn how to work in Team set up*<br>*CO4: Develop aspiration to work up the ladder in the Institute/ Industry* | Credit<br>4<br><br>No. of hours<br>120 |

## INSTRUCTIONS FOR ON JOB TRAINING / FIELD PROJECT

Total:120 hours (8 hours per week) Total:100 Marks

On job training or a Field Project is a skill based practical programme. This program can be carried out in two ways:

1. Training in external research Institute/ National Institute/ industry/ company based on mathematical applications. This program can be carried out with one External Mentor

from the sponsoring institute and Internal Mentor from the Department of Mathematics of the College. The student has to undergo training of 120 hrs during M.Sc. Sem-II programme. The work carried out has to be submitted to the Head of the Department in the form of Project Report duly signed by the External Mentor and Internal Mentor. Continuous Internal Evaluation (CIE: 50 marks) will be assigned jointly by the two mentors while Semester End Examination (SEE: 50 marks) will be based on presentation of the work and viva by External Examiner appointed by university.

2. A field-based project can be assigned by the Internal Mentor from the Department only. However, such project will be based on field activity that will lead to skill enhancement. The work carried out has to be submitted to the HOD of the Institute/College in the form of Project Report duly signed by the Internal Mentor. Continuous Internal Evaluation (CIE: 50 marks) will be assigned by the Internal Mentor while Semester End Examination (SEE; 50 marks) will be based on presentation of the work and viva by External Examiner appointed by the University.

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2/8/2023