BOT 406

Cytology and Genetics

Unit I. Chromatin organization:

i. Chromosome structure and packaging of DNA.

ii. Nucleosome organization, DNA Structure (A, B and Z forms)

iii. Organization of centromere and telomere.

iv. Karyotype analysis and the banding patterns.

v. Special types of chromosomes- Polytene, Lampbrush, B-chromosome and sex chromosomes.

vi. Molecular basis of chromosome pairing.

Unit II. Structural and Numerical alterations in chromosomes:

i. The origin, meiosis and breeding behaviour of duplication, deficiency, inversion, translocation heterozygotes, haploids, aneuploids and autopolyploids.

ii. The allopolyploids and evolution of major crop plants.

Unit III. Mutation:

i. Spontaneous and induced mutations.

ii. Physical and chemical mutagens.

iii. Molecular basis of gene mutations.

iv. Transposable elements and mutation induced by transposons.

v. Site directed mutagenesis.

Unit IV. DNA damage and repair mechanism.

i. DNA damage and repair mechanism.

ii. Initiation of cancer at cellular level. Proto-oncogenes and oncogenes.

Unit V. Cytogenetics of aneuploids and structural heterozygotes:

i. Effect of aneuploids on plant phenotypes.

ii. The use of monosomics and trisomics in chromosome mapping of diploid and polyploid species.

iii. The breeding behavior and genetics of structural heterozygotes.

iv. The complex translocation heterozygotes.

v. Robertsonian translocation.

vi. B-A translocation.

Unit VI. Genetics of prokaryotic and eukaryotic organelles:

i. **Phage and Bacterial Genetics** —mapping of the bacteriophage genome, genetic recombination in phage, transformation, transduction and conjugation in bacteria

ii. Genetics of mitochondria and chloroplast, cytoplasmic male sterility.

iii. Gene fine structure. Cis-trans test, introns and their significance, RNA splicing.

iv. Regulation of gene expression in prokaryotes and eukaryotes.

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Practical Based on 406

1. Induction of polyploidy in plants using colchicine. Different methods of application of colchicine.
2. Isolation of biochemical mutants following physical and chemical mutagenic
3. Isolation of chlorophyll mutants following physical and chemical mutagenic treatments.
4. Isolation of morphological mutants following physical and chemical mutagenic treatments.
5. Karyotype analysis in any two plant species.
6. Meiosis of complex translocation heterozygotes.
7. Meiotic behaviour of monosomy in plants & its effect.
8. Meiotic behaviour of trisomy in plants and its effect.
9. Mitotic/ meiotic chromosomal behaviour in mutagen treated materials.
10. Orcein and Feulgen staining of the polytene chromosomes of Chironomus.
11. Study of chromosome pairing and disjunction in translocation heterozygote.
12. Utilization of banding technique for identification of chromosomes in karyotype.

Suggested Readings :

1. Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. I989. Molecular Biology (Ed.) Garland Publishing Inc. New York.
2. Atherly, A. G., Girton, J. R. and McDonald, J. F. 1999. The Science of Genetics. Saunders College USA.
3. Burnham, C. R. 1962. Discussions in Cytogenetics, Burgess Publishing Co., Minnesota.
4. Busch. H. and Rothblum, L. 1982 Volume X. The cell nucleus: DNA part A, Academic Press.
5. Hartl, D. L. and Jones E. W. 1998. Genetics: Principles and Analysis (4^{ih} Ed.) Jones and Barew Publishers, Massachusetts, USA.
6. Khush, G. S. 1973. Cytogenetics of Aneuploids, Academic Press, New York, London.
7. Karp, G. 1999. Cell and Molecular Biology; Concepts and Experiments, John Wiley and Sons Inc. USA.
8. Lewin, B. 2000. Genes VII. Oxford University Press, New York, USA. Lewis, R. 1997. Human Genetics: Concepts and applications (2^{nd} Ed),WCB, McGraw Hill, USA.

9. Malacinski, G. M. and Friefelder, D. 1998. Essentials of Molecular Biology (3rd Ed.), John and Bartlet Publishers Inc. London. Russel, P. J. 1998. Genetics (5th Ed) The Benjamin / Cummings Publishing Company, Inc. USA.
10. Snustad, D. P. and Simmons, M. J. 2000. Principles of Genetics (2nd Ed.), John Wiley and Sons Inc. USA.

BOT 407

Plant Development & Reproduction

Plant Development

Unit I. **i. Meristems:** Organization of shoot and root apical meristem, various theories, Cytological and Molecular analysis of SAM, control of tissue differentiation especially Xylem and Phloem.

ii. Tissue systems: Differentiation and functions of different tissue systems such as epidermis, parenchyma, chlorenchyma, sclerenchyma, laticifers and glands.

Unit II. **i. Vascular tissues:** Origin, structure and functions Xylem and Phloem elements and their taxonomic significance, Wood development in relation to Environment.

Unit III. **i. Leaf:** Growth and differentiation, differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll.

ii. Root: Initiation and development; lateral roots, root hair, root microbe Interaction.

Plant Reproduction

Unit IV. i. **Flower:** Structure and development

ii **Pollination:** Types of pollination, attractions and rewards of pollination, pollination mechanism and vectors, breeding systems, structure of pistil, pollen interaction and fertilization.

Unit V. **i. Male gametophyte:** Structure of anthers, micro-sporogenesis, role of tapetum, male sterility, pollen germination, pollen tube growth and development, pollen storage, pollen allergy, pollen embryos.

ii. Female gametophyte: Ovule development, magasporogenesis, organization of the embryo sac. Structure of the embryo sac.

Unit VI. **i. Seed development and fruit growth:** Double fertilization, Endosperm development, Embryogenesis, Ultra-structure and nuclear cytology; Development of dicot and monocot embryos, poly-embryony, apomixes, embryo culture.

Practicals Based on BOT-407

1. Dermatology - trichomes and stomata and leaf anatomy of *Nerium, Terminalia* etc.
2. Mechanical tissues (Collenchyma, Sclerenchyma, Stone cells and Xylem) , Secretary tissues (Mucilage Canals, Resin canals, Nectaries, and oil glands), laticifers (Latex cells and Vessels).
3. Vascular tissues and its constituents by sections and maceration, wood anatomy, TS, TLS and RLS
4. Abnormal secondary growth in *Dracaena, Bignonia, Aristolochia, Achyranthus, Nyctanthus, Salvadora, Beta, Mirabilis, Tinospora.*
5. Study of microsporogenesis and gamtogenesis in sections of anthers.
6. Examination of modes of anther dehiscence and collection of pollen grains for
7. Microscopic examination (maize, grasses, *Crotolaria, Tradescantia, Brassica, Petunia, Solanum* etc.)
8. Test for pollen viability using stains and *in vitro* pollen germination using hanging drop and sitting drop cultures, suspension culture and surface culture.
9. Estimation of percentage and average pollen tube length *in vitro*
10. Pollen storage, pollen pistil interaction, *in vitro* pollination.
11. Study of ovules and embryo sacs.
12. Field study of types of flowers and pollination mechanism. .
13. Study of nuclear and cellular endosperms.

Suggested readings

Burjes, J. (1985). "An Introduction to Plant cell development Cambridge University Press, Cambridge.

Carlquist S (2001). Comparative Wood Anatomy, Springer-Verlag, Germany.

Chopra, V.L. (2001), 'Plant Breeding, Field Crops', Oxford, BH Pvt. Ltd, New Delhi.

Chopra, V.L. (2001), 'Plant Breeding; theory and practice', Oxford I BH Pvt. Ltd.

Cutler DF (1978). Applied Plant Anatomy, Longman, United Kindom

Cutter EG (1978) Plant Anatomy, Part I & II, Edward Arnold, United Kingdom.

Cutter, E.G. 1978 Plant Anatomy - Experiments and interpretations' Part I and II, Edward Arnold

Dickinson WC (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA.

Esau, K, 1965. "Plant Anatomy" (Second edition; 7th reprint 1991), Wiley Eastern, New Delhi.

Fahn A (1974) Plant Anatomy, Pergmon Press, USA & UK.

Fahn, A. (1977). Plant Anatomy' (3rd edition, 1982). Pergamon Press, Oxford.

Forster, A.S. 1960. 'Practical plant anatomy D.van Nostrand company. Inc.

Fosket DE. (1994) Plant, Growth and Development: A Molecular Approach, Academic Press.

Foskt D.E. 1994 'Plant growth and development' - A molecular approach Academic Press, Santiago.

Fritsch FE (1935, 1945). The Structure and Reproduction of Algae Vols. I and II. Cambridge University Press, Cambridge, UK.

Hopkins WG. (2006). The Green World: Plant Development, Chelsea House Publication

Howell SH. (1998) Molecular Genetics of Plant Development, Cambridge University Press.

Howell, S.H. 1998, Molecular genetics of plant development, Cambridge University Press, Cambridge.

Hyndon, R,F. 1990, Plant Development - The Cellular Basis Univ. Hyman, London.

improvement' Cambridge University Press. Cambridge.

Leyser O and Day S (2003) Mechanism of Plant Development, Blackwell Press

Mauseth JD (1988). Plant Anatomy, The Benjamin/ Cummings Publisher, USA

Murphy, T.M. and Thompson, WF. 1988 'Molecular plant development Prentice Hall, New Jersey.

Nair MNB (1998). Wood Anatomy and Major Uses of Wood, Faculty of Forestry, University of Putra Malaysia, Malaysia. 11

Procton, M. and Yeo, P. (1973), 'The pollination of flowers', William Collins Sons, London.

Raghavan V (1997). Molecular Embryology of Flowering Plants. Cambridge University Press.

Raghavan V (2000) Developmental Biology of Flowering Plants, Springer, Netherlands

Raghavan, V. (1999) 'Developmental Biology of flowering plants', Springier Verlag, New York.

Reven, P.H., Evert, R.F. and Eicbhom, S.E. 1992 'Biology of Plants' (5^{th} Edition), New York.

Richards AJ (1986) Plant Breeding System, George Allen and Unwin.

Roberts, L.W. 1976. Cyto-differentiation in plants, Cambridge University Press, Cambridge.

Shivanna KR (2003) Pollen Biology and Biotechnology, Science Publishers.

Shivanna, K.R. and John, B.M. (1985), 'The angiosperm pollen structure and function', Willey Eastern Ltd., New York.

Shivanna, K.R. and Rangaswamy, N.S. (1992), 'Pollen Biology: A laboratory manual', Springer Verlag, Berlin.

Shivanna, K.R. and V.K. Sarobney, (Ed) 'Pollen Biotechnology for crop production and

Sleeves, T.A. and Sussex, LM. 1989, 'Patterns in plant development *(*7^{th} edition) Cambridge Press, Cambridge.

BOT 408

Biotechnology

Unit I. Biotechnology: Basic concept, Historical, principles of tissue culture, Cellular totipotency, Discoveries of Plant Growth hormones in brief review, Contribution of Sir Gottlieb Haberlandt, Development of Tissue culture as a technique, Scope and Importance.

Unit II. Introduction to tissue culture: Tissue culture laboratory, Equipment's in Tissue culture laboratory, Preparation of Media, Media composition, Plant Growth Regulators and their Role, selection of media for specified applications, Selection of explant, Sterilization, Sterilizing agents, initiation of tissue culture

Unit III. Cellular totipotency: Media for initiation of callus, dynamics of callus growth, measurement of growth, organogenesis and factors controlling it, genome instability in reaction to morphogenesis, somaclonal variation and its applications.

Unit IV. Cell and organ culture: Plant organ culture; shoot tip, shoot apical meristem, root, leaf, flower and ovary culture, embryo rescue, factors influencing embryogenesis, suspension culture in stationary and stirred tank reactors, isolation of single cells and their culture, measurement of growth,

Unit V. Practical approaches of single cell culture: Somatic embryogenesis, protoplast isolation, regeneration of protoplasts and protoplasts fusion, Synthetic seeds, generation of cybrid and hybrids, cryopreservation of plant cells.

Unit VI. **Applications of tissue culture:** Applications in agriculture and Horticulture, Application in Forestry, Application of Tissue culture in pharmaceutical industry. *In situ* and *ex-situ* conservation. *In vitro* mutagenesis and its application. Production of transgenic plants

Unit. VII. Recombinant DNA technology: Gene cloning, Vectors, Role of *Agrobacterium*, Gene cloning techniques - Gene gun, Electroporation, Microinjection, Liposome mediated gene transfer, Ultra sonication and Pollen Mediated gene transfer.

Practicals based on 408

1. Equipment's required in Tissue culture Lab
2. Media preparation
3. Sterilization of media
4. Sterilization of explant.
5. Explant Culture.
6. Anther culture
7. Pollen culture,
8. Micropropagation.
9. Embryo rescue technique.
10. Somaclonal variation.
11. *In vitro* mutation.
12. Isolation of plant protoplasts and viability testing.
13. Protoplast fusion by PEG.
14. Tissue culture of Horticultural plant Banana.
15. Tissue culture of Medicinal plant.

Suggested readings:

1. Henry, R.J. Practical application of plant molecular Biology, Champman and Hall
2. Kalyan kumar De. Introduction to Plant Tissue culture,
3. Bhojwani, Plant Tissue Culture.
4. Montell S.H. Mathews, J.A., Meker, R.A. Principles of Plant Biotechnology.
5. Glover, D.M. and Hanes, B.D. (eds.) 1995. DNA cloning 1: A practical approach, core techniques , 2nd edition, PAS, IRL press at Oxford University Press.
6. Plant cell culture protocols. Humana Press, Inc. New Jersey, USA.
7. Shaw, C.H. (ed.) 1998, Plant Molecular Biology. A practical approach IRI Press, Oxford.
8. Smith, R.H. 2000. Plant Tissue culture: Techniques and Experiments. Academic Press, New York.
10. Susan R. Barnum (1998). *Biotechnology: an introduction*. Thomson Brooks/cole.
11. George Acquaah (2005). *Understanding biotechnology*. Pearson.
12. Biotechnology; P.K. Gupta

BOT 409

Plant Physiology and Metabolism

Unit I. Plant water relations: Water Potential, Absorption and Transpiration, Stomatal Physiology, Active and passive transport of solutes, Phloem loading and unloading, source-sink relationship, Physiology of plants under water stress.

Unit II. Enzyme: Nomenclature, Properties and classification of enzymes, Mechanism of Enzyme action, regulation of enzyme action, isoenzymes.

Unit III. Photosynthesis: Light and dark reactions, pigments and mechanism of light absorption, Photosystem I and II, Emerson enhancement effect, C3, C4 and CAM pathways, significance of C4 and CAM pathways, photorespiration, Photo synthetic productivity.

Unit IV. Respiration: Glycolysis, TCA cycle and its role in synthesis of bio-molecules Mitochondrial electron transport, oxidative phosphorylation, Pentose phosphate pathway, cyanide resistance, Bioenergetics principles.

Unit V. Nitrogen Metabolism: Nitrification and denitrification, Nitrate assimilation, Biological nitrogen fixation, Biosynthesis of amino acids - reductive animation and trans amination, Protein synthesis, classification of amino acids and proteins, amphoteric nature and zwitter ions, structure of proteins, protein denaturation, Isolation and purification of proteins.

Unit VI. Lipid Metabolism: Fatty acids, lipids, triglycerides, Saponification, oxidation of Fatty acids - alpha and beta oxidation.

Unit VII. Plant Growth: Growth curve, growth analysis, Plant Growth Regulating substance (PGRS), Gibberellins, Cytokinesis, Abscisic acid, Ethylene, role of PGRS in agriculture.

Unit VIII. Plant Development: Physiology of flowering, Phytochrome, flowers induction, Seed germination and dormancy, senescence and aging, stress physiology, vernalization and abscission.

Practicals Based On BOT- 409

1. Separation of chlorophyll pigments by paper and thin layer chromatography,
2. Spectrophotometry - Absorption spectrum for chlorophyll pigments extracted from green leaves.
3. Estimation of total chlorophyll, chlorophyll 'a' and chlorophyll b
4. Estimation of reducing sugars using Fehling's solution A and B.
5. Isolation of starch from potato.
6. Isolation of pectin form fruit rinds.
7. Hydrolysis of starch by acid and crude enzyme extract from germinating seeds.
7. Effect of temperature on permeability.
8. Difference between C3 and C4 plants- chlorophyll content and leaf anatomy.
9. Estimation of Ascorbic acid from fruit juice and germinating seeds.
10. Estimation of proline in normal plant and that under stress.
11. Separation of amino acids by paper and thin layer chromatography.
12. Chemical tests for protein.
13. Estimation of protein by Lawry's method.
14. Estimation of protein by Biuret method.
15. Isoelectric point of casein.
16. Immobilization of enzymes using sodium alginate.
17. Preparation of leaf protein concentrate (LPC) by heat coagulation method.
18. Iodine number of fat.
19. Saponification number of fat.
20. Growth analysis - RGR, NAR and LAI.
21. Biostatistics: mode, median, mean, range, mean deviation, standard deviation, coefficient of variation (C.V.) in simple or classified data (frequency distribution).

Suggested Readings :

1. Plant physiology: F.N. Salisbury and C.W. Ross, CBS Publishers and Distributors, New Delhi.
2. Principles of Biochemistry, A.L. Lehninger, CBS Publishers and Distributors, New Delhi.
3. Plant physiology: R.G.S. Bidwell, Mac Millan Publishers Co., New York.
4. Advnced plant physiology, M.B. Wilkins, English Language Book Society, London.
5. Principles of plant physiology, Bormer, J. and Galston, A.W.
6. Introductory plant physiology, Noggle G.R. and Fritz, G.S., Prentice Hall, USA.
7. Plant Water Relationships, Slyter, R.O. Academic Press, New York.
8. Plant physiology, D. Hess, Narosa Publishing House, New Delhi.
9. Elementary Biochemistry, Mertz, E.T. Vakils, Fetter and Simsons Pvt Ltd. Mumbai.

10. Essentials of Biological Chemistry, Fairley, J.L. and Kilgon, G.L., Earr west Press Pvt. Ltd., Delhi.
11. Plant physiology, Devlin, R.M. and Hostan, F.H., CBS Publishers and Distributors, New Delhi.
12. Plant Physiology, S.C.Datta, Willey Eastern Limited, Culcutta.
13. Plant Physiology, S. Mukharji, A.K.Ghosh, New Central Book Agencies, Kolkatta.
14. An Introduction to Biometry, A.M.Mungikar, Sarswati Printing Press, Aurangbad.
15. Biostatical Analysis, A.M.Mungikar, SarswatiPrinting Press, Aurangabad.
16. Laboratory Manual in Biochemistry, Jayraman, J., New Age International Publishers, Mumbai.
17. Experiment in Plant Physiology, D. Bajrachrys Narosa Publishing House, New Delhi.

BOT 410

Research Methodology - I

Unit I.: Microscopy: Light Microscopy, Phase contrast Microscopy, SEM & TEM, The flow cytometry and confocal microscopy in karyotype analysis.

Unit II.: Stains and Staining Procedures: Preparation and use of various stains used in Botany- Saffranine, Crystle Violet, Light Green, Erythrosine, Acetocarmine, Fuelgen, Basic Fucschin, Cotton Blue, Iodine, Sudan IV, Fluoroglucinol, Carbolic acid etc. Sectioning and Maceration, Microtomy and its staining.

Unit III.: Ethical and Legal issues of Research: Authentication of specimens, Legal permissions for collection of biological material from Local Biodiversity committees, Forest Department, State Biodiversity Board and National Biodiversity Authority.

Unit IV.: Plant Collection and Preservation –- Plant collection, Voucher specimens, Herbarium techniques, Liquid preservation etc. **Sampling of Plant materials** for Phytochemistry, DNA finger printing, Tissue Culture, Cytological, pathological studies etc.

Unit IV.: Biostatistics: i) Biostatistics used in analysis of data - mean, variance, standard deviation, standard error, coefficient of variation and 't' test, lay out of field experiments.

Unit V.: Laboratory Techniques: Ultracentrifugation, TLC, fractionation, Biochemical analysis, Electrophoresis, PCR, GISH, FISH techniques. Tissue culture technique, Spectroscopy,

Suggested Readings :

1. An Introduction to Practical Biochemistry-Third Edition- David T. Plummer. Tata Macgrew Hill
2. Senger R. S. Gupta Shalini, Sharma A. K., 2011, Laboratory Manual On Bioechonology- Studium Press India PVT LTD, New Dehli-2000
3. Paterson, D. D. 2008, Statistical Techniques in Agricultural research, J.V. Publishing House Jodhpur.
4. Jensen Wiliam A. 2015, Botanical histochemistry- Principles and Practice-Agri-Horti Press New Dehli.
5. Mungikar, A. M. 2003. Biostatical Analysis. Saraswati Printing Press. Aurangabad.

BOT 401

Cell Biology

Unit I .i.**Prokaryotic and eukaryotic Cell:** The ultra-structural details and comparative assessment.

Unit II i. Plasma membrane: Molecular organization, current models and functions. Cell wallarchitecture, biosynthesis, assembly, growth and cell expansion.

iiPlasmodesmata: Structure and role in movement of molecules andmacromolecules.

Unit III. i. Cytoskeleton: Organization and role of microtubules and microfilaments.Implications in flagellate and other movements.

ii. **Plant vacuole:**Tonoplast membrane, ATPases, transporters, as storageorganelle.

Unit IV. Chloroplast and Mitochondria: Ultrastructure, function and biogenesis. Theorganization of genome and patterns of gene expression.

Unit V. Nucleus: Microscopic and submicroscopic organization. Structure and function ofnuclear Envelope. The ultrastructure of nucleolus and its role in rRNA biosynthesis.

Unit VI. Ribosomes: Structure and site of protein synthesis. Mechanism of translation,details of initiation, elongation and termination. The structure and role of RNA.

Practicals based on Bot-401

1. To determine mitotic Index in different plant materials.
2. Karyomorpholpgical studies from slide/photograph.
3. Induction of mitotic abnormalities through chemical treatment.
4. Determination of chiasma Frequency in plants.
5. Fluorescence staining with FDA for cell viability and cell wall staining with calcoflour.
6. Demonstration of-SEM and TEM organelles.
7. Demonstration of acid phosphataes and succinic dehydrogenase activity in plants.
8. Localization of nuclear DNA by using Feulgen as a DNA specific stain.

BOT-402

Molecular Biology

Unit I. Cell signaling: Signal transduction, signaling pathways, second messengers, cAMP, genetic disorders ; due to the G protein defect. Lipid derived second messengers.Receptor tyrosine kinase and signaling pathway. Molecular biology of signaling.

Unit II. Other cellular organelles: Structure and functions of micro bodies,Golgi apparatus, Lysosomes and Endoplasmic reticulum.

Unit III. Proteinsorting: Targeting of proteins to organelles. Translocation of secretaryproteins across the ER membrane. The post translational modifications in RER.

Unit IV. Cell Cycle and its molecular aspects: Control mechanism, the role of cycline and cycline dependent kinases, Retinoblastoma and E_2F proteins. Cytokinesis and cell plateformation. Mechanism of programmed cell death (Apoptosis) and Senescens.

Unit V. Molecular Cytogenetics

i. Nuclear DNA Content: The C-value paradox, the COT value curve & its significance

ii. **Restriction mapping**: Concept and techniques, multigene families and their evolution.

iii. Computer assisted chromosome analysis, chromosome micro-dissection and micro cloning.

Practicals based on BOT-402

1. Demonstration of native and SDS PAGE profiles of seed proteins.
2. Isolation of plant DNA and its quantitation by spectrophotometric method.
3. Isolation of DNA and preparation of Cot curve.
4. Restriction digestion of plant DNA, its separation by agarose gel electrophoresis and visualization by ethidium bromide staining.
5. Isolation of RNA and its quantitation by spectrophotometric method.
6. Separation of plant RNA by agarose gel electrophoresis and visualization by ethidium bromide staining,
7. Demonstration of Western blotting.
8. Estimation of seed proteins by Lowry's method.

Suggested Readings (For BOT-401 & 402 Theory)

1. Lewin, B. 2000, Genes VII, Oxford University Press, New York.
2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D.I 999.Molecular Biology of the cell. Garland Publishing, Inc. New York.
3. Wolfe, S.L. 1993. Molecular and cellular biology. WodsworthPublishing Company, California, U.S. A.
4. De, D.N. 2000. Plant cell vacuoles. An introduction. CSIRO Publication,Collingwood, Australia.
5. Kleinsmith, I.J. and Kish, V.M. 1995. Principles of Cell and MolecularBiology (End Edition). Harper Collins College publishers, New York, U.S.A.
6. Lpdish, H., Berk, A., Zipursky, S.Z., Matsudaira, P., Baltimore, D. and Darnell,J., 2000. Molecular Cell Biology. (4^{th}Edition). W.H. Freeman and company, New York, U.S.A.

Review Journals

1. Annual review of plant physiology and molecular biology.
2. Current advances in Plant Sciences.
3. Trends in Plant Sciences.
4. Nature reviews: Molecular and Cell Biology.

Suggested Readings (For Course BOT401and 402 Practicals)

1. Click, B.R. and Thompson, J.E. 1998. Methods in Plant Molecular biology and biotechnology. CRCPress, BOCA RBTON Florida.
2. Glover, D.M. and Hames, B.D. (Eds.) 1995. DNA cloning I: A practical approach, Core techniques,first edition, TASIRL Press al Oxford University Press, Oxford.
3. Gunning B.E.S. and Steer, M.W. 1996. Plant cell biology, structure and function. Jones and BartletPublishers, Boston, Massachusetts.
4. Hackett, P.B., Funchs, J.A. and Messing, J.W. 1998. An Introduction to recombinant DNAtechniques: Basic experiments in gene manipulation. The Benjamin Cummings PublishingCompany, Inc. Memno Park, California.
5. Hall, J.L. and Moore, A.L. 1983. Isolation of membranes and organelles from plant cells. AcademicPress, London, U.K,
6. Harris, N. and Opataks, K. J. 1994. Plant Cell Biology: A practical approach. IRL Press at OxfordUniversity Press, Oxford, U.K.
7. Shaw, C.H. (Ed.) 1988. Plant Molecular Biology: A Practical Approach. IRL Press, Oxford.

BOT 403

(Biology and Diversity of Algae, Fungi and microbes)

UNIT- I. Algae:

- Introduction of phycology with special reference to Indian work.
- Algae in diversified habitats (Terrestrial, fresh water, marine)
- Criteria used in classification of algae, pigments, reserve food and flagella; and important systems of classification of algae.
- A general account of thallus organization, reproduction and life history of algae.
- Study of important groups of algae with reference to General account, cell structure and method of reproduction in
    - **Cyanophyta -** *Nostoc* and *Oscillatoria.*
    - **Chlorophyta**- salient features of Volvocales, Oedogonials and zygnematales (Desmids)
    - **Xanthophyta -** *Botridiuim, vaucheria.*
    - **Bacillariopyta -** *Diatoms.*
    - **Phaeophyta -** *Ectocarpus*.
    - **Rhodophyta -** *Batrachospermum.*
- Algal blooms, Role of Algae in human welfare, bio fertilizer.

UNIT- II. Fungi:

General Characters, Classification.

- Economic importance of fungi in medicine, Agriculture (Biopesticide andbiofertilizers), food (SCP. Mushrooms)
- Fungi as plant pathogen – General account of different groups and type study of fungi as pathogen.
    - Mastigomycotina - *Phytophora, albugo,*
    - Zygomycotina –*Rhizopus*,
    - Ascomycotina – *Claviceps, Erysiphae,*
    - Basidiomycotina – *Puccinia, Ustilago,*
    - Deuteromycotina – *Alternaria, Fusarium, Cercospora, Helminthosporium*.

UNIT- III. Bacteria:

General characters, ultrastcture, classification, koch's postulates, archaebacteria and eubacteria.

- Role of agrobacterium in GM crops.
- Citus canker.
- Angular leaf spot of cotton.

UNIT- IV. Phytoplasma: General Account, ultrastructure and economic importance

- Grassy shoot of sugarcane.
- Little leaf of brinjal.

UNIT- V. Viruses: General account, ultrasturcture and economic importance of viruses.

- TMV
- Papaya leaf curl.

Practicals: Based On BOT 403

(Biology and Diversity of Algae, Fungi and microbes)

Algae:

01. Collection and study of algae from different localities, Identification up to generic level.
02. Morphological study of algal forms: *Microsystis, Oscillatoria, Lyngbya, Nostoc, Anabacna,Scytonema, Tolypothrix, Rivularia, Gloeotrichia, Cahthrix, Chlamydomonas, Pandorina, Eudorina, Volvox, Hydrodictyon, Scenedesmus, Pedistruium, Ulothrix, Ulva, Odeogonium, Cladophora, Pithophora, Draparnaldia, Draparnidiopsis, Coleochaete, Cosmarium, Closterium, Caulerpa, Acetabularia, Chara, Nitella, Botrydium, Vaucheria, Pinnularia, Navicula, Fragillaria, Ectocarpus, Diciyota, Fucus, Batrachospermum, Polysiphonia, Corallina.*

Fungi and microbes:

01. Principal and working of instruments.
02. Preparation of Media, strains and Isolation of Bacteria and Fungi from soil and infected plant tissues and pure culture.
03. Gram staining of bacteria.
04. Morphology and Taxonomy of following fungi - *Albugo, Phytophthora, Mucor, Rhizopus, Plasmopara, Sclerospora, Taphrina, Phyllochora, ClavicepsChaetomium, Puccinia, Ustilago, Sphacelotheca, Agaricus, Polyporus,Volveriella, Cyaihus, Lycoperdon, Geaster, Alternaria, Aspergillus, Penicilliuin, Helminthosporium, Cercospora, Curvularia, Fusarium, Rhizoctonia, Coltetotrichutn, Phoma.*
05. Growth of Fungi on liquid and solid media — *Fusarium* and *Helminthosporium.*

06. Study of bacterial plant diseases - Citrus canker, Angular leaf spot of cotton, soft rot of fruits.

07. Study of Phytoplasma diseases - Little leaf of brinjal, Sesamumphyllody, Grassy shoot of sugarcane.

08. Study of viral plant diseases - Papaya mosaic, Tomato leaf curl, Yellow vein mosaic of Bhindi.

09. Collection and submission of fungal, viral, phytoplasma and bacterial diseases of plants.

Suggested Readings on BOT 403 Algae:

1. Chapman V.J. & DJ. Chapman (1983) The Algae, The MacMillan Press Ltd., London.

2. Desikachary T.V. (1959) Cyanophyta, 1CAR, New Delhi.

3. Fritsch F.E. (1961) The Structure and Reproduction of the Algae, Vol. I & H, CambridgeUniversity Press, London.

4. KumarH.D. (1988) Introductory Phycology, Affiliated East-West Press Pvt. Ltd., New Delhi.

5. Prescott G. W. (1969) The Algae: A Review, Thomas Nelson .and Sons Ltd., Melbourne.

6. Round F.E. (1981) The Ecology of Algae, Cambridge University Press, London.

7. Smith G.M. (1950) The fresh water algae of the United states, McGrawIIill Hoc Co., New York.

8. Vijayraghavan&SunitaKumari (1995) Chlorophyta, Bisen Singh M. P. Singh, Dehra Dun.

Suggested Readings — (Fungi and microbes)

1. U. Sinha and SheelaShrivastava (1985) An Introduction to Bacteria, Vikas Publishing House Pvt. Ltd., New Delhi.

2. Burgey's Manual of Systematic Bacteriology, Vol. 1-4(1986-1989) Williams & Wilkins, Baltimore.

3. J.P, Verma (1992) The Bacteria, Malhotra Publishing House, New Delhi,

4. A.J. Salle (1974) Fundamental Principles of Bacteriology, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

5. K.G.Hardy (1987) Plasmids - a Practical Approach, 1RL Press, Oxford, Washington D.C.

6. Bruce A. Voyles (2002) The Biology of Viruses, McGraw Hill, Boston.

7. LuriaS.E., J.E. Darnel!, D. Baltimore & A. Campbell (1978) General Virology, John Wiley *& Sons,* New York.

8. E.W. Mester, C.E. Roberts, M.M. Pearsall and B. J.McCarth- General Microbiology, Holt, Renehart& Winston, New York.

9. Powar&Daginawala (2004) General Microbiology Vol. II, Himalaya Publishing House, Mumbai.

10. R,F. Boyd (1984) General Microbiology, Times Mirror/Mosby College Publishing St. Louis.

11. S.B. Biswas & .Amrita Biswas (1993) An Introduction to Viruses, Vikas Publishing House Pvt. Ltd., New Delhi.

12. V.K. Gupta & M,K. Behl (1994) Indian Plant Viruses & Mycoplasma, Kalyani Publishers, Ludhiana.

13. S.P. Raychoudhari& T. K. Nariani (1977) Virus & Mycoplasma Diseases of plants in India, Oxford & IBH Publishing Co., New Delhi.

14. K.B. Deshpande& P.B, Papadiwal (1979) A Laboratory course in Bacteriology, COSIP-ULP - Botany Publication, Marathwada University, Aurangabad.

15. P.B. Papdiwal (1980) Biotechniques, COSIP- ULP - Botany Publication, Marathwada University, Aurangabad.

16. Alexopoulous C.J., C.W.Mims& M. Blakwel (1996) - Introductory Mycology, John Wiley & Sons Inc.

17. Dube H.C. (1994) - An Introduction to Fungi ,Vikas Publishing House, New Delhi.

18. Sharma P.O. (2000) - Microbiology and plant pathology, Rastogi Publication, New Delhi.

19. Mukadam D.S. (1997) 'The Illustrated Kingdom of Fungi', Aksharganga Publication, Aurangabad.

20. Mukadam D. S. (2004) - Modern Topics in Fungi, Saraswati Printing Press, Aurangabad.

21. Rangaswaini G. & A. Mahadevan (2001) - Diseases of Crop Plants in India., Prentice Hall of India, New Delhi.

BOT 404

(Taxonomy of Angiosperms)

UNIT- I: Angiosperms: Definition, its characteristic features and probable causes of theirevolutionary success. Taxonomy: Definition, scope, principles, aims and objectives of taxonomy. History of Botanical Explorations in Maharashtra with special reference to Marathwada.

UNIT- II: Phylogeny of Angiosperms: A general account of origin of Angiosperms with reference to timeand place and possible ancestors: euanthial theory (Bennettitales, Caytoniales, Cycadales) and pseudanthial theory (Pentoxylales, Glossopteridae).

UNIT- III: Criteria used for classification; phases of plant classification and brief history on account of artificial, natural, phylogenetic systems of classifications with special reference to Bentham and Hooker, Cronquist's system, Takhtajan's system and Broad outline of APG III (2009) system of classification and its merits and demerits.

UNIT-IV: Botanical Nomenclature: Concept of nomenclature, Binomial nomenclature and itsadvantages, formation of code, Melbourne Code 2011, Principles of International Code of Nomenclature of Algae, Fungi and Plants (ICN), ending of taxa names, Typification.Taxonomic literature: Flora, manuals, monographs, periodicals, dictionaries, indices,journals, pictorial encyclopedias and books.

UNIT-V: Taxonomic evidences: Morphology, anatomy, embryology, palynology, cytology, phyto-chemistry and numerical taxonomy. Taxonomic tools: Serological and molecular techniques, GIS, GPS, Use of computers in angiosperms taxonomy (Use of computer and data bases for identification of plants with the help of website). Herbarium Techniques, Major herbaria of the World and India. Contributions of Herbarium BAMU.

UNIT-VI: Causes of variations in population; Speciation, Species Concepts; Taxonomic Hierarchy.

UNIT-VII: Angiosperm Families: Nymphaeaceae, Hydatellaceae, Magnoliaceae, Papaveraceae, Malvaceae, Sapotaceae, Apiaceae, Asteraceae, Arecaceae and Poaceae.

Practicals Based on BOT-404

TAXONOMY OF ANGIOSPERMS

1. Morphology: Terminologies related to Habit and life span, root, stem, leaves, inflorescence,Flower, fruits.
2. Phytography: preparation of scientific botanical description of a plant specimen.
3. Study of at least 20 locally available families of flowering plants.
4. Identification of genus and species of locally available wild plants.
5. Preparation of botanical keys at generic level by locating key characters.
6. Knowledge of at least 10 medicinal plant species.
7. Demonstration of the utility for secondary metabolites in the taxonomy of someappropriate genera.
8. Field trips within and around the University Campus, compilation of field notes andpreparation of herbarium sheets of plants.
9. Botanical excursion of about one week duration to any botanically rich location preferableoutside the State.

Suggested Readings

1. Cole, A.J. 1969. Numerical Taxonomy. Academic Press. London.
2. Davis, P.H. and Heywood, V.H. 1973. Principles of AngiospermsTaxonomy. Robert E.KriegerPub. Co. New York.
3. Grant, V. 1971. Plant Speciation, Columbia, University Press, New York.
4. Grant, W.F. 1984. Plant Biosystematics, Academic Press, London.
5. Harrison, H.J. 1971. New concepts in Flowering Plant Taxonomy. Hieman Educational Book Ltd.,London.
6. Heslop-Harrison, J. 1967. Plant Taxonomy. English Language Book Soc. & Edward Arnold Pub.Ltd. U.K.
7. Heywood, V.H. and Moore, D.M. 1984.CurrentConcepts in Plant Taxonomy, Academic Press,London.
8. Jones, A.D. and Wilbins, A.D. 1971. Variations and Adaptions in Plant species. Hieman&Co.Educational Ltd. London.
9. Jones S.B. Jr. &Luchsinger,A.E. 1986. Plant Systematics, (2nd Edition) McGraw-Hill Book Co. NewYork.
10. Radford, A.E. 1986 Fundamentals of Plant Systematics. Harper & RawPublications, U.S.A.

11. Solbrig. O.T. &S olbrig D.J. 1979. Population Biology andEvolution. Addison wesley Publication Co. Inc.U.S.A.
12. Stebbins, G.L. 1974 Flowering Plant- EvolutionAbove Species Level. EdwardArnold Ltd,.London.
13. Stace,C. A. 1989. Plant Taxonomy and Biosystamatics. (2nd Edition)Edward Arnold,, London.
14. Takhtajan A. L. 1997. Diversity and Classification of Flowering Plants. Columbia University Press,New York.
15. Woodland D.W. 1991. Contemporary Plant Systematies.Prentice Hall, New Jersey.

BOT-405

Indian Constitution

BOT 501: BIOLOGY & DIVERSITY OF BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS

Unit I. Bryophytes: Systems of classification, distribution, Economic importance. Habitat, external and internal morphology, reproduction, gametophytes and sporophytes,phylogeny and interrelationships of the orders: Sphaerocarpales, Takakiales, Marchantiales and Jungermanniales,Anthocerotales, Sphagnales, Andreales and Bryales.

Unit II. Pteridophyta: Classification, Origin and evolution,Phylogenetic relationship with Bryophyta. Morphology, anatomy, phylogeny and interrelationships of the orders Psilopsida-Psilotales and Psilophytales,Lycopsida- Lycopodiales, Selaginellales, Isoetales, Equisetopsida – Equisetales and Pteropsida- Filicales.

Unit III. Sporophyte and gametophyte in Pteridophytes, Stelar organization and evolution,Origin of leaf and Telome concept, Sporocarp, Heterospory and seed habit, Comparison of Pteridophyta with Bryophyta and Gymnosperms.

Unit IV. Gymnosperms: Introduction, Classification and distribution of Gymnosperms, Morphology, anatomy, reproduction, phylogeny of the orders Pteridospermales (Caytoniaceae, Medullosaceae) Bennettitales (Williamsoniaceae, Cycadeoideaceae) Cycadales (Cycadaceae) Ginkgoales (Ginkgoaceae) Coniferales (Pinaceae, Araucariaceae) Taxales (Taxaceae) Gnetales (Gnetaceae) and Economic importance of gymnosperms.

Unit V. Paleobotany: Introduction, Contributions of Prof. Birbal Sahani, Geological time scale, Fossils and fossilization, Continental drift/ plate tectonics.

PRACTICALS BASED ON BOT 501: BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS

i. **Vegetative Organization:***Marchantia, Riccia, Anthoceros, Sphagnum,Polytrichum.*

ii. **Anatomical Organization:** *Marchantia, Cyathodium, Anthoceros, Sphagnum.*

iii. **Archegonia and Antheridia and their Organization:***Riccia, Marchantia, Anthoceros,Sphagnum.*

iv. **Sporophytes***: Riccia, Marchantia, Pellia, Anthoceros, Funaria, Sphagnum,Polytrichum.*

Pteridophytes: Morphological and anatomical studies of1) *Psilotum*2) *Lycopodium.* 3) *Selaginella,* 4) *Isoetis,* 5) *Equisetum,*6) *Ophioglossum,* 7) *Osmunda,* 8) *Gleichenia,* 9) *Pteris,* 10) *Adianium,*11) *Marselia,* 12) *Salvinia,* 13) *Azolla*and additional forms/speciescollected during study tour.

Gymnosperms : Study of the vegetative and reproductive parts, including anatomy of thefollowing genera : *Cycas, Zamia, Pinus, Cedrus, Taxodium, Cryptomeria,Cupressus, Thuja, Juniperus, Podocarpus, Cephalotaxus, Agathis, Araucaria,Taxus, Ginkgo, Gnetum.*

SUGGESTED READINGS:

Agashe, S. N. (1995) Paleobotany, Oxford & IBH, New Delhi

Bir, S. S. (2005) Pteridophytes their Morphology, Cytology, Taxonomy and Phylogeny.Today & Tomorrow's Printers and Publisher.

Biswas, C. and B. M. Johri (2004) The Gymnosperms, Narosa Publishing House, New Delhi

Campbell, C. J. (1940) Evolution of land Plants, Stanford University Press.

Coulter J. M. and C. J. Chamberlain (1978) Morphology of Gymnosperms, Central Book Depot, Allahabad

Eames, A. J. (1974) Morphology of Vascular Plants- lower groups, Tata Me Graw-Hill Publishing Co. New Delhi.

Foster, A. S. & F. M. Gifford (1967) Comparative morphology of vascular plants, Freeman Publishers, San Fransisco.

Kakkar, R. K. and B. R. Kakkar (1995) The Gymnosperms (Fossils and Living) Central Publishing House, Allahabad.

Kashyap S. R. (1932) Liverworts of Western Himalayas and the Plains.Vol. I & II, The University of Panjab, Lahore.

Parihar, N. S. (1991) Bryophytes, Central Book Dept., Allahabad.

Parihar, N. S. (1976) The biology and morphology of the pteridophyta, Central Book Depot, Allahabad.

PuriPrem (2005) Bryophytes Morphology, Growth and Differentiation- Pulisher- Atmaram and Sons New Delhi

Rashid, A. (1976) An introduction to pteridophyta, Vikas Publishing House Ltd., New Delhi.

SambamurtyA. V. S. S. , (2005) A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, Today & Tomorrow's Printers and Publishers

Sharma O. P. (2002) Gymnosperms, PragatiPrakashan, Meerut.

Sharma P. N. and Sahni K. C. (2005) Gymnosperms of India and Adjacent Countries Publisher-Bhishan Singh Mahendra Pal Singh, Dehradun

Tewari, Shiv Datt and GiriBala Pant (2005) Bryophytes of Kumaun Himalaya. Publisher-Bhishan Singh Mahendra Pal Singh- Dehradun

Siddiqui K. A. (2002) Elements of Paleobotany, KitabMahal, Allahabad.

Smith, G. M. (1976) Cryptogamic Botany - Vol. II, Tata Me Graw-Hill Publishing Co. Ltd. New Delhi.

Sporne, K. R. (1976) Morphology of Pteridophyta. Hutchinson University Library, London.

BOT 502: ECOLOGY & CONSERVATION

Unit I i. An introduction to plant ecology and its scope.

ii. **Structure of ecosystem:** Abiotic components (climatic factors, Topographic/factors, Edaphic factors); Biotic components (Interactions among organisms, Autotrophs and Heterotrophs) Ecological Pyramids (Pyramid of numbers, Biomass and energy)

iii.**Functions of ecosystem:** Productivity (Primary and secondary productivity, food chains, Grazing and detritus food chains) food webs. Biogeochemical cycles: C, N, P and S.

Unit IIi.**Community ecology:** Classification, Analysis of communities, characteristics of communities, species diversity, Growth form and structure, origin, development and composition.

ii.Competition and coexistence, intra-specific interactions, interspecific interactions, scramble and contest competition model, mutualism and commensalism,prey-predator interactions.

Unit IIi. **Biogeography:** Major biomes of the World -Terrestrial, Tundra, arboreal coniferous forests, temperate and tropical grasslands and deciduous forests, Mediterranean and Desert vegetation, Tropical rain forests; Aquatic Ecosystems- Fresh water, Estuarine and marine. Endemism and hotspots of biodiversity.

Unit IV.i. **Environmental pollution** in relation to air, water and soil. Use of fertilizer, pesticides andother chemicals in agriculture and hygiene and their disposal.

ii. Climate change: Greenhouse gases, their sources, trends and role, Ozone layer and its depletion (Global warming, Sea level rise, UV radiation) acid rain, Bioindicator and biomarkers of environmental health.

iii. Concepts of ecological management and sustainable development.

Unit V. i**. Biodiversity:** Concept, types and situation in India. IUCN categories.

ii. **Strategies of conservation**: *In situ* conservation, protected regions in India: Sanctuaries, National parks, Wetlands, Sacred groves, mangroves for conservation of wild biodiversity. *Ex situ* conservation: Principles and practices, Botanic gardens- Definitions, Criteria and types; Important Botanic Gardens in India and World, BGCI, gene bank, seed banks, cryobanks.

Unit VI.i. General activities of Botanical Survey of India **(BSI)** and National Bureau of plant Genetic Resources **(NBPGR)** for conservation efforts.

ii. Biological Diversity Act 2002; Forest Conservation Act 1980, Wild Life Protection Act 1972 and related international conventions.

PRACTICALS BASED ON BOT 502: ECOLOGY & CONSERVATION

1. To calculate mean, variance, standard deviation, standard error, coefficient of variation and to use 't' test for comparing two means related to ecological data.
2. To find out relationship between two ecological variables using co-relation and regression analysis.
3. To find out association between important grassland species using chi-square test.
4. To determine minimum size and number of quadrates required for reliable estimate of biomass in grassland.
5. To determine diversity indices (Shannon-Wiever concentration of dominance) for protected and unprotected grass land stands.
6. To estimate IVI of the species in a wood land using point centerquadrate method.
7. To determine soil moisture content, porosity and bulk density of soils collected from varying depths at different locations.
8. To determine the water holding capacity of soils collected from different locations.
9. To estimate the DO content in water samples by Winkeler's method.
10. To estimate chlorophyll content in SO_2 fumigated and non-fumigated plant leaves.
11. Visits to different ecosystems and submission of report.
12. Scientific visits to laboratories / Industries / Research Institutes working in conservation of plants and submission of report.

SUGGESTED READINGS:

Ambasht, R. A. (1990) A text book of Plant Ecology, Students Friends & Co., Varanasi.

Benny Joseph (2005) Environmental Studies, Tata McGraw Hill Publishing Co., Ltd., New Delhi.

Conklin, A. R. Jr. (2004) Field Sampling: Principles and Practices in Environmental Analysis. CRC Press.

Fahey, T. J. and Knapp, A. K. (2007) Principles and Standards for Measuring PrimaryProduction. Oxford.

Grant, W. E. and Swannack, T. M. (2008) Ecological Modeling. Blackwell.

Koromondy, E. J. (2005) Concepts of Ecology.4th Ed. Prentice Hall of India, New Delhi.

Muller, Dombosis, D. and H. Ellenberg (1974) Aims and methods of vegetation ecology, Wiley, New York.

Mungikar, A. M. (2003) Biostatistial Analysis. Saraswati Printing Press. Aurangabad.

Odum E. P. (1971) Fundamentals of Ecology, Saunders, Philadelphia.

Rajagopalan, R. (2005) Environmental studies, Oxford University Press, New Delhi.

Ramkrishna, P. S. (2001) Ecology and Sustainable Development. National Book Trust, New Delhi.

Sharma, P. D. (2001) Ecology and Environment, Rastogi Publications. Meerut.

Stiling, Peter. (2004) Ecology- Theories and Applications.4th Ed. Prentice Hall of India, New Delhi.

Trivedi, P. R. (1999) Encyclopedia of Ecology and Environment. Vol. 1 - 10, Indian National Green Party, New Delhi.

Trivedi. R. K., Goel P. K., Trisal C. L. (1998) Practical Methods in Ecology and Environmental Science: Enviro-media Publisher, Karad

Wilkinson, D. M. (2007) Fundamental Processes in Ecology: An Earth system Approach. Oxford.

Wyse Jackson, P. S. and Sutherland, L. A. (2000) International Agenda for Botanic Gardens in Conservation, Botanic Garden Conservation International (BGCI) UK

Yadav, Manju (2003) Ecology. Discovery Publishing House, New Delhi.

WEBSITES:

www.nbaindia.org

www.envfor.nic.in

www.moef.nic.in

www.bgci.org.uk

www.bsi.nic.in

www.bsienvis.nic.in

www.nbpgr.ernet.in

www.maharashtrastatebiodiversityboard.gov.in

www.iucn.org

www.iucnredlist.org

www.iucnredlistecosystems.org

www.conservation.org

www.biodiversity-a-z.org

BOT-521- (Elective-A)
Crop genetics and Plant breeding-I

Unit I: Crop genetic resources: Importance of genetic Conservation, global network for genetic conservation and utilization in major crops of the world. Institutes engaged in conservation and improvement of crop genetic resources.

Unit II: Food supplies, nutrition and crop breeding: World food situation, nutritional problems, Nutritional objectives.

Unit III: Methods of plant breeding: Introduction, selection, (Pure line selection, W. L. Johansons experiments on beans and their significance, Variety acclimatization, genetic significance of pollination methods, methods of breeding self and cross pollinated crops and asexually and vegetatively propagated crops.

Unit IV: Incompatibility in plant breeding: Types, nature, characteristics genetic and biochemical basis, methods of induction and overcoming, incompatibility as a tool in breeding crops.

Unit V:

1. Male sterility: Definition and classification, Male sex expression and chemical Induction of male sterility, perspectives.

2. Back cross: Genetic basis, Methodology in selection to character under transfer, Transfer of two or more characters, Inter-varietal. Inter-specific and intergeneric transfer.

BOT 522 – (Elective –A)
Crop genetics and plant breeding - II

Unit I Heterosis breeding: i) Historical aspects, ii) Interbreeding depression, iii) Homozygous and heterozygous balance, iv) Genetic basis of inbreeding, v) Genetic and physiological basis of heterosis, vi) Heterosis and plant breeding.

Unit II. Mutagenesis and Mutation Breeding:

A. **Mutagenesis:** Spontaneous mutations, mutation frequency, Physical mutagens, ionizing and non-ionizing radiations, radio-sensitivity, cytological and genetic effects, chemical mutagens, mutagenic compounds, mode of action, molecular basis of mutations. Ames test.*In - vitro* site directed mutagenesis

B. **Mutation Breeding:** i) Historical perspective, ii) The nature and chemical basis of mutation, iii) Physical and chemical mutagenesis, iv) Mutagenic treatment schedules, v) Screening of mutation in population, vi) Frequency and spectrum of mutants, micro and macro mutants, vii) mutagenic effectiveness and efficiency, viii) environmental mutagenesis repair mechanism, ix) Role of mutations in crop improvement programme.

Unit III.

1. **Resistance breeding:**

A. Disease resistance-nature, mechanism of resistance, methodology problems and achievements.

B. Insect resistance: Nature, mechanism of resistance, methodology, problem and achievements.

C. Drought resistance, importance, types, nature of resistance methods and examples.

2. **Quality breeding:** A. Nature of quality B. Genetic and biochemical basis C. Genetic manipulation of quality and quantity.

Unit IV. Distant Hybridization: a) Importance, b) Interspecific, intergeneric gene transfers, methodology, problem and remedial measures, c) Man made species.

Unit-V. Seed production and distribution: Introduction variety evaluation, variety maintenance, availability of new varieties, seed production and regulation, seeds industry development. Breeding crops with special reference to Marathwada region like wheat. Jowar, Bajra, Cotton, Groundnut, Safflower etc.

PRACTICALS BASED COURSE – BOT 521 AND BOT 522 (ELECTIVE A)

1. Study of floral biology of different crop plants.
2. Demonstration of hybridization technique in self and cross pollinated crops.
3. Study of pollen germination and demonstration of incompatibility.
4. Demonstration of male sterility in Jowar.
5. Study of pollen fertility.
6. Study of pollen viability.
7. Karyotype analysis in crop plants.
8. Aneuploid analysis in crop plants.
9. Induction of polyploidy in crop plants.
10. Study of seed protein profile by native and SDS-PAGE.
11. Estimation of oils from edible oil crops.
12. Estimation of leaf proteins, seed proteins in diploids and polyploids.
13. Mutagenesis**:** Introduction of mutations through physical / Chemical mutagenic treatments and raising M_1 & M_2 generations. Assess in the effect of mutagens on different M_1 parameters and M_2 chlorophyll viable mutant frequency and spectrum.
14. Study of mutagenesis data published in different journals and arriving at logical conclusions by providing theoretical reasons.
15. Designing of filed experiments.

SUGGESTED READINGS

1. Plant Breeding - B. D. Sitigi.
2. Plant Breeding - J. R. Sharma.
3. An Introduction of plant breeding - H. K. Chaudhary.
4. Evolution of crop plants -Edited by Simmonds N. W (1986)
5. Breeding field crops - Poehlrnann and Sleper.
6. Plant Breeding perspectives - Edited by Sheep and Mendnkasen.
7. Crop Breeding, P. B. Vose and S. G. Blixt
8. Genes. Chromosomes and Agriculture.Chrispels and Simmonds.
9. Principles of Genetics - Snusted and Simulants.
10. Manual of mutation breeding by FAO/IAEA.
11. Mutation Research -Aurebach.
12. Chemical mutagenesis - Fishbeiri et al.
13. Discussions in cytogenetics. Burnhan C. R. 1962 -
14. Genetics - Principles and analysis. Khush G. S. 1973 -
15. Genetics Principles and analysis. Haiti and Jones 1998 -
16. Molecular biology of the gene. Watson J. D. 1989

BOT- 521 – (Elective B)

Plant Pathology-I

Unit I. Nature, origin and evolution of parasitism: Interrelationship of parasitism and pathogenicity; physiology of pathogenicity; Natural process of pathogenesis, evolution of parasitism and pathogenicity. Effect of environment on different classes of parasitism; law of host - parasite balance, host genetics in relation to type of pathogenicity; search for effective disease control.

Unit II. Plant disease diagnosis:

Field observations, laboratory investigations, isolation and purification of plant pathogens, Koch's postulates; identification of plant pathogens.

Unit III Classification of Plant diseases:

Based on crop plants, symptoms, causal organisms.

Unit IV. Symptoms, etiology and disease cycle of diseases caused by:

a) Mastigomycotina:

Damping off of seedlings, Rhizome rots of ginger, early blight of potato, white rust of crucifers, Downy mildew of Bajra, Downy mildew of grapes.

b) Ascomycotina:

Stem galls of coriander, leaf spot of turmeric, powdery mildew of grapes, Ergot of Bajra.

Unit V. Symptoms, etiology and disease cycle of diseases caused by

a) Basidiomycotina :

Loose smut of wheat, Bunt of wheat, Kernel bunt of Rice, Head smut of Jowar, Grain smut of Jowar, Whip smut of sugarcane. Rust: Rust of wheat, Rust of Bajra, Rust of groundnut

Unit VI. Symptoms, etiology and disease cycle of diseases caused by Deuteriomycotina:

Early blight of potato, leaf spot of crucifers, tomato and brinjal caused by *Alternaria*, Tikka disease of groundnut, *Helminthosporium* leaf spot on Rice; Blast of Rice, Red rot of sugarcane Die back of chilli, Wilt of Pigeon pea, Panama disease of Banana, Blight of gram, *Rhizoctonia* stem rot of crops.

BOT- 522 – (Elective B)

Plant Pathology-II

Unit I. History: Beginning of modern plant pathology; Contribution of Anton De Bary; Benedict Prevost; J.C. Kuhn; M.S. Woromin; B.C. Stakman; Paul Neergaard, P.H. Gergory, K.C. Mehta. History of the development of plant pathology in India; plant disease clinics.

Unit II. Agents of infections and diseases:

i. Biotic agents: Bacteria, viruses, fungi, mycoplasma, nematodes.

ii Abiotic agents: Air pollution; mineral elements, temperature, toxic effects of improperly used chemicals.

Unit III. Phytoplasma diseases: Symptoms and disease cycle of little leaf of brinjal; Sesamum phyllody, Witches broom diseases, Grassy shoot of sugarcane.

Unit IV. Viral diseases: Symptoms produced by viruses on plants, study of plant virus disease; Tobacco mosaic, leaf curl of tomato, papaya mosaic, yellow vein mosaic of bhendi, Bunchy top of Banana, Tristeza of citrus.

Unit V. Bacterial diseases: symptoms of bacterial diseases on plants. Study of bacterial diseases: Angular leaf spot of cotton, citrus canker, Gummosis,, of sugarcane, Bacterial wilt of solanaceous vegetables. Halo blight of bean, Soft rots of fruits.

Unit VI. Non parasitic diseases: Non infectious diseases of plants, Nutritional deficiencies, Blossom rot of tomato, mango black tip, zinc deficiency of citrus.

Unit VII. Dispersal of plant pathogens: Direct transmission; Indirect transmission; Plant disease epidemiology; Some important epiphytotics; Methods used in plant disease forecasting.

Unit VII. Enzymes of plant pathogens: Cell wall degrading enzymes; Proteolytic enzymes - Macerating enzyme, Polygalacturonase, Pectin esterase; trans-aminase and their role in disease development. Cellulolylic enzymes and their role in disease development.

Practical Course-Bot 521 and 522(Elective B)

1. Collection and preservation of diseases specimens.
2. Symptomology, histopathology of disease given in theory.
3. Virulence test for pathogens.
4. Production and assay of macerating enzymes.
5. Production and assay of polygalactronase, cellulolytic enzymes, amylase.
4. Visits to fields for study of diseases.

Suggested readings Bot 521 and 522(Elective B)

1. Agrios, G.N. (1969) Plant Pathology, Academic Press, New York.
2. Rangaswami, G. and A. Mahadevan (2001) Disease of crop plants in India, Printic Hall of India, Pvt. Ltd., New Delhi.
3. Gupta, V.K. and V.S. Paul (2001) Disease of vegetable crops. Kalyani Publ. Ludhiana,
4. Gupta, V.K. and S.K. Sharma (2000) Disease of fruit crops, Malyani Publ. Ludhiana.
5. Raychaudhari, S.P. and T.K. Nariani (1977), Virus and Mycoplasma disease of plants in India. Oxford and IBK Publ. Corp., New Delhi.
6. Bos L. (1999), Plant viruses, unique and intriguing pathogens. Backhugs Publ. Leiden.
7. Rangaswami, G. and S. Rajagopalan (1973), Bacterial plant pathology, T.N. Agri. Uni. Coimbatore.

BOT-521 (Elective C)

TAXONOMY OF ANGIOSPERMS-I

UNIT-I: **Taxonomy;** Aims and objectives of taxonomy, functions and phases of taxonomy; taxonomy as synthetic discipline (passing remarks), Characteristic features of angiosperms

UNIT-II: **Phylogeny of angiosperms:** monophyletic and polyphyletic origin of angiosperms, herbaceous origin hypothesis, origin of monocotyledons; molecular evidence to angiosperm origin, cradle of angiosperms.

UNIT-III: **Taxonomic hierarchy:** it's major, minor and infraspecific categories and ranks

A brief history of Pre-Darwinian and post Darwinian systems of classification with special emphasis on Thorne and Cronquist's systems of classification

UNIT-IV: **Concept of taxonomic character:** analytical and synthetic, qualitative and quantitative, genetically and environmentally controlled, good and bad character, character weighing, taxonomic coefficient

UNIT-V: Trends in evolution of characters: in flowering plants in habit and habitat, phyllotaxy, stomatal apparatus, nodal anatomy, xylem, phloem, cambium, vascular cambium, inflorescence, flower, androecium, gynoecium, pollination, fertilization, placentation, fruit, seed and seedling.

UNIT-VI: **Phylogenetic relationship:** Primitive and advanced characters, monophyletic, paraphyletic and polyphyletic, homology and analogy, parallel and convergent evolution, plesiomorphic and apomorphic characters. **Cladistics:** Operational Taxonomic Units (OTU) characters and coding, measuring of similarity, cladograms.

UNIT-VII: History of botanical explorations in Maharashtra and Marathwada. Contributions of Botanical Survey of India.

BOT-522 (Elective C)

TAXONOMY OF ANGIOSPERMS-II

UNIT-I: **The concepts of species;** plant speciation: allopatric/ abrupt/ sympatric/ hybrid/ apomictic speciation and isolation mechanism. Types of speciation: quantum, catastrophic, local, geographic and phyletic. Causes of variation in population, ecotypes and ecads, evolution and differentiation of species, adaptive radiations.

UNIT-II: **Botanical Nomenclature:** Scientific names: legitimate name, illegitimate name, autonym, homonym, synonym, basionym, tautonym, alternative name, ambiguous name, superfluous name, naked name, conserved name, rejected name; procedure to describe new taxon; Latin diagnosis and description, effective and valid publication, coining of generic names and specific epithets; citation of names of author(s) ; Scientific Journals in plant taxonomy.

UNIT-III: **Taxonomic evidences:** Morphology, micro-morphology, ultrastructure systematics- SEM and TEM studies, anatomy, embryology, palynology, cytology, ecology, population biology, phyto-chemistry, molecular biology and numerical taxonomy.

UNIT-IV: **Herbarium:** History, Objectives and function of an herbarium, Types of herbaria, role of herbarium in Systematics, Floristics, Teaching, Research, Assessment and documentation of phyto diversity and Public Education, pests in herbarium and its control. Contribution of "BAMU" Herbarium

UNIT-V: Botanic Gardens: Definition, criteria, history and role of botanic gardens, special types of botanic gardens: Arboretum, Pineatum, Orchidarium, Bambusetum, Fernary. Important Botanic Gardens in India and World.

UNIT-VI: Comparative account on distribution, floral morphology, interrelationships of families belonging to the following order as per Engler's system of classification:

a) Magnoliales,	b) Alismatales,	c) Liliales,	d) Asparagales,
e) Poales,	f) Zingiberales	g) Ranunculales	h) Malphighiales
i) Fabales	j) Cucurbitales		

Practicals based on BOT-521C & BOT-522 (Elective C)

TAXONOMY OF ANGIOSPERMS I & II

1. Description of species based on many specimens to study intraspecific variation.
2. Study of morphology and general evolutionary trends in flowers, stamens and carpels of primitive families viz. Magnoliaceae, Papaveraceae, Nymphaeaceae, Lauraceae
3. Study of different types of ovules, placentation and evolutionary trends therein
4. Exercises on nomenclature problems: Author citation, principle of priority, transfer of taxa, effective and valid publication.
5. Describing new taxon, deposition of type, Latin diagnosis and abbreviations used in citations.
6. Semi-permanent pollen preparations by acetolysis method and study of different pollen morphotypes.
7. Taxonomic distribution of special units of pollen dispersal- bi celled pollen, tetrads, polyads and pollinia and pollen types.
8. Study of plant surface attributes with the help of SEM photographs.
9. Descriptions, sketching, classification and identification of at least 30 families represented in local flora.
10. Classification and identification of at least 5 species of some of the genera like *Alysicarpus, Amaranthus, Cassia, Chlorophytum, Commelina, Cyperus, Euphorbia, Indigofera, Leucas, Sida, Solanum.*
11. Several One-day botanical excursions to botanically rich locations.
12. Botanical excursion of about one week to any botanically rich location preferable outside the State.

SUGGESTED READINGS:

1. AHMEDULLAH, M., AND M. P. NAYAR. 1987. Endemic Plants of the Indian Region. Vol. I. Botanical Survey of India. Howrah.
2. BHOJWANI, S. S. AND BHATNAGAR, S. P. 1984. Embryology of Angiosperms. Vikas Publ. House, New Dehli.
3. BILGRAMI, K. S. AND J. V. DOGRA. 1990. Phyto-Chemistry and Plant Taxonomy. New Delhi, CBS Publishers
4. CRONQUIST, A. 1988. The Evolution and Classification of Flowering Plants (2nd ed.) Allen Press, U. S. A.
5. DANIEL, M. 2009. Taxonomy: Evolution at work. Narosa Publishing House Pvt. Ltd. New Delhi.

6. DAVIS, P. H., AND V. H. HEYWOOD. 1991. Principles of Angiosperm Taxonomy. Today and Tomorrow Publications, New Delhi
7. DOBSON, A. P. 1996. Conservation and Biodiversity. Scientific American Library. New York, U. S. A.
8. ERDTMAN, G. 1986. Pollen Morphology and Plant Taxonomy: Angiosperms An Introduction to Palynology. Netherland, E. J. Brill, Leiden.
9. FORMAN, L. AND D. BRIDSON. 1989. The Herbarium Handbook. Royal Botanic Gardens, Kew, U. K.
10. GRAHAM, L. E. 1993. Origin of Land Plants. John Wiley & Sons. Inc. New York.
11. GREUTER, W, (Ed.) 2007. International Code of Botanical Nomenclature. (VIENNA CODE) KoeltzVesentific Books. Germany.
12. GROOMBRIDGE, B, (Ed.) 1992. Global Biodiversity: Status of the Earth's Living Resources. Chapman and Hall. London.
13. HENRY, A. N., M. CHANDRABOSE. 1980. An Aid to International Code of Botanical Nomenclature. Today & Tomorrow's Printers and Publishers. New Delhi.
14. HEYWOOD, V. H. 1995. Global Biodiversity Assessment. Cambridge University Press, Cambridge, U. K.
15. HUTCHINSON, J. 1973. The Families of Flowering Plants. 3rd Edition. Oxford University Press. Oxford.
16. JAIN, S. K. and R. R. RAO. 1977. A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi.
17. JOHRI, B. M. 1994. Botany in India: History and Progress. Vol-I. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
18. JONES, S. B., AND A. E. LUCHSINGER. 1987. Plant Systematics. 2nd Edition. McGraw-Hill Book Company. New York.
19. JUDD, W. S, C. S. CAMPBELL, E. A, KELLOG, P. F. STEVENS AND N. J. DONOGHUE. 2008. Plant Systematics. Sinauer Associates, INC, Publishers. Sunderland, Massachusetts, USA.
20. LAWRENCE, G. H. M. 1951. Taxonomy of Vascular Plants. The Macmillan Company. New York.
21. MABBERLEY, D. J. 2005. The Plant-Book, A portable dictionary of the vascular plants. Cambridge University Press, United Kingdom
22. MANILAL, K. S. AND M. S. MUKTESH KUMAR [ed.] 1998. A Handbook of Taxonomic Training. DST, New Delhi.

23. MINELLI, A. 1993. Biological Systematics: The State of the Art. London, Chapman & Hall.
24. MONDAL, A. K. 2005. Advanced Plant Taxonomy. New Central Book. Agency Pvt. Ltd. Kolkata.
25. MOORE, R., W. D. CLARK, K. R. STERN AND D. VODOPICH. 1995. Botany: Plant Diversity. Wm. C. Brown Publishers. London.
26. NAIK, V. N. 2000. Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company Limited, New Delhi.
27. Nair, P. K. K. 1966. Pollen morphology of Angiosperms. Periodical Expert Book Agency, New Delhi.
28. NAYAR, M. P., 1996. "Hot Spots" of Endemic plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Thiruvananthapuram, India.
29. NAYAR, M. P., AND R. K. SASTRY. 1987-1990. Red Data Book on Indian Plants. Vols. I - III. Botanical Survey of India. Howrah.
30. QUICKE, D. L. J. 1993. Principles and Techniques of Contemporary Taxonomy. Chapman and Hall. London.
31. RADFORD, A. E., W. C. DICKISON, J. R. MASSEY, AND C. R. BELL. 1974. Vascular Plant Systematics. Harper & Row. New York.
32. RAVEN, P. H., R. F. EVERT, AND S. E. EICHHON. 1992. Biology of Plants. 5th Edition. Worth Publishers. New York.
33. SANTAPAU, H. AND H. A. HENRY. 1994. A dictionary of the flowering plants in India, CSRI, New Delhi.
34. SHARMA A. AND A. SHARMA. 1980. Chromosome Technique: Theory and Practices (3rd ed.) Butterworths, London.
35. SHIVANNA, K. R. AND N. S. RANGASWAMY. 1992. Pollen Biology- A Laboratory Manual. Springer-Verlag
36. SIMPSON, M. G. 2006. Plant Systematics. Elsevier Academic Press, California, USA.
37. SINGH, G. 2005. Plant Systematics – Theory and Practice. Oxford and YBH Publishing Co. Pvt. Ltd., New Delhi.
38. SIVARAJAN, V. V. 1989. Introduction to Principles of Plant Taxonomy. Oxford and IBH Publishing Co. New Delhi.
39. SOLTIS, D. E., P. S. SOLTIS, P. K. ENDRESS AND M. W. CHASE. 2005. Phylogeny and Evolution of Angiosperms. Sinauer Associates, Inc, Massachusetts, USA.
40. STACE, C. A. 1989. Plant Taxonomy and Biosystematics. Edward Arnold, London.
41. STUESSY, T. F. 2002. Plant Taxonomy. Bishen Singh Mahendra Pal Singh, Dehra Dun, India.

42. SUBRAMANIAM, N. S. 1995. Modern Plant Taxonomy. Vikas Publishing House. New Delhi.

43. TAKHTAJAN, A. 1997. Diversity and Classification of Flowering Plants. Bishen Singh and Mahendra pal Singh, Dehra Dun, India.

44. TAYLOR, D. V. AND L. J. HICKEY. 1997. Flowering Plants: Origin, Evolution and Phylogeny. CBS Publishers & Distributers, New Delhi.

45. WILEY, E. O. 1981. Phylogenetics: The Theory and Practice of Phylogenetic Systematics. New York, John Wiley & Sons.

BOT 521 (Elective D)

Advanced Plant Physiology and Biochemistry-I

Unit I. Plant Composition : Structure and biochemical role of major plant constituents, carbohydrates and its derivatives, structure and classification of proteins, glycoproteins, peptidoglycans, lipids and glycoproteins, lipid and triglycerides, fatty acids, vitamins and nucleic acids.

Unit II. Pigments: chlorophylls, phycobiliproteins, phenolics, sterols, alkaloids, carotenoids, phytochrome, anthocyanine, phenolics, sterols, alkaloids, porphyrins, organic acids, possibilities of isolating these chemicals for human welfare.

Unit III.Principles and applications of colorimeters, photometry flame photometers, spectrophotometry, chromatography (ion exchange, affinity, thin layer, high pressure liquid) gel filtration, electrophoresis, electro focusing and ultracentrifugation,

Unit IV. Application of radioactive tracer technique in biology, radioactive isotopes

Autoradiography, Biophysical methods X ray diffraction, fluorescence UV, NMR and ESR Atomic absorption spectroscopy

Unit V. Growth analysis: Growth, growth curve, lag, log and senescence phase, growth rates AGR, RGR, NAR, LAP, LAI, CGR and LAD productivity potential of dwarf varieties, causes of dwarfism, morphological and physiological factors in relation to height. Yields of dwarf plants,

BOT 522 (Elective D)

Advanced Plant Physiology and Biochemistry - II.

Unit I Photosynthesis and plant productivity C3, C4 and CAM pathways and photorespiration in relation to crop productivity, soil and water conservation methods, weed biology herbicides, biological weed control, intensive cropping, zero tillage use of plant growth regulators and bio-fertilizers in agriculture, Nitrogen use efficiency, optimum economic dose of nitrogen fertilizers green manuring.

Unit II Biomass : The concept of Biomass, Biomass production, Utilization of biomass as a energy agricultural. Residue and their management HDEF energy forests energy crapping hydro carbon, plants biomathylation biogas, biogas plants, biogas production from soils city wastes.

Unit III.The practice of green manuring and preparation of compost NADEP and other methods, Utilization of solid wastes for composting recent trends in solid waste management and production sources.

Unit IV. Green crop fraetionation: The GGF system and advantages of GCF. Mechanical fractionation, plants suitable for GCF, Machinery recommended for mechanical fractionation, products, pressed crop residue (PCR) Juice, leaf protein concentrate and deproteinized Juice (DPJ)

Unit V. Green Crop Fractionation: Use of PCR in animal nutrition preparation of silage, silage fermentation, use of leaf juice as a milk replacer, Preparation of LPC, chloroplastic and cytoplasmic LPC, Nutritive value of LPC, and its suitability in human nutrition as a sources of protein and vitamin - A, preservation of LPC, DPJ as a replacer of tissue culture media, LPC compared with algal protein SCP, the possibility of increasing protein productivity through green crop fractionation. Bidkin Process.

Practical Based on BOT 521 & BOT 522 (Elective-D)

1. Estimation of B - carotene with column chromatography.
2. Estimation of reducing sugars by Folin – Wu tube.
3. Estimation of cellulose by cramption and Maynord Method.
4. Estimation of free fatty acids.
5. Estimation of nitrates.
6. Thin layer chromatographic technique.
7. Techniques of flame photometry: estimation of sodium and potassium.
8. Estimation of gross energy by chromic acid oxidation method.
9. Estimation of N by micro – Kjeldhal's method.
10. Estimation of crude protein, crude fat and crude fiber.
11. Estimation of ash acid soluble / insoluble ash, Nitrogen free extracts and total carbohydrates.
12. Estimation of cell wall constituents, ADF, NDF, cellulose, hemicellulose, lignin etc.
13 Estimation of calcium by titration method.
14. Estimation of phosphorus by SubbaRao and Fiske Method,
15. Growth analysis: AGR, RGR, NAR, LAR, LAI, CGR and LAD.
16. The process of GCF and extractability of dry matter and Nitrogen.
17. Preparation of LPC, by heat coagulation, acid coagulation and fermentation.
18. Preparation of cytoplasmic and chloroplastic LPC by differential heat coagulation.
19. Preparation of TCM using DPJ and Inoculation of explant.

Suggested Readings

1) Hess, D. Plant Physiology, Narosa Publishing House, New Delhi.

2) Mukharji, S. and Ghosh, A. K. Plant Physiology. New Central Book Agencies, Kolkatta.

3) Noggle, G. R. and Fritz, G. S. Introductory plant physiology, Prentice Hall, U. S. A.

4) Vaidya, V. G., Sahasrabuddhe, K. R. and Khupse, V. S. Crop production and field experimentation, Continental Prakashan, Pune - 30.

5) ICAR Handbook of Agriculture, ICAR, New Delhi.

6) Mungikar, A. M. Bibliography of leaf protein in Marathwada University.

7) Pine, N. W. (1971) Leaf protein, its preparation, quality and use, Blackwell Scientific Publ. U. K.

8) Telek, H. and Graham, LT. (1983) Leaf protein concentrates, AVI, Publishing Co., USA.

Service Course- I

BOT 525

(Basic Plant Tissue Culture)

Unit-I (Introduction to Plant Tissue culture): Introduction to Plant Tissue culture, Terms and definitions, Historical background, Laboratory organization, Tools and techniques, methods of sterilization. Laboratory contaminants- it's control and measures.

Unit-II (Media Preparation and dynamics of Growth): Introduction to tissue culture: Media composition, Preparation, Phytohormonesand their usage, selection of media for specified applications, initiation of tissue culture, cellular totipotency, media for initiation of callus, dynamics of callus growth, organogenesis and factors controlling it, genome instability in relation to morphogenesis, somaclonal variation and its applications.

Unit-III (Culture techniques): Cell and organ culture: Plant organ culture; shoot tip, Micropropagation, shoot apical meristem, root, leaf, flower and ovary culture, embryo rescue, somatic embryogenesis, factors influencing embryogenesis, synthetic seeds, suspension culture in stationary and stirred tank reactors,

Unit-IV (Advance Culture techniques): Isolation of single cells and their culture, measurement of growth, protoplast isolation, culture, regeneration and fusion of protoplasts, generation of cybrid and hybrids, cryopreservation of plant cells. Role of Ovary and ovule in *In-vitro* Fertilization in production of agricultural and horticultural crops. Hardening techniques

Unit-V (Recombinant Techniques in Tissue Culture): Recombinant DNA technology: Gene cloning, principles and techniques. Techniques for gene transfer. Markergenes.Applications of tissue culture: Applications in agriculture and industry.

SUGGESTED READINGS

1. Kalyankumar De. Introduction to Plant Tissue culture,
2. Bhojwani, Plant Tissue Culture.
3. Dubey. R. C. a Textbook of Microbiology
4. Montell. S. H. Mathews, J. A., Meker, R. A. Principles of Plant Biotechnology.
5. Glover, D. M. and Hanes, B. D. (eds.) 1995. DNA cloning 1: A practical approach, core techniques, 2nd edition, PAS, IRL press at Oxford University Press.
6. Purohit Plant Tissue Culture
7. Plant cell culture protocols. Humana Press, Inc. New Jersey, USA.
8. Shaw, C. H. (ed.) 1998, Plant Molecular Biology. A practical approach IRI Press, Oxford.

9., R. H. 2000. Plant Tissue culture: Techniques and Experiments. Academic Press, New York.

10. Rajdan : An introduction to plant tissue culture.

11. SandhyaMitra: Genetic engineering.

BOT 503

BIOPROSPECTING AND PLANT RESOURCE UTILIZATION

Unit I: Bioprospecting: Definition, Introduction, Current practices in Bioprospecting for conservation of Biodiversity and Genetic resources.

Bioprospecting Act: Introduction, Phases of Bioprospecting, Exemption to Act. Fields of Bioprospecting.

Unit II: Medicinal Plants Bioprospecting/ Pharmaceutical Bioprospecting: for new drugs, assays in Bioprospecting. Antioxidant assay – NO free radical scavenging assay, Antigenotoxicity assay – MTT assay, Antiviral activities of plants – SRB assay.

Unit III: Marine Bioprospecting: Sources of marine planktons and their Bioprospecting, Isolation and cultivation of Marine bioresources, Isolation of Marine Yeast and its industrial applications, Bioactive chemicals from Seaweeds and their applications.

Unit IV: Microbial Bioprospecting: Isolation of Microbial metabolites and their bio-activity. Endophytic microbial products as Antibiotics.

Unit V: Origin, evolution, botany, cultivation and uses of Food, Fodder, Fibers, Oil yielding crops, wood and timber, Non-wood forest products(NWFPS): Bamboos, Gums, Dyes, Resins, Fruits etc.

Unit VI: Botany, Chemistry, Properties and uses of Medicinal and Aromatic plants.

Unit VII: Research Methodology: Separation of secondary metabolites, Pharmacognostic procedures, Authentication of specimens, Preservation of plants and plants products.

Laboratory exercise:

1. Food Crops: Morphology, anatomy, micro-chemical test for stored material: Wheat,
rice, maize, chickpea, potato, sweet potato, sugarcane,
2. Study of any five important crops used for fodder / forage purpose: Jowar, Bajra, lucerne, Maize etc.
3. Plant fibers: Cotton, jute, sun hemp, coir, silk cotton: Morphology microscopic study anatomy of whole fibers, using appropriate staining methods.
4. Medicinal and aromatic plants: At least 5 medicinal and 5 aromatic plants and their morphology, anatomy, phyto-chemistry.
5. Oil yielding crops: Mustard, groundnut, soybean, coconut, sunflower, castor: Morphology, microscopy of oil yielding tissue, test for oil, acid, Iodine numbers.
6. Gum, resin, tannin, dye yielding plants.

7. Fire wood and timber yielding plants.

8. Antioxidant assay – NO free radical scavenging assay.

9. Antigenotoxicity assay – MTT assay.

10. Antiviral activities of plants – SRB assay.

11. Scientific visits to laboratories / Industries / Research Institutes and field and submission of report.

References

1. Arora, R.K. and Nayar, E.R. (1984), Wild relatives of crop plants in India, NBPGR Science MonographNo.7.

2. Baker, H.G. (1978), Plants and civilization. Ill Ed. (A. Wadsworth, Belmount).

3. Bole, P.V. and Vaghani, Y. (T986). Field guide to common Indian trees, Oxford University Press, Mumbai.

4. Thakur, R.S., Puri, H.S. and Husain, A. (1969). Major medicinal plants of India, Central Institute of medicinal and aromatic plants, Lucknow.

5. Swaminathan, M.S. and Kocchar, S.L. (Es.) (1989). Plants and Society, MacMillan Publication Ltd.,

6. Sharma, O.P. (1996). Hills Economic Botany, Tata McGraw Hill co., Ltd., New Delhi,

7. Kocchar, S.L. (1998). Economic Botany of the tropics, II Edn. MacMillan India Ltd.,

8. CSIR (1986), The useful plants of India Publication and Information directorate, CSIR^ New Delhi.

9. CSIR (1948 - 1976) The wealth of India, 53

BOT 504

Genetic Engineering and Bioinformatics

Unit I Genetic Engineering of Plants:

Aims, strategies for development of transgenic.

Transformation and regeneration of plants, DNA delivery systems- Agrobacterium tumefaciens,

Direct gene transfer. The selection and analysis of transformants.Plant regeneration systems, Stability of the transgenes and Environmental risk assessment. Gene targeting - Transformation of recalcitrant species.

Unit II Microbial genetic Manipulations:

Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial microbes and nitrogen fixers, fermentation technology.

Unit III Introduction to Bioinformatics-

Definition of Bioinformatics- History of Bioinformatics, scope and application of Bioinformatics.Fundamentals of Internet, www, HTML, URLs,Role of internet and www in bioinformatics.

Biological Data Acquisition- The form of biological information; DNA sequencing methods – basic DNA sequencing, Types of DNA sequences – genomic DNA, cDNA, Expressed sequence tags (ESTs), Genomic survey sequences (GSSs);

Databases: Format and Annotation

Common sequencing file formats – NBRF/ PIR, FASTA, Files for multiple sequence alignment – multiple sequence format (MSF), ALN format; Files for structural data – PDB format.

Unit VI Bioinformatics Databases: Primary sequence databases (GenBank-NCBI, the nucleotide sequence database-EMBL, DNA sequence databank of Japan-DDBJ; Protein sequence and structure databases (PDB, SWISS-PROT and TrEMBL);

Derived (Secondary) Databases of Sequences and Structure: Prosite, PRODOM, PRINTS, Pfam, BLOCK, SSOP, and CATH.

Enzyme Database, Biodiversity Database.

Unit V Technique's in Bioinformatics- Sequence alignment, database searching and structure prediction

Pairwise sequence alignment, Database similarity searching, FASTA, and BLAST. Multiple sequence alignment and analysis with CLUSTAL X and CLUSTAL W. Measurement of sequence similarity; Similarity

and homology. Phylogenetic tree.Phylogenetic data analysis, tree building methods, tree evaluation &interpretation methods. Phylogenetic analysis with PHYLIP software.Prediction of secondary and tertiary structures with different software's and tools. Structure visualization software's RasMol,SpdbViewer etc.

Unit VI.Introduction to Genomics and Proteomics

Introduction to genomics- scope and application, Computational genomics, Organization of the prokaryotic and eukaryotic genomes, Human Genome Project.Genome maps and types, current sequencing technologies, partial sequencing, gene identification, gene prediction rules and software, Genome databases; Annotation of genome, Genome diversity: taxonomy and significance of genomes – bacteria, yeast, Homo sapiens, Arabidopsis, etc.

Functional Genomics - Microarray - Gene Expression, methods for gene expression analysis; Applications of DNA microarray.

Laboratory Exercise

1) Different file formats –Genbank, Genpept, FASTA, EMBL, NBRF/PIR, , PDB file format.

2) Entrez and Literature Searches. PubMed, PubMed central, OMIM / OMIA.

3) Primary sequence Databases- NCBI, EMBL, DDBJ.

4) Protein Structure Database– PDB.

5) Prediction of secondary structure of proteins.

6) Visualization of tertiary structure of proteins in Rasmol.

7) Accessing existing databases on www.

8) Sequence alignment – BLAST.

9) Homology search tools like BLAST and modeller.

10) Genomics- Genome databases, Annotation of genome, Perdition of ORFs

dbSNP and other SNP related database .

11) GENSCAN and GeneMark.

Suggested Reading:

1) Baxevanis, A.D. and Francis Ouellellette, B.F. (1998) "Bioinformatics– a practical guide to the analysis of genes and proteins" John Wiley and Sons

2) Mount, D. (2004) "Bioinformatics: Sequence and Genome Analysis"; Cold Spring Harbor Laboratory Press, New York. (ISBN 0-87969-712-1)

3) Sharma, V. Munjal, A. and Shankar, A. (2008) “A text book of Bioinformatics” first edition, Rastogi Publication, Meerut – India.

4) Bergman N. H. (2007),”Comparative genomics” Volume 2, Humana Press

5) Cantor C.R., Smith C.L., (1993) “Genomics: the science and technology behind the Human Genome Project” John Wiley and Sons

6) Choudhuri S., Carlson D. B. (2008), “Genomics: fundamentals and applications” Informa Healthcare

7) Clark M (2000), “Comparative genomics” Springer 8) Griffiths A. J. F., Miller J.H., Suzuki D.T., (2000) “An Introduction to Genetic Analysis” W.H. Freeman and Co., Publishers.

9) Pevsner J (2009), “Bioinformatics and functional genomics”, Edition 2, John Wiley and Sons

10) Primrose S. B., Twyman R. M. (2004), “Genomics: applications in human biology” Wiley-Blackwell

11) Primrose S. B., Twyman R. M. (2006), “Principles of gene manipulation and genomics” Wiley-Blackwell

12) Saccone C., Pesole G., (2003), “Handbook of comparative genomics: principle and methodology” John Wiley and Sons

13) Suhai S (2000), “Genomics and proteomics: functional and computational aspects” Springer

BOT 505

Research Methodology - II

Unit I: Introduction of Research:

Meaning of Research, Objectives and types, Research Process, Criteria of good research, defining the research problem.

Unit II: Research Methodology: Designing, features and concepts of good design, basic principles of experimental design, sampling design- its steps and types, random sampling, measurement and scaling techniques in research.

Unit III: Method of data collection: primary and secondary data, observation method, interview method, questionnaires, schedules, characteristics of data.

Unit IV: Interpretation and report writing: meaning, techniques of interpretations, precautions in interpretation, significance of report writing, different steps in report writing, types of report, review writing- review of literature, scientific books and scientific papers.

Unit V: Computer applications- Data Processing with MS word, MS Office, Power point Presentation, MS Excel, Searching references with the help of Internet.

Preparing project proposals for financial assistance to various funding agencies.

Suggested Reading:

1. Kothari, C. R. 2009. Research Methodology-Methods and Techniques, 2nd Rev. Ed. New Age International Publishers, Delhi.

BOT 523 (Elective A)
Advanced Genetics and Molecular Biology

UNIT I. MICROBIAL GENETICS:

A. **Microorganisms as model systems for genetic studies**: Virus and phage organization, Lytic and temperate phages, recombination in phages and gene mapping.
B. **Recombination in bacteria:** transformation, transduction, conjugation and gene mapping, Tetrad analysis in fungi.

UNIT II. HUMAN GENETICS AND CANCER:

A. **In born errors of metabolism**: Human karyotype, the chromosomal basis of genetic disorders and syndromes, amniocentesis, genetic counseling.
B. **Genetic basis of cancer:** Forms of cancer, genetic basis, cancer and cell cycle, oncogenes, genetic pathway to cancer, genetic counseling.

UNIT III. GENOME ORGANIZATION:

A. Genome size variation, cot curve analysis, DNA complexity, LINES and SINES, gene amplification and gene families.
B. Mitochondria and chloroplast genome.

UNIT IV. FUNDAMENTAL PROCESSES:

A. **DNA replication, repair and recombination:** Overview, enzymes of replication, Replication apparatus, primosome and replisome, Replication mechanism, continuous and discontinuous DNA synthesis, supercoiling and termination of replication, Eukaryotic DNA replication, DNA repair mechanism and homologous and site-specific recombination.
B. **RNA synthesis:**Central dogma, role of DNA in protein synthesis, RNA polymerase, mechanism of transcription, eukaryotic transcription, Post transcriptional modification of in RNA, mapping and poly acetylation, split gene, introns, exons and gene splicing, reverse transcription.
C. **Protein synthesis:** Triplet code, deciphering the code, degeneracy, Translation: ribosomes, chain initiation, elongation and termination. Inhibitors of protein synthesis.
D. **Regulation of gene expression:** Prokaryotic: lac operon inducible system, CAP proteins and catabolic repression, his operon repressible system, Lac-operon attenuation control. Post transcriptional control, feedback inhibition and protein degradation, Eukaryotes : short term regulation, heat shock proteins, hormonal regulation, DNA methylation, Heterochromatin and gene inactivation.

UNIT V:APPLIED BIOLOGY:

A. **Genomics:** Structural genomics, cytogenetic maps, RFLP, RAPD, QT maps, FISH and chromosome specific library. Genome sequencing, human, yeast, *Arabidopsis,* genome projects, functional genomics expressed sequences, DNA chips and genome evolution.
B. **Genetic engineering:** Isolation of DNA, restriction endonucleases, construction of genomic library, screening of DNA library for desired gene, Southern, Northern and Western blotting, prokaryotic and eukaryotic vectors, DNA sequencing, Maxam and Gilbert's procedure, Sanger Coulson method, automated DNA sequencing machine, PCR and DNA amplification, Marker gene, reporter and selection marker gene, Ti plasmids and viral vectors, Direct gene transfer

through electroporation, ballistic gun, micro injection, liposome and PEG mediated gene transfers. Application of recombinant DNA technology in medicine, industry and agriculture.

Laboratory Exercise based on 523

Advanced genetics and molecular biology I & II

1. Comparative radio-sensitivity in two crop species.
2. solation of genonmic DNA using C-TAB method and quantification.
3. Evaluation of quality of isolated DNA.
4. Restriction and ligation reactions.
5. Agarose gel electrophoresis of DNA.
6. PCR amplification and RAPD marker.
7. Isolation of plasmid DNA
8. Conjugation in *E. coli.*
9. Study of growth curve in *E. coli.*
10. Substrate induced enzyme induction in plants.
11. Transformation in bacteria.
12. Isolation and quantification of total RNA and agarose gel electrophoresis.
13. Cytological effects of radiations and chemical mutagens in higher plants.

Suggested Readings:

1. Snustad, P.D. and Simmons, MJ. 2000, Principles of Genetics, 2Qd Ed, John, Wiley and Sons, Inc., London.

2. Lewin, R. 1999, Human genetics, Concepts and applications. 3rd Ed, McGraw Hill, Dubuque, IA.

3. Lewin, B. 2000, Genes VII, Oxford University, New York.

4. Griffith, A.J.F., Miller, J.H. Suzuki, D.T. Lewontin, R.C. and Gilbert, .M, 2000. Introduction to genetic analysis, 5th Ed. W.H. Freeman, N. Y.

5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular cell Biology, Freeman, W.H. and Co., N. Y.

6. Watson, J.D., Gilman, M., Witkowski, J. and Zoller, M. 1992, Recombinant DNA W.H. Freeman and Co., N.Y. A..c(Hi. (1994). Molecular Biology of cell, 3rd Ed. Garland

7. Albart A.et.al 1914 J.M.andGingold, E.B. 1993, Molecular biology and Biotechnology,
Royal Soc., Publications,

8. U.K. If ftinaiin, R. 1991, Principles of Genetics, 3rd Ed. Win Brown, Dubuque, USA.

9. Brown J.A. 1992. Genetics, a molecular approach II Ed.

10. Tamarin, R. 1991 principls of Genetics III edition, Win brown , Duabuque, USA

BOT 523 (Elective B)

Plant Pathology – III

Unit I. Pathogenesis: Penetration and entry by plant pathogen; Pre-penetration; Entry through natural opening; Direct penetration; Entry through wounds, root hairs and buds.

Unit II. Seed Pathology: Scope and importance; seed health testing; methods and procedures; Detection of seed borne-fungi, Bacteria and viruses. Seed bio deterioration: Biochemical changes, Morphological abnormalities, loss in germinability. Mycotoxins, fusarium toxin and aflatoxins. Control of Post-harvest spoilage of grains.

Unit III Toxins of Plant pathogens: Phytotoxins; Classifications of toxins, Fusaric acid, Lycomarasmin, Pirieularin, Alternaric acid, Tabtoxin, Phaseolotoxin, Victorin

Unit IV Physiological imbalances in disease plants: Photosynthesis, respiration, protein metabolism, phenol metabolism, plant growth regulators.

Unit V. i. Disease Resistance in Plants: Primary infection resistance, Structural and Chemical defences; Post infection resistance: Production and activities of phytotoxins. Histological accumulation of phenols, hypersensitive substances and enzymes, detoxification.

ii. Genetics of host Pathogen interaction: Resistance and susceptibility, Vertical and horizontal resistance, Gene for Gene hypothesis, PR-Proteins, physiological specialization, mutation, heterokaryosis.

Unit VI. Disease Management: Cultural Methods- Avoidance of pathogen, exclusion of inoculum, eradication of pathogen, Chemical methods- sulphur fungicides, Copper fungicides, Mercury fungicides, Quinone fungicides, Systemic fungicides, Antibiotics, Breeding for disease resistance, Integrated Pest Management, Biopesticides and bioagents; *Trichoderma* and VA mycorrhiza. Application of Biotechnology in disease management.

Practical's Based on Course-BOT 523

1. Detection of seed borne-fungi and Bacteria.
2. Production and assay of macerating enzymes.
3. Evaluation of fungicide against plant pathogenic fungi.
4. Evaluation of Bioagents against plant pathogenic fungi
5. Evaluation of antibiotics again pathogenic bacteria.
6. Extraction and estimation of pigments in healthy and diseased plants.
7. Estimation of Nucleic acids.

Suggested readings

1. Chandnivala, M. (1955). Recent advances in plant pathology, Amol Publication, Pvt. Ltd.,

2. Nurenburg, H.W. (1985) Pollution and their ecotoxicological significance, John Wiley and Sons, New York.

3. Mehrotra, R.S. Plant Pathology, Tata McGraw Hill Publication Co., Ltd., New Delhi.

4. Agriso, G.N. Plant Pathology, Academic Press, New York and London.

5. Bilgrami, K.S. and H.C. Dubey, A text book of Modem plant pathology, Vikas Publishing House, New Delhi.

6. Nene, Y. and P.N. Thaphyal Fungicides in plant disease control II lidiv Oxford and IBH Publishing Co., New Delhi

7. Vyas, S.C. Systemic fungicides, Vol. 1 - 3, Tata Mc(Jrnw Hill Publishing Co., Ltd., New Delhi.

8. Dekker, J. and S.G. Georgopoulos (Ed), Fungicides Resistance in plnnl Protection, CARD Publications,

10. Gangawane, L.V. and Jayashree Deshpande. Pesticides and crop plnntn in India, Ajay Prakashan, Aurangabad.

11. Holton, C.S., Fischr, C.N. Fulton, R.W., Hart, H. and S.K.A.Macallan. Plant Pathology: Problems and progess (1908 - 1958), The University of Wisconsin, USA.

Laboratory Exercise Based on Course-BOT523

1. Production and assay of macerating enzymes.

2. Production and assay of polygalacturonase, cellulolytic enzymes, amylase, toxins, phytoalexines etc.

3. Evaluation of fungicide against plant pathogenic fungi.

4. Evaluation of antibiotics again pathogenic bacteria.

5. Extraction and estimation of pigments in healthy and diseased plants.

6. Estimation of Nucleic acids,

Suggested readings

1. Chandnivala, M. (1955). Recent advances in plant pathology, Amol Publication, Pvt. Ltd.,

2. Nurenburg, H.W. (1985) Pollution and their ecotoxicological significance, John Wiley and Sons, New York.

3. Mehrotra, R.S. Plant Pathology, Tata McGraw Hill Publication Co., Ltd., New Delhi.

4. Agriso, G.N. Plant Pathology, Academic Press, New York and London.

5. Bilgrami, K.S. and H.C. Dubey, A text book of Modem plant pathology, Vikas Publishing House, New Delhi.

6. Nene, Y. and P.N. Thaphyal Fungicides in plant disease control II lidiv Oxford and IBH Publishing Co., New Delhi

7. Vyas, S.C. Systemic fungicides, Vol. 1 - 3, Tata Mc(Jrnw Hill Publishing Co., Ltd., New Delhi.

8. Dekker, J. and S.G. Georgopoulos (Ed), Fungicides Resistance in plnnl Protection, CARD Publications,

10. Gangawane, L.V. and JayashreeDeshpande. Pesticides and crop plnntn in India, Ajay Prakashan, Aurangabad.

11. Holton, C.S., Fischr, C.N. Fulton, R.W., Hart, H. and S.K.A.Macallan. Plant Pathology: Problems and progess (1908 - 1958), The University of Wisconsin, USA.

BOT- 523 (Elective C)

TAXONOMY OF ANGIOSPERMS-III

UNIT-I: Phylogeny of Angiosperms: Isoetes-monocotyledone theory, Coniferales-amentiferae theory, Gnetales-angiosperms theory, anthostrobilus theory, Bennettitalean theory, Caytonialean theory, Stachyspory-phyllospermae theory, pteridosperm theory, Pentoxylales theory and Durian theory; Co-evolution of insect and plants.

UNIT-II: Study of fossil angiosperms: Malvaceae: Sahniocarpon; Myrtaceae: Sahnipushpam; Soneratiaceae: Sahnianthus, Enigmocarpon; Palmae: Palmoxylon.

UNIT-III: Taxonomic tools: Serological and molecular techniques, GIS, GPS, Use of computers in angiosperms taxonomy (Use of computer and data bases for identification of plants with the help of website). Taxonomic keys: suggestions for construction and use of keys: types of keys.

UNIT-IV: Molecular Biology: Acquisition of Molecular Data, sources of DNA sequence data, Plant genomes, Polymerase Chain Reaction (PCR) analysis, DNA Sequencing Reaction, Types of DNA Sequence Data, Generation and analysis of DNA Sequence Data, Restriction Fragment Length Polymorphism analysis (RFLP), allozymes, micro-satellite DNA, Random Amplified Polymorphic DNA (RAPDs), Amplified Fragment Length Polymorphism (AFLPs).

UNIT-V: Numerical Taxonomy: Principles of taxometrics, operational taxonomic units, taxonomic characters, measuring resemblances, cluster analysis, classification.

Biosystematics: Aims, objectives and steps in biosystematic studies, biosystematic categories, importance of biosystematic studies.

UNIT-VI: Recent system of classification: Angiosperm Phylogeny Group (APG IV) system.

UNIT-VII: Phytogeography: World vegetation, theories of plant distribution, vicarious areas, centres of origin, theory of tolerance.

Laboratory Exercise based on BOT 523 C

TAXONOMY OF ANGIOSPERMS-

1. Assessment of taxonomic characters (a) analytical and synthetic characters, (b) qualitative and quantitative characters.

2. Study of different taxonomic features (a) stomata, (b) trichomes, (c) crystals, (d) pollen grains.

3. Describing new taxon, deposition of type, Latin diagnosis and abbreviations used in citations.

4. Detection of taxonomically important chemical compounds by various tests.

5. Detection of variations in a given population.

6. Exercises on nomenclature problems: Author citation, principle of priority, transfer of taxa, effective and valid publication etc.

7. Practicals based on numerical taxonomy/ cluster analysis.

8. Study of different types of ovules, placentations and evolutionary trends therein.

9. Study of following fossil angiosperm specimens: Palmoxylon, Enigmocarpon, Sahnianthus, Glossopteris with the help of slides/ specimens.

10. To identify family with the help of computerized Key.

11. Preparation and standardization of some simple Ayurvedic Drugs.

Suggested Readings:

1. AHMEDULLAH, M., AND M.P. NAYAR. 1987. Endemic Plants of the Indian Region. Vol. I. Botanical Survey of India. Howrah.

2. BENSON, L.D. 1962. Plant Taxonomy: Methods and Principles. Ronald Press, New York.

3. BHOJWANI, S. S. AND BHATNAGAR, S. P. 1984. Embryology of Angiosperms.Vikas Publ. House, New Dehli.

4. BILGRAMI, K.S. AND J.V. DOGRA. 1990. Phyto Chemistry and Plant Taxonomy. New Delhi, CBS Publishers

5. CRONQUIST, A. 1968. The Evolution and Classification of Flowering Plants.Houghton Mifflin. Boston.

6. CRONQUIST, A. 1981. An Integrated System of Classification of Flowering Plants. Columbia University Press, New York.

7. CRONQUIST, A. 1988. The Evolution and Classification of Flowering Plants (2nd ed.) Allen Press, U.S.A.

8. DANIEL, M. 2009. Taxonomy: Evolution at work. Narosa Publishing House Pvt. Ltd. New Delhi.

9. DAVIS, P.H., AND V.H. HEYWOOD. 1965. Principles of Angiosperm Taxonomy. Oliver & Boyd. Edinburgh.

10. DAVIS, P.H., AND V.H. HEYWOOD. 1991. Principles of Angiosperm Taxonomy. Today and Tomorrow Publications, New Delhi

11. DOBSON, A.P.1996. Conservation and Biodiversity.Scientific American Library. New York, U.S.A.

12. ERDTMAN, G. 1952. Pollen Morphology and Plant Taxonomy.Angiosperms.Almquist and Wiksell. Stockholm.

13. ERDTMAN, G. 1986. Pollen Morphology and Plant Taxonomy : Angiosperms An Introduction to Palynology. Netherland, E.J.Brill, Leiden.

14. FORMAN, L. AND D. BRIDSON. 1989. The Herbarium Handbook. Royal Botanic Gardens, Kew, U.K.

15. GRAHAM, L.E. 1993. Origin of Land Plants.John Wiley & Sons.Inc. New York.

16. GREUTER, W, (Ed.). 2007. International Code of Botanical Nomenclature. (VIENNA CODE).KoeltzVesentific Books. Germany.

17. GROOMBRIDGE, B, (Ed.). 1992. Global Biodiversity: Status of The Earth's Living Resources. Chapman and Hall. London.

18. HENRY, A.N., M.CHANDRABOSE. 1980. An Aid to International Code of Botanical Nomenclature. Today & Tomorrow's Printers and Publishers. New Delhi.

19. HESLOP-HARRISON, J. 1953. New Concepts in Flowering Plant Taxonomy.Heinemann Ltd. London.

20. HEYWOOD, V.H. 1967. Plant Taxonomy. Edward Arnold Ltd. Great Britain.

21. HEYWOOD, V.H. 1995. Global Biodiversity Assessment.Cambridge University Press, Cambridge, U.K.

22. HUTCHINSON, J. 1973. The Families of Flowering Plants.3rd Edition.Oxford University Press. Oxford.

23. JAIN, S.K. and R.R. RAO. 1977. A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi.

24. JOHRI, B.M. 1994. Botany in India: History and Progress. Vol-I. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

25. JONES, S.B., AND A.E. LUCHSINGER. 1987. Plant Systematics. 2nd Edition. McGraw-Hill Book Company. New York.

26. JUDD, W. S, C. S. CAMPBELL, E. A, KELLOG, P. F. STEVENS AND N. J. DONOGHUE. 2008. Plant Systematics. Sinauer Associates, INC,Publishers.Sunderland, Massachusetts, USA.

27. LAWRENCE, G.H.M. 1951. Taxonomy of Vascular Plants.The Macmillan Company. New York.

28. MABBERLEY, D.J. 2005. The Plant-Book, A portable dictionary of the vascular plants. Cambridge University Press, United Kingdom

29. MANILAL, K. S. AND M. S. MUKTESH KUMAR [ed.] 1998. A Handbook of Taxonomic Training. DST, New Delhi.

30. MINELLI, A. 1993. Biological Systematics: The State of the Art. London, Chapman & Hall.

31. MONDAL, A.K. 2005. Advanced Plant Taxonomy.New Central Book.Agency Pvt. Ltd. Kolkata.

32. MOORE, R., W.D. CLARK, K.R. STERN AND D. VODOPICH. 1995. Botany: Plant Diversity. Wm. C. Brown Publishers. London.

33. NAIK, V. N. 2000. Taxonomy of Angiosperms. Tata McGraw – Hill Publishing Company Limited, New Delhi.

34. Nair, P. K. K. 1966. Pollen morphology of Angiosperms.Periodical Expert Book Agency, New Delhi.

35. NAYAR, M.P., 1996. "Hot Spots" of Endemic plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Thiruvananthapuram, India.

36. NAYAR, M.P., AND R.K. SASTRY. 1987-1990. Red Data Book on Indian Plants.Vols.I - III.Botanical Survey of India. Howrah.

37. QUICKE, D.L.J. 1993. Principles and Techniques of Contemporary Taxonomy.Chapman and Hall. London.

38. RADFORD, A.E., W.C. DICKISON, J.R. MASSEY, AND C.R. BELL. 1974. Vascular Plant Systematics. Harper & Row. New York.

39. RAVEN, P.H., R.F. EVERT, AND S.E. EICHHON. 1992. Biology of Plants. 5th Edition.Worth Publishers. New York.

40. SANTAPAU, H. 1955. Botanical Collector's Manual. Botanical Survey of India.

41. SANTAPAU, H. AND H.A. HENRY. 1994. A dictionary of the flowering plants in India, CSRI, New Delhi.

42. SHARMA A. AND A. SHARMA. 1980. Chromosome Technique: Theory and Practices (3rd ed.) Butterworths, London.

43. SHIVANNA, K. R. AND N. S. RANGASWAMY. 1992. Pollen Biology- A Laboratory Manual. Springer-Verlag

44. SIMPSON, M. G. 2006. Plant Systematics. Elsevier Academic Press, California, USA.

45. SIMPSON, M.G. Plant Systematics. Elsevier Academic Press. Burlington, U.S.A.

46. SINGH, G. 2005. Plant Systematics – Theory and Practice. Oxford and YBH Publishing Co. Pvt. Ltd., New Delhi.

47. SIVARAJAN, V.V. 1989. Introduction to Principles of Plant Taxono¬my.Oxford and IBH Publishing Co. New Delhi.

48. SOLTIS, D. E., P. S. SOLTIS, P. K. ENDRESS AND M. W. CHASE. 2005. Phylogeny and Evolution of Angiosperms. Sinauer Associates, Inc, Massachusetts, USA.

49. STACE, C.A. 1989. Plant Taxonomy and Biosystematics. Edward Arnold, London.

50. STUESSY, T. F. 2002. Plant Taxonomy.Bishen Singh Mahendra Pal Singh, Dehra Dun, India.

51. SUBRAMANIAM, N.S. 1995. Modern Plant Taxonomy.Vikas Publishing House. New Delhi.

52. TAKHTAJAN, A. 1997.Diversity and Classification of Flowering Plants. Bishen Singh and Mahendra pal Singh, Dehra Dun, India.

53. TAYLOR, D. V. AND L. J. HICKEY. 1997. Flowering Plants: Origin, Evolution and Phylogeny. CBS Publishers & Distributers, New Delhi.

54. WILEY, E.O. 1981. Phylogenetics : The Theory and Practice of Phylogenetic Systematics. New York, John Wiley & Sons.

BOT 523 (Elective D)

Plant Physiology – III

Unit I. Plant water relations: molecular structure of. water, water potential, Absorption of water by land plants, transpiration and its significance, physiology of stomatal movements, anti-transpirants.

Unit II Stress physiology: Biotic and abiotic environmental stresses, effect on plant metabolism and growth, high temperature stress, water stress, chilling stress, thermogenesis, salinity and salt stress, salt respiration, salinity and agriculture.

Unit III Seed germination, seedling growth, seed dormancy, light and temperature sensitive seeds, Biochemical changes associated with seed germination, Hormonal regulation, conditions for seed germination, Mobilization of reserve food material, longevity of seed and seed viability.

Unit IV Organic farming, mixed fanning, crop rotation and inter-cropping, weed management and control, Herbicides, weed biomass as green manure, organic matter recycling and preparation of compost / vermicompost, Production of crop plants under organic and conventional fanning system, Bio-fertilizers, Bio-methylation

Unit V Biostatistics: Collection and tabulation of data, Frequency distribution, normal curve, location, dispersion, normal distribution, tests of significance, t test, F test, chi square test, correlation and regression. Experimental designs, Analysis of data: RBD, LSD, Factorial and split plot RBD.

Laboratory Exercise Based on BOT523 (Elective D):

1. Determination of water potential.
2. Determination of relative water content (RWC).
3. Effect of growth regulators on seed germination.
4. Estimation of starch in fresh, germinating and germinated seed.
5. Estimation of glucose at various stage of seed germination.
6. Estimation of protein content during seed germination – Lawry's method, burette method
7. Estimation of non-protein nitrogen (NPN) content in germinating seeds,
8. Estimation of vitamin C in germinating seeds.
9. Accumulation of praline in normal and stressed plants.
10. Determination of seed viability.
11. Seed dormancy and breaking of seed dormancy by using physical, scanning, hot water, acid and PGRs.
12. Studies on effect of 2,4 - D on seed germination.
13. Measures of central value - mode, median, mean, range, standard deviation, mean deviation and coefficient of co-relation.
14. Frequency distribution - Graphic representation, frequency curve and Histogram.
15. Calculation of central value of dispersion in classified data,
16. Statistics in agricultural science - ANOVA for various field experimentation,
17. Correlation, regression and calculation of optimum economic use for fertilizers.

SERVICE COURSE-2

BOT 526

MEDICINAL PLANTS

Unit I Introduction of Systems of Medicines- a) Ayurved b) Siddha d) Unani e) Chinese f) Naturopathy g) Homeopathy.

Unit II a) Health Concept in Ayurved, **b)** Dincharya and Rutucharya

c) Anupan d) Pathya and Apathy e) ViruddhaAhaar.

Unit III Classification **of Drugs:**

a) Root drugs: *Withaniasomnifera (L)*Dunal*, Asparagus racemosus*Willd.*Chlorophytumborivillianum, Vetiveriazizanoides(1.)* Nash, *Glycirrhizaglabra*

b) Rhizome drugs: *Zingiberofficinale Rose, Curcuma longa L., Acoruscalamus*L.

c) Stem and wood drugs: *Tinosporacordifolia*(Willd.) Miers*,Santalum album L, Pterocarpusmarsupium*Roxb.,*Pterocarpussantalinus*

d) Bark drugs: *Terminalia cuneata*Roth, *Cratevaadansonii*DC subsp. *odora(* Buch.- Ham.) Jacobs, *Acacia nilotica(* L.) Del, *Azadirachtaindica*A. Juss.,

e) Leaf drugs: *Aloe vera*(L.) Burm.f, *Adhatodazeylanica*Medic.,*Cymbopogoncitratus, kalanchoepinnata*(Lamk.) Pers. *Mentha*sp.

f) Flower drugs: *Syzigiumaromaticum, Crocus sativus*

g) Fruit drugs: *Emblicaofficinale, Terminalia bellirica*(Gaertner) Roxb.,*T. Chebula(Gaertner)* Retzv*Aeglemarmelos(L) Corr.*

h) Seed drugs: *Syzigiumcumini*(L.) Skeel ,*Celastruspaniculatus*Willd.,

Semecarpusanacardium L. f

i) Entire plant drugs:*Ocimumtenuiflorum L, Bacopamonnierie (L.)* Penn,

Unit IV a) Identification of Medicinal Plants

b) Harvesting, Storage and preservation of Medicinal plants

Unit V Introduction of formulations of some Ayurvedic drugs: a) Asava and Arishta, b) Churna c) Vati and ghutid) Aark e) Pak and Avaleha f) Fant and Kadha

g) Satva h) Tailam and ghritam

Suggested Readings:

1. Anonymous 2000, "The Ayurvedic Formulary of India" - Part - ll, Govt. Of India Publication, New Delhi.

2. Daniel,M. 2006, "Medicinal Plants - Chemistry and Properties" Oxford &IBM Publishing Co. Pvt. Ltd. New Delhi.

3. Desai W. G. 1975, *"AushadhiSangraha"* Rajesh Publication, Pune.

4. Garde G. K. 2009, (Revised Edition) "Sort/7 *Vagbhat - Ashtanghridayam",* Rajesh Publication, Pune.

5. Jain S. K. 1991, "Dictionary of Indian Folk Medicine and Ethnobotany" Deep Publication, New Delhi.

6. KameshwaraRao C. 2000, "Material for the Database of Medicinal Plants" Karnataka state Council for Science and Technology for the Department of Forests, Environment and Ecology, Govt of Karnataka Publication.

7. Kirtikar K. R. and Basu B. D. 2001(Reprint) "Indian Medicinal Plants" Oriental enterprises Uttaranchal.

8. Manilal K. S. 2001, "Van Rheed'sHortusMalabaricus" English Edition. University of Kerala Publication.

9. Nadkarni K. M. 1976, (Revised Edition) " IndianMateriaMedica" Popular Prakashan, Mumbai.

10. Sharma 0. P. 1996, "Hills Economic Botany" Tata McGraw Hill Publication, New Delhi.

11. Yoganarasimhan S. N. 1996, " Medicinal Plants of India" vol. I. Karnataka. Interline Publication Pvt. Ltd. Bangalore.

12. Anonymous, *"UpcharPaddhatiaurPathya"* Baidyanath Publication.

13. Anonymous, " *VividhUpcharpaddhati".....*

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and University Development.

..2..

Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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S*/-160615/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Syllabus of B. A. /B. Sc. Third year (Mathematics) (optional) With Effect from June – 2015

DR . BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGABAD
BOARD OF STUDIES IN MATHEMATICS
REVISED SYLLABUS FOR THIRD YEAR B.Sc. (MATHEMATICS)
(With Effect From June -2015)

Semester V

Compulsory Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Optional Papers (Any One):

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I
Paper – MAT 505: Programming in C – I

Semester VI

Compulsory Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Optional Papers (Any One):

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II
Paper – MAT 605: Programming in C – II

REVISED SYLLABUS FOR THIRD YEAR B.A. (MATHEMATICS)

(With Effect From June -2015)

Semester V

Main Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Subsidiary Papers:

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I

Semester VI

Main Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Subsidiary Papers:

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 501: Real Analysis – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets and elements, Operations on sets.

2) Functions:
Functions, Real-valued functions, Equivalence, Countability, Real numbers, Least upper bounds. [1]

3) Sequences of Real Numbers:
Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Monotone sequences, Operations on convergent sequences, Operations on divergent sequences, Limit superior and limit inferior, Cauchy sequences. [1]

4) Series of Real Numbers:
Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and convergence, Test for absolute convergence. [1]

5) Jacobians:
Definitions, Case of function of functions, Jacobian of implicit functions, Necessary and sufficient condition for a Jacobian to vanish. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 1 : 1.3(A, B, C, D, E, F, G, H, I), 1.4(A, B, C, D, E), 1.5(A, B, C, D, E, F, G, H, I), 1.6(A, B, C, D, E), 1.7(A, B, C, D, E).

Chapter 2 : 2.1(A, B, C, D), 2.2(A, B), 2.3(A, B, C, D), 2.4(A, B, C), 2.5(A, B), 2.6(A, B, C, D, E), 2.7(A, B, C, D, E, F, G, H, I, J), 2.8(A, B, C, D), 2.9(A, B, C, D, E, F, G, I, J, K, L, M), 2.10(A, B, C, D, E), 2.12(A, B).

Chapter 3 : 3.1(A, B, C, D), 3.2(A, B, C, D, E), 3.3(A, B), 2.4(A, B, C), 3.6 (A, B, C, D, E, F, G, H, I,)

2] J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.

Scope:

Chapter 13 : Articles 1, 2, 3, 4, 5, 6, 7

References:

1) D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.
2) Hari Kishan ***: Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

Note : Questions on prerequisite should not be asked.

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 502: Abstract Algebra – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets, Functions, Integers.

2) Group Theory:
Definition of a group, Some examples of groups, Some preliminary lemmas Subgroups, A counting Principle, Normal subgroups and quotient groups Homomrphism, Automorphism. [1]

3) Ring Theory:
Definition and examples of rings Some special classes of ring, Ideals and quotient rings More ideals and quotient rings, Polynomial ring. [1]

Recommended books:
1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:
Chapter 2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7(Cauchy's Theorem for Abelian Groups and Cauchy's Theorem for Abelian Groups are without proof), 2.8.
Chapter 3 : 3.1, 3.2, 3.3, 3.5, 3.9(Omit Theorem 3.9.1)

References:
1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) I. N. Herstein : Abstract Algebra (Third Edition): Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : Contemporary Abstract Algebra (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Note : Questions on prerequisite should not be asked.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 503: Mathematical Statistics – I

Periods : 60
Marks : 50

1) Frequency Distribution and Measures of Central Tendency:
Frequency distribution, Continuous frequency distribution, Graphical representation of a frequency distribution, Histograms, Frequency Polygon, Measures of Central Tendency, Arithmetic mean, Properties of arithmetic mean, merits and demerits of Arithmetic mean, Weighted mean, Median, Merits and demerits of Median, Mode Merits and demerits of mode, Geometric mean, Merits and demerits of Geometric mean, Harmonic mean, partitions [1]

2) Measures of Dispersion Skewness and Kurtosis:
Dispersion, Characteristic for an ideal measure of dispersion, Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and root mean square deviation, Relation between and s, Different formulae for calculating variance, Variance of the combined series, Coefficient of dispersion, Coefficient of variations, Moments, Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of Origin and scale on moments, Pearson's and coefficients, Skewness and kurtosis. [1]

3) Theory of Probability:
Introduction, Definition of various terms, Mathematical or Classical Probability, Statistical Probability, Axiomatic approach to probability, Random experiments, Sample space, Events, Some illustrations, Algebra of events, Probability – Mathematical Notion, Probability function, Theorems on Probability of events, Law of addition of Probability, Multiplication law of probability and conditional probability, Independent events, Pairwise independent events, Conditions for mutual independence of n events. [1]

4) Random Variables and Distribution Functions:
Random Variable, Distribution function, Properties of distribution function, Discrete random variables, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Various measures of Central tendency, Continuous distribution function. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Nineth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 2: 2.1, 2.1.1, 2.2, 2.2.1, 2.2.2, 2.3, 2.4, 2.5, 2.5.1, 2.5.1, 2.5.2, 2.5.3, 2.6, 2.6.1, 2.7, 2.7.1, 2.8, 2.8.1, 2.9, 2.9.1, 2.11.
Ch – 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.7.1, 3.7.2, 3.7.3, 2.8, 2.8.1, 3.9, 3.9.1, 3.9.2, 3.10, 3.13, 3,14.
Ch – 4: 4.1, 4.3, 4.3.1, 4.3.2, 4.5, 4.5.1, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.6, 4.6.1(omit Thm 4.1), 4.6.2, 4.7, 4.7.2, 4.7.3, 4.7.4, 4.7.5
Ch – 5: 5.1, 5.2, 5.2.1, 5.3, 5.3.1, 5.3.2, 5.4, 5.4.1, 5.4.2, 5.4.3

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 504: Ordinary Differential Equations – I

Periods : 60
Marks : 50

Prerequisite: Complex numbers

1) Preliminaries:
Introduction, Functions, Polynomials, Complex series and the exponential function, Determinants. [1]

2) Linear Equations of First Order:
Introduction, Differential Equations, Problems associated with differential equations, Linear equations of the first order, The equation $y' + ay = 0$, The equation $y' + ay = b(x)$, The general linear equation of the first order. [1]

3) Linear Equations with Constant Coefficients:
Introduction, The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for Wronskian, The non-homogeneous equation of order two. [1]

Recommended Book:

1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice Hall of India Learning Private Limited, New Delhi-110001, (2009)

Scope:
Chapter 0. - Article 1, 3, 4, 5, 6
Chapter 1. - Article 1, 2, 3, 4, 5, 6, 7
Chapter 2. - Article 1, 2, 3, 4, 5, 6

Reference Books:

1) E.A.Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 505: Programming in C – I

Periods : 45
Marks : 40

1) Overview of C :
Introduction, Importance of c, Sample C Programs, Basic structure of C programs, programming style, Executing a C program. [1]

2) Constants, Variables and Data Types :
Introduction, Character set, C tokens, Keywords and identifies, Constants, variables, Data types, Declaration of Variables, Storage class Assigning values to variables, Defining symbolic constants, case studies. [1]

3) Operators and Expressions:
Introduction, Arithmetic of operators , Relational operators, Logical operators, Assignment operators, Increment and decrement operators, Conditional operators, Bitwise operators, Special operators, Arithmetic expression, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expression, Operators precedence and Associativity, mathematical functions. [1]

4) Managing Input and Output Operators:
Introduction, Reading a character, Writing a character, Formatted input, Formatted output. [1]

Recommended Book :

1] E. Balagurusamy : ***Programming in ANSI C*** (Fourth Edition) :Tata McGraw Hill

Scope:
Ch.1 :1.1,1.2, 1.3,1.4,1.5,1.6, 1.8 to 1.10
Ch.2 : 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10, 2.11
Ch.3 : 3.1 to 3.16
Ch.4 : 4.1 to 4.5

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Practical Paper – MAT-PR- 505(Based on MAT 505)

Periods : 15
Marks : 10

List of Experiments/Programs:

1. Program to find Maximum between two numbers using conditional operator.
2. Program to convert Temperature in Farad into Celsius. (C=0.5(F-32))
3. Program to find addition of two numbers.
4. Program to find square root of a number using *sqrt()* function.
5. Program to find m^n using *pow()* function.
6. Program to find simple interest (Si=(p+n+r)/100).
7. Program to find Area of Circle ($A=\pi r^2$)
8. Program to find Circumference of Rectangle (C= 2(length+breadth))
9. Program to find root of Quadratic Equation $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
10. Program to find Area of Rectangle (A = w x h)
11. Program to find circumference of circle
12. Program to find Area of Triangle. (A= ½ x b x h)
13. Program to find Area of Square (A = a2)
14. Program to find Area of Sphere (A = 4 π r2√)□
15. Program to Find Area of Cone (A= π r (r + 2+r2)

Note: University Practical Examination will be conducted annually.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 601: Real Analysis – II

Periods : 60
Marks : 50

1) Limits in Metric Spaces:
Metric spaces, Limits in metric spaces. [1]

2) Continuous Functions on Metric Spaces:
Functions continuous on metric spaces, open sets, Closed sets. [1]

3) Connectedness, Completeness and Compactness:
More about open sets, connected sets, bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces, Uniform continuity. [1]

4) Calculus:
Sets of measure zero, Definition of Riemann Integral, Existence of Riemann Integral, Fundamental Theorem of Calculus. [1]

5) Fourier Series:
Introduction. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 4 : 4.2(A, B, C), 4.3(A, C, D).

Chapter 5 : 5.3(A, B, C, D, E, F, G, H), 5.4(A, B, C, D, E, F, G), 5.5(A, B, C, D, E, F, G, H, I, J, L, M).

Chapter 6 : 6.1(A, B), 6.2(A, B), 6.3(A, B, C, D, E), 6.4(A, B, C, D, E, F), 6.5 (A, B, C, D, E), 6.6(A, B, C, D), 6.8(A, B, C, D, E)

Chapter 7 : 7.1(A, B, C, D), 7.2(A, B, C, D, E, F, G), 7.3(Theorem and Lemma are without Proof), 7.4(A, B, C, D, E, F), 7.8(A, B, C, D, E, F, G)

2] D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.

Scope:

Chapter 10 : Articles 10.1

References:

1) J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.
2) Hari Kishan ***: Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 602: Abstract Algebra – II

Periods : 60
Marks : 50

1) Vector Spaces and Modules:

Elementary basic concepts, Linear independence and bases, Dual Spaces, Inner product spaces, Modules. [1]

Recommended books:

1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:

Chapter 4 : 4.1, 4.2, 4.3, 4.4, 4.5

References:

1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) P. N. Chatterjjee : ***Linear Algebra*** : Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : ***Contemporary Abstract Algebra*** (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 603: Mathematical Statistics – II

Periods : 60
Marks : 50

1) Mathematical Expectation, Generating Functions:
Mathematical expectation, Expectation of a function of a random variable, Addition theorem of expectation, Multiplication theorem of expectation, Expectation of linear combination of random variables, Covariance, Correlation coefficient, Variance of a linear combination of random variables. [1]

2) Theoretical Discrete Probability Distributions:
Binomial distribution, moments, Recurrence relation for the moments of Binomial distribution, Moment generating function of Binomial distribution, Additive property of Binomial distribution, Cumulants of Binomial distribution, Recurrence relation for cumulants of Binomial distribution, Poission distribution, Moments of Poission distribution, Recurrence relation for moments of Poission distribution, Moment generating function of Poission distribution, cumulants of Poission distribution, Additive property of independent Poission variates, Geometric didtribution, Lack of memory, Moment of geometric distribution, Moment generating function of Geometric distribution. [1]

3) Theoretical Continuous Distributions:
Rectangular or Uniform distribution, Moments of rectangular distribution, Moment generating distribution of rectangular distribution, Normal distribution, Normal distribution as a limiting case of a binomial distribution, Mode of Normal distribution, Median of Normal distribution, moment generating function of Normal distribution, Cumulant generating function of Normal distribution, moments of Normal distribution, Gamma distribution, Moment generating function of Gamma distribution, Cumulant generating function of Gamma distribution, additive property of Gamma distribution, Exponential distribution, Moment generating function of exponential distribution. [1]

4) Correlation and Regression:
Bivariate distribution, Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, limits for correlation coefficient, Assumptions underlying Karl Pearson's correlation, Regression, Lines of regression, regression curves, Properties of regression coefficients, Angle between two lines of regression. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Ninth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.6.1, 6.7
Ch – 7: 7.2, 7.2.1, 7.2.2, 7.2.6, 7.2.7, 7.2.9, 7.2.10, 7.3, 7.3.2, 7.3.4, 7.3.5, 7.3.7, 7.3.8, 7.5, 7.5.1, 7.5.2, 7.5.2
Ch – 8: 8.1, 8.1.1, 8.1.2, 8.2, 8.2.1, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.6, 8.6.1
Ch – 10: 10.1, 10.2, 10.3, 10.3.1, 10.3.2, 10.7, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 604: Ordinary Differential Equations – II

Periods : 60
Marks : 50

1) Linear Equations with Variable Coefficients:
Introduction, Initial value problems for the homogeneous equation, Solution of homogeneous equation, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The nonhomogeneous equation, Homogeneous equation with analytic coefficients, The Legendre equation. [1]

2) Linear Equations with Regular Singular Points:
Introduction, The Euler equation, Second order equations with regular singular points- an example, Second order equations with regular singular points- the general case, The Bessel equation. [1]

Recommended Book:
1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice India Learning Private Limited, New Delhi-110001, (2009)

Scope:

Chapter 3.- Article 1,2,3,4,5,6,7,8
Chapter 4.- Article 1,2, 3, 4, 7

Reference Books:

1) E. A. Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 605: Programming in C – II

Periods : 45
Marks : 40

1) Decision Making and Branching:
Introduction, Decision making with if statement, Simple if statement, The ifelse statement, Nesting of ifelse statement, The elseif ladder, The switch statement, The ?: Operator, The goto statement [1]

2) Decision Making and Looping:
Introduction, The while statement, The do statement, The for statement, Jumps in loops [1]

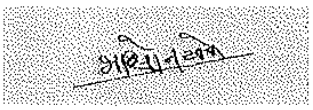
3) Arrays:
Introduction, One dimensional arrays, Declaration, Initialization, Two dimensional arrays, Initializing two-dimensional arrays, Multidimensional arrays. [1]

Recommended Book :
1] E. Balagurusamy : ***Programming in ANSI C*** (Second Edition) : Tata McGraw Hill

Scope:
Ch – 5 : 5.1 to 5.9
Ch – 6 : 6.1 to 6.5
Ch – 7 : 7.1 to 7.7

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

Note: (i) There should be annual practical based on Paper : MAT 505 and MAT 605 of 20 Marks in Mar/Apr Practical Examination
(ii) There should be separate passing for Theory and Practical.



Dr. B. R. Sontakke
(Chairman, Board of Studies in Mathematics)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Practical Paper – MAT-PR 605(Based on MAT 605)

Periods : 15
Marks : 10

List o f Experiments/Programs:

1. Program to find minimum between two number using if.
2. Program to Calculate factorial of a number.
3. Program to check given number is prime or not.
4. Program to check given number is Armstrong or not. ($153 = 1^3+5^3+3^3$)
5. Program to find n terms of Fibonacci Series (1 1 2 3 5 8 13 21 .....)
6. Program to find n terms of the Series.

$$\sum_{n=1}^{\infty} \frac{1}{2^n} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots.$$

7. Program to Sort any 10 Array Elements.
8. Program to Calculate Addition/Subtraction of two Matrices.
9. Program to calculate multiplication of two matrices.
10. Program to calculate Determinant of Matrix.
11. Program to Find Transpose of a Matrix.
12. Program to check given year is leap or not.
13. Program to find sum of series 1 to n.
14. Program to Calculate Grade of Student by inputting Percenta ge of the student.
15. Program to C heck given number is palindrome or not (ex. 12321)

Note: University Practical Examination will be conducted ann ually.

15

PRACTICAL QUESTION FORMAT

(MAT-PR-505 &605) (20 Marks) Max.Time :Three Hours

Q.1. Record Book **05 Marks.**

Q.2. Oral (Viva) **05 Marks.**

Q. 3. Write/Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

OR

Q. 4. Write /Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

Dr. Bhausaheb Sontakke
Chairman,
BOS in Mathematics

16

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/NP/B.Sc.-Ist Yr./SEM.-I & II/157/2013

It is hereby notified for information of all concerned that, on the recommendations of the Boards of Studies, Ad-hoc Boards, and Faculty of Science, the **Academic Council at its meeting held on 25-03-2013** has accepted the **following revised syllabi for B.Sc. First Year progressively under the Faculty of Science** :-

Sr. No.	*Revised Syllabus*	
[1]	*B.Sc. [Physics]*	*Semester- I & II,*
[2]	*B.Sc. [Dairy Science & Technology]*	*Semester- I & II,*
[3]	*B.Sc. [Industrial Chemistry]*	*Semester- I & II,*
[4]	*B.Sc. [Geology]*	*Semester- I & II,*
[5]	*B.Sc. [Chemistry]*	*Semester- I & II,*
[6]	*B.Sc. [Botany]*	*Semester- I & II,*
[7]	*B.Sc. [Electronics] Science*	*Semester- I & II,*
[8]	*B.Sc. [Fisheries]*	*Semester- I & II,*
[9]	*B.Sc. [Microbiology]*	*Semester- I & II,*
[10]	*B.A. [Statistics]*	*Semester- I & II,*
[11]	*B.Sc. [Statistics]*	*Semester- I & II,*
[12]	*B.Sc. [Zoology]*	*Semester- I & II,*
[13]	*B.Sc. [Textile and Interior Decoration]*	*Semester- I & II,*
[14]	*B.Sc. [Home Science]*	*Semester- I & II,*
[15]	*B.A. / B.Sc. [Mathematics]*	*Semester- I & II.*

This is effective from the **Academic Year 2013-2014** and onwards.

These **syllabi are available on the University Website www.bamu.net**

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/NP/B.Sc.-IST YEAR/
Sem-I & II/2013/5132-541
A.C.S.A.I.No.327[9].

Date:- 08-05-2013.

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Director,
Board of College and University Development.

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Copy forwarded with compliments to :-

1] **The Principals, affiliated concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above all syllabi on University Website [www.bamu.net].**

Copy to :-

1] The Controller of Examinations,

2] The Superintendent, [B.Sc. Unit],

3] The Superintendent, [B.A. Unit],

4] The Superintendent, [Eligibility Unit],

5] The Programmer [Computer Unit-1] Examinations,

6] The Programmer [Computer Unit-2] Examinations,

7] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,

8] The Public Relation Officer,

9] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

-=**=-

S*/-080513/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Syllabus

B.A./B.Sc. Mathematics
Semester – I & II
(With Effect from June 2013)

Syllabus

B.A. / B.Sc. (Mathematics) Semester- I (With effect from June 2013)

MAT 101: Differential Calculus **Marks : 50.**

1. Prerequisite:

Functions: Domain and range of a function, independent and dependent variables, polynomial functions and rational functions, constant functions and identity functions, one-one functions, onto function, invertible functions, composite function. [1]
Limit and Continuity: Limit of a function, left handed and right handed limits, non existence of limit, theorems on limits (statements only), theorems on continuity (statements only), discontinuity, types of discontinuity. [1]

2. Differentiations:

Derivative of a function, derived function, derivability implying continuity, geometrical interpretation of a derivative, hyperbolic functions, derivatives of hyperbolic and inverse hyperbolic functions, logarithmic differentiation, derivative of implicit functions. [1]

3. Successive Differentiation:

Higher order derivatives, calculation of n th derivatives, some standard results, determination of n th derivative of rational functions, the n th derivatives of the products of the powers of sines and cosines, Leibnitz's theorem: n th derivative of the product of two functions.[1]

4. Mean Value Theorems:

Rolle's Theorem, Lagrange's mean value theorem, meaning of the sign of the derivative, Cauchy's mean value theorem, higher derivatives, Taylor's theorem, Maclaurin's theorem, Maclaurin's power series for a given function. [1]

5. Partial Differentiation:

Function of two variables, limit of a function of two variables, continuity of a function of two variables at a point, limit of a continuous function, partial derivatives, partial derivatives of higher order, homogeneous function, Euler's theorem on homogeneous function, total differentials, differentiation of composite function and implicit function.[1].

6. Prerequisite:

Scalar product of two vectors, sign of the scalar product, length of a vector as a scalar product, angle between two vectors, commutativity, distributivity, right handed and left handed vector triads, vector product, some properties of vector product, scalar triple product, distributive law, some properties of scalar triple product, vector triple product.[2]

7. Differential Operators:

Point Functions: scalar valued point functions, vector valued point functions, limits and continuity, directional derivatives, Cartesian representation of point functions and their directional derivatives, directional derivatives of point functions along co-ordinate axes and along any line, gradient of a scalar point function, character of gradient as a point function, the operator ∇, operator $a.\nabla$, divergence and curl, gradient, divergence and curl of sums and product. [2]

Text Book:

[1]. Shanti Narayan: Differential Calculus, Shyamlal Charitable Trust, 2004

Scope:
Chapter 2: Articles 2.1, 2.11, 2.12, 2.31, 2.32, 2.4 2.42, 2.5
Chapter 3: Articles 3.2, 3.21, 3.22, 3.3, 3.6, 3.61, 3.62, 3.8, 3.81
Chapter 4: Articles 4.1, 4.11, 4.12, 4.14, 4.15, 4.7, 4.71, 4.72, 4.9, 4.10
Chapter 5: Complete
Chapter 7: Articles 7.1, 7.2, 7.3, 7.5, 7.6, 7.61
Chapter 10: Articles 10.1, 10.2, 10.3, 10.4, 10.41, 10.5, 10.51, 10.6, 10.61, 10.8, 10.81, 10.9, 10.91, 10.93, 10.94

[2]. Shanti Narayan and P. K. Mittal : Vector Analysis, S. Chand and Company Ltd, 2007.

Scope:
Chapter 3: Articles 3.1, 3.1.1 to3.1.9, 3.1.10 (statements only)
Chapter 5: Articles 5.2, 5.2.1, 5.3, 5.3.1 to 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.5, 5.5.1, 5.6, 5.7, 5.7.1 to 5.7.3, 5.8
Chapter 10: Articles 10.1, 10.1.1 to 10.1.2, 10.2, 10.2.1 to10.2.3, 10.3, 10.3.1 to 10.3.2, 10.4, 10.4.1 to 10.4.2, 10.5, 10.6, 10.7, 10.7.1 to 10.7.2, 10.9, 10.10, 10.11, 10.12, 10.12.1 to10.12.2, 10.14, 10.15 (results 1 to 6).

Note: Questions on prerequisite may not be asked.

MAT 102: Differential Equations **Marks: 50**

1. Prerequisite:

Ordinary and partial differential equations, order and degree of Differential equations, Solutions: general, particular, singular.

2. Equations of The First Order and of The First Degree:

Exact differential equations, Linear equations, Equations reducible to the linear form.

3. Linear Equations with Constant Coefficients:

Linear equations, complementary functions, particular integral, complete integral, The linear equations with constant coefficients and second member zero, case of auxiliary equation having equal roots, case of auxiliary equation having imaginary roots, the symbol D, the linear equation with constant coefficients and second member a function of x, the symbolic function $1/f(D)$, methods of finding the particular integral, short methods of finding particular integrals corresponding to the terms e^{ax}, x^m, $\sin ax$, $\cos ax$, $e^{ax}V$ and xV in the second member.

4. Linear Equations with Variable Coefficients:

The homogeneous linear equation, methods of finding solution, the symbolic functions $f(\theta)$ and $1/f(\theta)$, methods of finding the particular integral, integral corresponding to a term of form x^m in the second member, equations reducible to homogeneous linear form.

5. Exact Differential Equations and Equations of Particular Forms:

Exact differential equations, criterion of an exact differential equation, the integration of an exact equation: first integral, equations of the form $\frac{d^n y}{dx^n} = f(x)$, equation of the form $\frac{d^2 y}{dx^2} = f(y)$.

6. Ordinary Differential Equations with More Than Two Variables:

Simultaneous differential equations which are linear, simultaneous equations of the First order.

7. Partial Differential Equations:

Definitions, derivation of a partial differential equation by the elimination of constants,, Derivation of a partial differential equation by the elimination of arbitrary functions.

Text Book:

D. A. Murray : Introductory Course in Differential Equations, Khosla Publishing House, New Delhi, 2003.

Scope:
Chapter 1: Articles 1, 2, 4
Chapter 2: Articles 11, 12,13,20,21
Chapter 6: Articles 49 to 53, 56 to 64
Chapter 7: Articles 65 to 71
Chapter 8: Articles 73 to 77
Chapter 11: Articles 98, 99
Chapter 12: Articles 107, 108, 109

Note:Questions on prerequisite may not be asked.

Syllabus

B.A / B.Sc. (Mathematics) Semester- II

MAT 201: Integral Calculus : **Marks: 50.**

1. Methods of Integration:

Reduction formulae. [1]

2. Integration of Algebraic Rational Functions:

Case of non-repeated linear factors, case of non-repeated linear or repeated linear factors, case of linear or quadratic non repeated factors [1]

3. Integration of Trigonometric Functions:

Integration of $\sin^n x$, $\cos^n x$ and reduction formulae for integration of $\sin^n x$, $\cos^n x$ [1]

4. Definite Integral as The Limit of a Sum:

Introduction, fundamental theorem.[1]

5. Areas of Plane Regions:

Areas of a region bounded by a curve, x-axis and two ordinates.[1]

6. Rectification, Length of Plane Curves:

Introduction, expression for lengths of curves $y = f(x)$, expressions for lengths of arc $x = f(y)$; $x = f(t)$, $y = \phi(t)$; $r = f(\theta)$. [1]

7. Volumes and Surfaces of Revolution:

Introduction, expressions for the volume obtained by revolving about either the axis [1]

8. Integral Transformation:

Introduction, line integrals, circulation, irrotational vector point functions, surface integrals, volume integrals, reduction of volume to surface integral, physical interpretation of Gauss theorem, reduction of surface to line integrals, condition for irrotational vector functional, Green's theorem.[2]

Text Books:

[1]. Shanti Narayan : Integral Calculus, S. Chand and Company Limited 1999.

Scope:
Chapter 2: Articles 2.8
Chapter 3: Articles 3.1 to 3.4
Chapter 4: Articles 4.1, 4.2
Chapter 6: Articles 6.1, 6.2
Chapter 7: Articles 7.1
Chapter 8: Articles 8.1, 8.2, 8.3, 8.31
Chapter 9: Articles 9.1, 9.2

[2]. Shanti Narayan and P. K. Mittal : Vector Analysis, S. Chand and Company Ltd, 2007.

Scope:
Chapter 11: Articles 11, 11.1, 11.1.1 to 11.1.2, 11.2, 11.2.1, 11.3, 11.3.1, 11.5, 11.6, 11.7, 11.8, 11.9, 11.11.

Note: Questions on prerequisite may not be asked.

MAT 202: Geometry **Marks:50.**

1. The Plane:

Equations of the first degree in x, y, z, transformation to the normal form, determination of plane under given conditions, equations of the plane through three given points, systems of planes, two sides of a plane, length of the perpendicular from a point to a plane, bisectors of angles between two planes, joint equation of two planes.

2. Right Line:

Equations of a line, equations of a straight line in terms of its direction cosines and the co-ordinates of a point on it, equations of a line through two points, symmetrical and unsymmetrical forms of the equations of a line, transformation of the equations of a line to the symmetrical form, angle between a line and a plane, the condition that a given line may lie in a given plane, the condition that two given lines are coplanar, number of arbitrary constants in the equations of a straight line, sets of conditions which determine a line, the shortest distance between two lines, the length and equations of the line of shortest distance between two straight lines, length of perpendicular from a given point to a given line.

3. Sphere:

Definition and equation of the sphere, equation of the sphere through four given points, plane section of a sphere, intersection of two spheres, equation of a circle, sphere through a given circle, intersection of a sphere and a line, equation of a tangent plane.

4. Cones, Cylinders:

The right circular cone, equation of a right circular cone, the right circular cylinder, equation of a right circular cylinder.

5. The Conicoid:

Central conicoids, intersection of a line and a central conicoid, tangent lines and tangent plane at a point, condition that a plane may touch a central conicoid.

Text Book:

[1] Shanti Narayan: ***Analytical Solid Geometry*****, S. Chand and Company Ltd, New Delhi, 1998**

Scope:
Chapter 2: Articles 2.1, 2.3, 2.31, 2.32, 2.4, 2.41, 2.42, 2.5, 2.6, 2.7, 2.71, 2.8
Chapter 3: Articles 3.1, 3.11, 3.12, 3.13, 3.14, 3.2 to3.5, 3.51, 3.6, 3.61, 3.7
Chapter 6: Articles 6.11, 6.12, 6.13, 6.2, 6.31, 6.32, 6.4, 6.41, 6.5, 6.6
Chapter 7: Articles 7.61, 7.62, 7.81, 7.82
Chapter 8: Articles 8.24, 8.3, 8.31, 8.32

(Dr. B. R. SONTAKKE)
Chairman, Board of Studies in Mathematics
Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and University Development.

..2..

Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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S*/-160615/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Syllabus of B. A. /B. Sc. Third year (Mathematics) (optional) With Effect from June – 2015

DR . BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGABAD
BOARD OF STUDIES IN MATHEMATICS
REVISED SYLLABUS FOR THIRD YEAR B.Sc. (MATHEMATICS)
(With Effect From June -2015)

Semester V

Compulsory Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Optional Papers (Any One):

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I
Paper – MAT 505: Programming in C – I

Semester VI

Compulsory Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Optional Papers (Any One):

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II
Paper – MAT 605: Programming in C – II

REVISED SYLLABUS FOR THIRD YEAR B.A. (MATHEMATICS)

(With Effect From June -2015)

Semester V

Main Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Subsidiary Papers:

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I

Semester VI

Main Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Subsidiary Papers:

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 501: Real Analysis – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets and elements, Operations on sets.

2) Functions:
Functions, Real-valued functions, Equivalence, Countability, Real numbers, Least upper bounds. [1]

3) Sequences of Real Numbers:
Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Monotone sequences, Operations on convergent sequences, Operations on divergent sequences, Limit superior and limit inferior, Cauchy sequences. [1]

4) Series of Real Numbers:
Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and convergence, Test for absolute convergence. [1]

5) Jacobians:
Definitions, Case of function of functions, Jacobian of implicit functions, Necessary and sufficient condition for a Jacobian to vanish. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 1 : 1.3(A, B, C, D, E, F, G, H, I), 1.4(A, B, C, D, E), 1.5(A, B, C, D, E, F, G, H, I), 1.6(A, B, C, D, E), 1.7(A, B, C, D, E).

Chapter 2 : 2.1(A, B, C, D), 2.2(A, B), 2.3(A, B, C, D), 2.4(A, B, C), 2.5(A, B), 2.6(A, B, C, D, E), 2.7(A, B, C, D, E, F, G, H, I, J), 2.8(A, B, C, D), 2.9(A, B, C, D, E, F, G, I, J, K, L, M), 2.10(A, B, C, D, E), 2.12(A, B).

Chapter 3 : 3.1(A, B, C, D), 3.2(A, B, C, D, E), 3.3(A, B), 2.4(A, B, C), 3.6 (A, B, C, D, E, F, G, H, I,)

2] J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.

Scope:

Chapter 13 : Articles 1, 2, 3, 4, 5, 6, 7

References:

1) D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.
2) Hari Kishan ***: Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

Note : Questions on prerequisite should not be asked.

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 502: Abstract Algebra – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets, Functions, Integers.

2) Group Theory:
Definition of a group, Some examples of groups, Some preliminary lemmas Subgroups, A counting Principle, Normal subgroups and quotient groups Homomrphism, Automorphism. [1]

3) Ring Theory:
Definition and examples of rings Some special classes of ring, Ideals and quotient rings More ideals and quotient rings, Polynomial ring. [1]

Recommended books:
1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:
Chapter 2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7(Cauchy's Theorem for Abelian Groups and Cauchy's Theorem for Abelian Groups are without proof), 2.8.
Chapter 3 : 3.1, 3.2, 3.3, 3.5, 3.9(Omit Theorem 3.9.1)

References:
1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) I. N. Herstein : Abstract Algebra (Third Edition): Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : Contemporary Abstract Algebra (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Note : Questions on prerequisite should not be asked.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 503: Mathematical Statistics – I

Periods : 60
Marks : 50

1) Frequency Distribution and Measures of Central Tendency:
Frequency distribution, Continuous frequency distribution, Graphical representation of a frequency distribution, Histograms, Frequency Polygon, Measures of Central Tendency, Arithmetic mean, Properties of arithmetic mean, merits and demerits of Arithmetic mean, Weighted mean, Median, Merits and demerits of Median, Mode Merits and demerits of mode, Geometric mean, Merits and demerits of Geometric mean, Harmonic mean, partitions [1]

2) Measures of Dispersion Skewness and Kurtosis:
Dispersion, Characteristic for an ideal measure of dispersion, Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and root mean square deviation, Relation between and s, Different formulae for calculating variance, Variance of the combined series, Coefficient of dispersion, Coefficient of variations, Moments, Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of Origin and scale on moments, Pearson's and coefficients, Skewness and kurtosis. [1]

3) Theory of Probability:
Introduction, Definition of various terms, Mathematical or Classical Probability, Statistical Probability, Axiomatic approach to probability, Random experiments, Sample space, Events, Some illustrations, Algebra of events, Probability – Mathematical Notion, Probability function, Theorems on Probability of events, Law of addition of Probability, Multiplication law of probability and conditional probability, Independent events, Pairwise independent events, Conditions for mutual independence of n events. [1]

4) Random Variables and Distribution Functions:
Random Variable, Distribution function, Properties of distribution function, Discrete random variables, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Various measures of Central tendency, Continuous distribution function. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Nineth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 2: 2.1, 2.1.1, 2.2, 2.2.1, 2.2.2, 2.3, 2.4, 2.5, 2.5.1, 2.5.1, 2.5.2, 2.5.3, 2.6, 2.6.1, 2.7, 2.7.1, 2.8, 2.8.1, 2.9, 2.9.1, 2.11.
Ch – 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.7.1, 3.7.2, 3.7.3, 2.8, 2.8.1, 3.9, 3.9.1, 3.9.2, 3.10, 3.13, 3,14.
Ch – 4: 4.1, 4.3, 4.3.1, 4.3.2, 4.5, 4.5.1, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.6, 4.6.1(omit Thm 4.1), 4.6.2, 4.7, 4.7.2, 4.7.3, 4.7.4, 4.7.5
Ch – 5: 5.1, 5.2, 5.2.1, 5.3, 5.3.1, 5.3.2, 5.4, 5.4.1, 5.4.2, 5.4.3

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 504: Ordinary Differential Equations – I

Periods : 60
Marks : 50

Prerequisite: Complex numbers

1) Preliminaries:
Introduction, Functions, Polynomials, Complex series and the exponential function, Determinants. [1]

2) Linear Equations of First Order:
Introduction, Differential Equations, Problems associated with differential equations, Linear equations of the first order, The equation $y' + ay = 0$, The equation $y' + ay = b(x)$, The general linear equation of the first order. [1]

3) Linear Equations with Constant Coefficients:
Introduction, The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for Wronskian, The non-homogeneous equation of order two. [1]

Recommended Book:

1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice Hall of India Learning Private Limited, New Delhi-110001, (2009)

Scope:
Chapter 0. - Article 1, 3, 4, 5, 6
Chapter 1. - Article 1, 2, 3, 4, 5, 6, 7
Chapter 2. - Article 1, 2, 3, 4, 5, 6

Reference Books:

1) E.A.Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 505: Programming in C – I

Periods : 45
Marks : 40

1) Overview of C :
Introduction, Importance of c, Sample C Programs, Basic structure of C programs, programming style, Executing a C program. [1]

2) Constants, Variables and Data Types :
Introduction, Character set, C tokens, Keywords and identifies, Constants, variables, Data types, Declaration of Variables, Storage class Assigning values to variables, Defining symbolic constants, case studies. [1]

3) Operators and Expressions:
Introduction, Arithmetic of operators , Relational operators, Logical operators, Assignment operators, Increment and decrement operators, Conditional operators, Bitwise operators, Special operators, Arithmetic expression, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expression, Operators precedence and Associativity, mathematical functions. [1]

4) Managing Input and Output Operators:
Introduction, Reading a character, Writing a character, Formatted input, Formatted output. [1]

Recommended Book :

1] E. Balagurusamy : ***Programming in ANSI C*** (Fourth Edition) :Tata McGraw Hill

Scope:
Ch.1 :1.1,1.2, 1.3,1.4,1.5,1.6, 1.8 to 1.10
Ch.2 : 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10, 2.11
Ch.3 : 3.1 to 3.16
Ch.4 : 4.1 to 4.5

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Practical Paper – MAT-PR- 505(Based on MAT 505)

Periods : 15
Marks : 10

List of Experiments/Programs:

1. Program to find Maximum between two numbers using conditional operator.
2. Program to convert Temperature in Farad into Celsius. (C=0.5(F-32))
3. Program to find addition of two numbers.
4. Program to find square root of a number using *sqrt()* function.
5. Program to find m^n using *pow()* function.
6. Program to find simple interest (Si=(p+n+r)/100).
7. Program to find Area of Circle ($A=\pi r^2$)
8. Program to find Circumference of Rectangle (C= 2(length+breadth))
9. Program to find root of Quadratic Equation $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
10. Program to find Area of Rectangle (A = w x h)
11. Program to find circumference of circle
12. Program to find Area of Triangle. (A= ½ x b x h)
13. Program to find Area of Square (A = a2)
14. Program to find Area of Sphere (A = 4 π r2√)□
15. Program to Find Area of Cone (A= π r (r + 2+r2)

Note: University Practical Examination will be conducted annually.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 601: Real Analysis – II

Periods : 60
Marks : 50

1) Limits in Metric Spaces:
Metric spaces, Limits in metric spaces. [1]

2) Continuous Functions on Metric Spaces:
Functions continuous on metric spaces, open sets, Closed sets. [1]

3) Connectedness, Completeness and Compactness:
More about open sets, connected sets, bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces, Uniform continuity. [1]

4) Calculus:
Sets of measure zero, Definition of Riemann Integral, Existence of Riemann Integral, Fundamental Theorem of Calculus. [1]

5) Fourier Series:
Introduction. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 4 : 4.2(A, B, C), 4.3(A, C, D).

Chapter 5 : 5.3(A, B, C, D, E, F, G, H), 5.4(A, B, C, D, E, F, G), 5.5(A, B, C, D, E, F, G, H, I, J, L, M).

Chapter 6 : 6.1(A, B), 6.2(A, B), 6.3(A, B, C, D, E), 6.4(A, B, C, D, E, F), 6.5 (A, B, C, D, E), 6.6(A, B, C, D), 6.8(A, B, C, D, E)

Chapter 7 : 7.1(A, B, C, D), 7.2(A, B, C, D, E, F, G), 7.3(Theorem and Lemma are without Proof), 7.4(A, B, C, D, E, F), 7.8(A, B, C, D, E, F, G)

2] D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.

Scope:

Chapter 10 : Articles 10.1

References:

1) J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.
2) Hari Kishan ***: Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 602: Abstract Algebra – II

Periods : 60
Marks : 50

1) Vector Spaces and Modules:

Elementary basic concepts, Linear independence and bases, Dual Spaces, Inner product spaces, Modules. [1]

Recommended books:

1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:

Chapter 4 : 4.1, 4.2, 4.3, 4.4, 4.5

References:

1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) P. N. Chatterjjee : ***Linear Algebra*** : Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : ***Contemporary Abstract Algebra*** (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 603: Mathematical Statistics – II

Periods : 60
Marks : 50

1) Mathematical Expectation, Generating Functions:
Mathematical expectation, Expectation of a function of a random variable, Addition theorem of expectation, Multiplication theorem of expectation, Expectation of linear combination of random variables, Covariance, Correlation coefficient, Variance of a linear combination of random variables. [1]

2) Theoretical Discrete Probability Distributions:
Binomial distribution, moments, Recurrence relation for the moments of Binomial distribution, Moment generating function of Binomial distribution, Additive property of Binomial distribution, Cumulants of Binomial distribution, Recurrence relation for cumulants of Binomial distribution, Poission distribution, Moments of Poission distribution, Recurrence relation for moments of Poission distribution, Moment generating function of Poission distribution, cumulants of Poission distribution, Additive property of independent Poission variates, Geometric didtribution, Lack of memory, Moment of geometric distribution, Moment generating function of Geometric distribution. [1]

3) Theoretical Continuous Distributions:
Rectangular or Uniform distribution, Moments of rectangular distribution, Moment generating distribution of rectangular distribution, Normal distribution, Normal distribution as a limiting case of a binomial distribution, Mode of Normal distribution, Median of Normal distribution, moment generating function of Normal distribution, Cumulant generating function of Normal distribution, moments of Normal distribution, Gamma distribution, Moment generating function of Gamma distribution, Cumulant generating function of Gamma distribution, additive property of Gamma distribution, Exponential distribution, Moment generating function of exponential distribution. [1]

4) Correlation and Regression:
Bivariate distribution, Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, limits for correlation coefficient, Assumptions underlying Karl Pearson's correlation, Regression, Lines of regression, regression curves, Properties of regression coefficients, Angle between two lines of regression. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Ninth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.6.1, 6.7
Ch – 7: 7.2, 7.2.1, 7.2.2, 7.2.6, 7.2.7, 7.2.9, 7.2.10, 7.3, 7.3.2, 7.3.4, 7.3.5, 7.3.7, 7.3.8, 7.5, 7.5.1, 7.5.2, 7.5.2
Ch – 8: 8.1, 8.1.1, 8.1.2, 8.2, 8.2.1, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.6, 8.6.1
Ch – 10: 10.1, 10.2, 10.3, 10.3.1, 10.3.2, 10.7, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 604: Ordinary Differential Equations – II

Periods : 60
Marks : 50

1) Linear Equations with Variable Coefficients:
Introduction, Initial value problems for the homogeneous equation, Solution of homogeneous equation, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The nonhomogeneous equation, Homogeneous equation with analytic coefficients, The Legendre equation. [1]

2) Linear Equations with Regular Singular Points:
Introduction, The Euler equation, Second order equations with regular singular points- an example, Second order equations with regular singular points- the general case, The Bessel equation. [1]

Recommended Book:
1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice India Learning Private Limited, New Delhi-110001, (2009)

Scope:

Chapter 3.- Article 1,2,3,4,5,6,7,8
Chapter 4.- Article 1,2, 3, 4, 7

Reference Books:

1) E. A. Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 605: Programming in C – II

Periods : 45
Marks : 40

1) Decision Making and Branching:
Introduction, Decision making with if statement, Simple if statement, The ifelse statement, Nesting of ifelse statement, The elseif ladder, The switch statement, The ?: Operator, The goto statement [1]

2) Decision Making and Looping:
Introduction, The while statement, The do statement, The for statement, Jumps in loops [1]

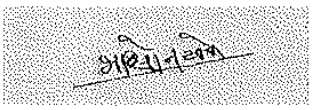
3) Arrays:
Introduction, One dimensional arrays, Declaration, Initialization, Two dimensional arrays, Initializing two-dimensional arrays, Multidimensional arrays. [1]

Recommended Book :
1] E. Balagurusamy : ***Programming in ANSI C*** (Second Edition) : Tata McGraw Hill

Scope:
Ch – 5 : 5.1 to 5.9
Ch – 6 : 6.1 to 6.5
Ch – 7 : 7.1 to 7.7

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

Note: (i) There should be annual practical based on Paper : MAT 505 and MAT 605 of 20 Marks in Mar/Apr Practical Examination
(ii) There should be separate passing for Theory and Practical.



Dr. B. R. Sontakke
(Chairman, Board of Studies in Mathematics)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Practical Paper – MAT-PR 605(Based on MAT 605)

Periods : 15
Marks : 10

List o f Experiments/Programs:

1. Program to find minimum between two number using if.
2. Program to Calculate factorial of a number.
3. Program to check given number is prime or not.
4. Program to check given number is Armstrong or not. ($153 = 1^3+5^3+3^3$)
5. Program to find n terms of Fibonacci Series (1 1 2 3 5 8 13 21 .....)
6. Program to find n terms of the Series.

$$\sum_{n=1}^{\infty} \frac{1}{2^n} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots.$$

7. Program to Sort any 10 Array Elements.
8. Program to Calculate Addition/Subtraction of two Matrices.
9. Program to calculate multiplication of two matrices.
10. Program to calculate Determinant of Matrix.
11. Program to Find Transpose of a Matrix.
12. Program to check given year is leap or not.
13. Program to find sum of series 1 to n.
14. Program to Calculate Grade of Student by inputting Percenta ge of the student.
15. Program to C heck given number is palindrome or not (ex. 12321)

Note: University Practical Examination will be conducted ann ually.

15

PRACTICAL QUESTION FORMAT

(MAT-PR-505 &605) (20 Marks) Max.Time :Three Hours

Q.1. Record Book **05 Marks.**

Q.2. Oral (Viva) **05 Marks.**

Q. 3. Write/Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

OR

Q. 4. Write /Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

Dr. Bhausaheb Sontakke
Chairman,
BOS in Mathematics

16

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and
University Development.

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Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

-:***:-

S*/-160615/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

PHYSICS SYLLABUS

B. Sc. III Year

Semester V & VI

Effective from academic year 2015-16

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
B. Sc. IIIrd year Physics Syllabus
(Semester-V and VI)
Revised syllabus from June 2015

Semester	Course Code	Paper	Title of Paper	Periods	Marks
V	301	XV	Classical & Quantum Mechanics	45	50
V	302	XVI	Electrodynamics	45	50
V	303	XVII	Practical	45	50
V	304	XVIII	Practical	45	50
VI	305	XIX	Atomic, Molecular Physics & Laser	45	50
VI	306	XX	Non-conventional energy sources and Optical fiber	45	50
VI	307	XXI	Practical	45	50
VI	308	XXII	Practical	45	50

Scheme of practical examination and marks

Practical examination will be conducted annually

Practical : paper XVII+XVIII based on theory paper XV & XVI (50+50= 100 Marks)

Practical : paper XXI + XXII based on theory paper XIX & XX (50+50= 100 Marks)

Experiment : Paper XVII+XVIII – Experiment 75 marks + Viva-Voce 15 Marks + Record Book/Journals 10 Marks + = 100 Marks

Experiment : Paper XXI + XXII - Experiment 70 marks + Viva-Voce 10 Marks + Record Book/Journals 10 Marks + Submission of project report 10 Marks = 100 Marks

B.Sc. IIIr^{d} year Physics (Semester-V)
Classical and Quantum Mechanics
Course code PHY-301
Paper-XV

Period-45 **Marks-50**

Chapter 1. Classical Mechanics [11]

Mechanics of Particle, Mechanics of system of particles Constraints, Classification of Constraints, Virtual Work, D'Alembert's principle, Lagrange's equation, Simple application of Lagrangian formulation –Simple Pendulum, Particle in space, Linear Harmonic Oscillator, Atwood's Machine .

Chapter 2. Origin of Quantum theory [12]

Introduction, Failure of Classical mechanics, Black body Radiation (Distribution of Energy), Plank's Quantum theory-Plank's Quantum postulates, linear momentum of photon in terms of wave vector, Plank's radiation law-Wein's law and Rayleigh's law, Einstein's equation: Quantum theory of photoelectric effect, Quantum effect.

Chapter 3. Wave Particle duality [12]

Introduction, de-Broglie's hypothesis for matter waves, de-Broglie's wavelength in terms of energy and temperature, de-Broglie phase velocity and particle velocity (relation between them), Group velocity, Relation between group velocity and phase velocity, Davisson-Germer Experiment, Heisenberg uncertainty principle, Applications of Heisenberg uncertainty principle (1) Nonexistence of electrons in nucleus (2) Binding energy of an electron in an atom.

Chapter 3. The Schrodinger Equation and its applications [10]

Wave Function (Ψ) of a moving particle, Time dependent Schrodinger's wave equation, Expectation value, Operators, Time independent Schrodinger equation (steady state form), particle in one dimensional box, Quantization of energy and momentum.

Reference Books

1) Classical Mechanics- H- Goldstein
2) Classical Mechanics – N.C. Rana and P.S. Joag
3) Classical Mechanics – Gupta, Kumar and Sharma
4) Introduction of Classical Mechanics – R.G. Takwale& P.S. Puranik.
5) Physics for degree student – C.L. Arora, P.S. Hemne (Ist edition S. Chand Publication).
6) Quantum Chemistry- Donald Allan Macquarie (Viva-Books Pvt. Ltd.).
7) Mathematics for Chemistry- Donald Allan Macquarie (Viva Books Pvt. Ltd.).
8) Concepts of Modern Physics - Arthur Beiser, ShobhitMahajan, S. RaiChoudhary (VIth Edition- Mc- Graw Hill).
9) Perspective of Modern Physics – Arthur Beiser.

B.Sc. IIIrd year Physics (Semester-V)

Electrodynamics

Course code PHY-302

Paper-XVI

Period-45 **Marks-50**

Chapter 1. Electrostatics [12]

Introduction : Electric field lines , electric flux and Gauss law, the divergence of E, Curl of E, Application of Gauss law: i) Electric field due to a uniform charged sphere ii) Electric field due to charged cylinder, Gaussian pillbox, Poisson's equation, Laplace's equation, Uniqueness theorem (First and Second)

Chapter 2. Time varying field [10]

Faraday's Law of Electromagnetic induction, Lenz's law, Self-Induction, Mutual Induction, equation of continuity, Maxwell's displacement current, Maxwell's equation (Derivation, Differential form)

Chapter 3. Electromagnetic waves III [15]

Origin of electromagnetic waves, characteristics of electromagnetic wave, electromagnetic wave equations in a conducting medium, transverse nature of electromagnetic wave, plane polarized electromagnetic wave, The Poynting Vector, Poynting theorem, Polarization of Electromagnetic waves

Chapter 4. Interaction of Electromagnetic waves with matter [08]

Boundary condition for the electromagnetic field vector –**B,E,D and H** at the interface between the two media, reflection and refraction at the boundary of two non conducting media.

Reference Books:

1. Introduction to Electrodynamics-David J. Griffiths, Third Edition.
2. Mechanics and Electrodynamics - Brijlal N. Subrahmanyam, JivanSeshan
3. Classical Electrodynamics – S.P. Pure
4. Electrodynamics- B.B. Laud
5. Electrodynamics-Gupta, Kumar and Singh, Pragati Prakashan, Meerut
6. Electromagnetic waves and fields –R.N.Singh

B.Sc. IIIr^{d} year Physics (Semester-V)

Practical

Course code PHY-303

Paper-XXI

Period-45 **Marks-50**

List of experiments

1. Measurement of the focal length of a given convex lens using laser
2. Spectral response of photoconductor (LDR)
3. Diffraction of grating using laser beam
4. e by Millikan's oil drop method
5. Study of thermocouple (Fe-Cu) and to find inversion temperature
6. Refractive Index R.I. of Optical fiber
7. constant of B.G. by standard condenser method
8. study of absorption spectra of iodine and determination of its wavelength using grating

Note :- At least Six experiments should be performed.

B.Sc. IIIrd year Physics (Semester-V)

Practical

Course code PHY-304

Paper-XXII

Marks-50

List of experiments

1. Beam divergence of a diode laser
2. Determination of the diameter of a thin wire using laser
3. To study the interference of light using optical fibers
4. Determination of wavelength of He-Ne laser by transmission grating and reflection grating
5. Y by Koenig's method
6. Edser's A pattern
7. e/m by Thomson methods by Excel
8. Surface tension by Ripple's method

Note :- At least Six experiments should be performed.

B.Sc. IIIrd year Physics (Semester-VI)
Atomic, Molecular Physics and LASER
Course code PHY-305
Paper-XIX

Period-45 **Marks-50**

Chapter 1. The Atom model [10]

Introduction, Thomson atom model, the Rutherford nuclear atom model, drawbacks of Rutherford atomic model, the Bohr's atom model, Bohr's theory of origin of spectral lines, diagrammatic representation of the series spectrum of the H-atom in the light of Bohr's theory.

Chapter 2. Vector Atom Model [15]

Introduction-vector atom model, Quantum numbers associated with the vector atom model, L-S coupling, j-j coupling, The Pauli's exclusion principle, Selection rules, Intensity Rules, Interval Rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect and its experimental study.

Chapter 3. Molecular spectra [15]

Introduction, origin of pure rotational spectrum of a molecule, origin of vibration-rotation spectrum of a molecule, Rayleigh's law of scattering, Raman effect-Discovery, experimental study, Applications of Raman effect-molecular structure, Nature of liquids, Crystal Physics, Nuclear Physics, Chemical effects.

Chapter 4. LASER [10]

Introduction, induced absorption, spontaneous emission, stimulated emission, population inversion, properties of laser beam, laser pumping, Types of laser-Ruby laser, He-Ne laser, carbon dioxide (CO_2) laser, Applications of laser-Biological, medical and industrial.

Reference Books

1. Atomic Physics – J.B. Rajam, S. Chand & Company Ltd.
2. Physics for degree students – C.L. Arora, Dr. P.S. Hemne, S. Chand Publication
3. Modern Physics – R. Murugeshan, Er. KiruthigaSivaprasath, S. Chand Publication
4. Introduction of Atomic Spectra-white.
5. Fundamentals of Molecular Spectroscopy- C.N. Banwell and E.M. McCash (McGraw Hill International Edition)

B.Sc. IIIr^{d} year Physics (Semester-VI)
Non-conventional energy sources and Optical fiber
Course code PHY-306
Paper-XX

Period-45 **Marks-50**

Chapter1. Non-conventional energy sources (12)

Introduction, Biomass, wind energy, tidal energy/Ocean energy, geothermal energy, biogas hydro energy, wind energy, solar energy

Biogas plant-fixed dome type

Wind energy: Introduction to wind energy, terms and definition: wind, wind farm, wind turbine, vertical axis wind turbine (VAWT), horizontal axis wind turbine (HAWT), propeller (wheel), wind mill,types of wind turbines generator units, monoblade HAWT, twin blade HAWT, merits and limitation of wind energy.

Chapter 2. Solar Photovoltaic Systems: (10)

Introduction to photovoltaic systems, Solar Cell fundamentals: i) Semiconductor, ii) P-N junction, iii) Generation of electron-hole pair by photon absorption, iv) I_V characteristics of solar cell

Electrical storage: Lead acid battery, basic battery theory

Chapter 3. Introduction of optical fiber (10)

Introduction, importance of optical fiber, classification of optical fiber- stepped index fiber, stepped index monomode fiber, Disadvantages of monomode fiber, plastic fiber, latest developed types of optical fibers- HPSUV; HPSIR; Halide; Tapered.

Chapter4. Fiber cables and fabrication (13)

Fiber fabrication: Classification of fiber fabrication techniques; external chemical vapour deposition (external CVD), axial vapour deposition (AVD), internal chemical vapour deposition (internal CVD)

Fiber Cables: Construction, Strength members, cable tensile loading, minimum bend radius losses incurred during installation of cables or during subscriber service testing of cable, selection criteria, optical cable fiber laying in telephone.

References:

1) Optoelectronics; R. A. Barapate (Tech-Max Publication, Pune)
2) Principles of Solar Cells, LEDs and Diodes: The role of the PN junction; ADRIAN KITAI (2011 John Wiley & Sons, Ltd)
3) Light Sources: Technologies and Applications; Spiros Kitsinelis (CRC Press Taylo & Francis Group, FL 33487-2742) - 2011
4) Energy technology (non-conventional, renewable, and conventional) - S. Rao, Dr. B.B. Parulekar, Khanna Publishers.
5) Non-conventional energy resources- B.H. Khan, G.D. Rai, R.P. Khare, IInd edition, McGraw Hill Education (India) Private Limited, New Delhi.
6) Non-conventional Energy Sources- G.D. Rai, Khanna Publisher
7) Solar energy and Rural development- S.H. Pawar, C.D. Lokhande& R.N. Patil
8) Solar energy, Fundamentals and applications- Garg, Prakash Tata McGraw Hill
9) Fiber Optics and Optoelectronics – R.P. Khare, Oxford University Press.

B.Sc. IIIr^{d} year Physics (Semester-VI)

Practical

Course code PHY-307

Paper-XVII

Marks-50

List of experiments

1. Thermal conductivity by Forb's method
2. Rydberg constant
3. B-H curve using magnetometer
4. Determination of Debye's temperature (e.g. Tin)
5. Determination of dielectric constant of liquid/solid
6. Resistance measurement of semiconductor by Vaders Pau's method
7. I-H Curve by Excel
8. Rydberg constant Excel

Note:- At least Six experiments should be performed.

B.Sc. IIIr^{d} year Physics (Semester-VI)

Practical

Course code PHY-308

Paper-XVIII

Marks-50

List of experiments

1. Temperature coefficient of resistance of semiconductor
2. Measurement of thickness of thin film by gravimeter/optical/electrical method
3. Temperature of sodium flame
4. Hartmann's dispersion formula
5. Maxwell's bridge (measurement of inductance using impedance at different frequency)
6. λ by grating (normal incidence)
7. Transistorized Regulated power supply using Zener diode.
8. Bridge Rectifier

Note:- At least Six experiments should be performed.

Compulsory Activities

Organize a visit / study tour to Thermoelectric / Hydroelectric Power station, Wind mill, Solar farm and submit project report along with a photograph during the final practical examination.

OR

Organize study tour to industry / Research centre and submit a report at the time of final practical examination.

QUESTION PAPER PATTERN
B.Sc.F.Y.(I & II Semester)
PHYSICS

Time : 2.30 Hours **Max.Marks :50**

Note:-1.All questions carry equal marks

2.Use of logarithmic table and electronic pocket calculator is allowed.

Q.1.Chapt. I (Long question) 10 Marks

OR
Chapt.II (Long question)

Q.2.Chapt.III (Long question) 10 Marks

OR
Chapt.IV (Long question)

Q.3. a)Chapt. I (Short question) 10 Marks
b)Chapt.II(Short question)

OR
a)Chapt.III (Short question)
b)Chapt.IV (Short question)

Q.4.Attempt any two 10 Marks

a)Chapter I Problem
b)Chapter II Problem
c)Chapter III problem
d)Chapter IV oproblem

Q.5. MCQ 10 Marks

Ten MCQ's having four alternatives based on theory and numerical (Minimum two MCQ's from each chapter)

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/NP/B.Sc.-Ist Yr./SEM.-I & II/157/2013

It is hereby notified for information of all concerned that, on the recommendations of the Boards of Studies, Ad-hoc Boards, and Faculty of Science, the **Academic Council at its meeting held on 25-03-2013** has accepted the **following revised syllabi for B.Sc. First Year progressively under the Faculty of Science** :-

Sr. No.	*Revised Syllabus*	
[1]	***B.Sc. [Physics]***	***Semester- I & II,***
[2]	***B.Sc. [Dairy Science & Technology]***	***Semester- I & II,***
[3]	***B.Sc. [Industrial Chemistry]***	***Semester- I & II,***
[4]	***B.Sc. [Geology]***	***Semester- I & II,***
[5]	***B.Sc. [Chemistry]***	***Semester- I & II,***
[6]	***B.Sc. [Botany]***	***Semester- I & II,***
[7]	***B.Sc. [Electronics] Science***	***Semester- I & II,***
[8]	***B.Sc. [Fisheries]***	***Semester- I & II,***
[9]	***B.Sc. [Microbiology]***	***Semester- I & II,***
[10]	***B.A. [Statistics]***	***Semester- I & II,***
[11]	***B.Sc. [Statistics]***	***Semester- I & II,***
[12]	***B.Sc. [Zoology]***	***Semester- I & II,***
[13]	***B.Sc. [Textile and Interior Decoration]***	***Semester- I & II,***
[14]	***B.Sc. [Home Science]***	***Semester- I & II,***
[15]	***B.A. / B.Sc. [Mathematics]***	***Semester- I & II.***

This is effective from the **Academic Year 2013-2014** and onwards.

These **syllabi are available on the University Website www.bamu.net**

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/NP/B.SC.-IST YEAR/
Sem-I & II/2013/5132-541
A.C.S.A.I.No.327[9].

Date:- 08-05-2013.

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Director,
Board of College and University Development.

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1] **The Principals, affiliated concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above all syllabi on University Website [www.bamu.net].**

Copy to :-

1] The Controller of Examinations,

2] The Superintendent, [B.Sc. Unit],

3] The Superintendent, [B.A. Unit],

4] The Superintendent, [Eligibility Unit],

5] The Programmer [Computer Unit-1] Examinations,

6] The Programmer [Computer Unit-2] Examinations,

7] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,

8] The Public Relation Officer,

9] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Revised Syllabus of

B.Sc. Ist Year

Physics

Semester - I & II

[Effective from 2013-14 & onwards]

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
B. Sc. I Year Physics Syllabus
Semester I & II
(Revised syllabus Effective from June 2013)

Semester	Course Code	Paper	Title of Paper	Periods	Marks
I	Phy101	I	Mechanics, Properties of Matter and Sound	45	50
I	Phy102	II	Heat and Thermodynamics	45	50
I	Phy103	III	Practical	45	50
II	Phy104	IV	Geometrical and Physical Optics	45	50
II	Phy105	V	Electricity and Magnetism	45	50
II	Phy106	VI	Practical	45	50

Note: - Scheme of Practical Examination
Student should perform one experiment in semester-II from paper III+VI
Scheme of Practical Examination
Experiment- (75marks) + Oral (15marks) + Record book (10 marks) = 100 Marks

30.1.2013
Chairman
BOS in physics

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
B. Sc. I Year Physics Syllabus
Semester I & II
(Revised syllabus Effective from June 2013)

Semester	Course Code	Paper	Title of Paper	Periods	Marks
I	Phy101	I	Mechanics, Properties of Matter and Sound	45	50
I	Phy102	II	Heat and Thermodynamics	45	50
I	Phy103	III	Practical	45	50
II	Phy104	IV	Geometrical and Physical Optics	45	50
II	Phy105	V	Electricity and Magnetism	45	50
II	Phy106	VI	Practical	45	50

Note: - Scheme of Practical Examination
Student should perform one experiment in semester-II from paper III+VI
Scheme of Practical Examination
Experiment- (75marks) + Oral (15marks) + Record book (10 marks) = 100 Marks

B. Sc. I Year Physics (Semester-I)
(Mechanics, Properties of Matter and Sound)
Course Code – Phy101
Paper – I

Periods – 45 **Marks – 50**

1. Mechanics: - 13 periods

Compound Pendulum- expression of time period, Interchangeability of centre of suspension and oscillation, Kater's Pendulum.

Newton's law of Gravitation (Statement only) , Gravitational Field , Gravitational Potential, Gravitational Potential of mass, Gravitational potential and field due to spherical shell and solid sphere (at a point, outside , inside and on the surface).

2. Elasticity: - 10 periods

Introduction , Moduli of Elasticity (Elastic constants), Twisting couple on a cylinder, Bending of Beam – Bending moment, cantilever loaded at free end – (a) When weight of beam is ineffective, (b) When weight of beam is effective, Depression of Beam loaded at centre

3. Viscosity and Surface Tension: 12 Periods

Viscosity - Introduction, energy of liquid in motion, Bernoulli's Theorem, practical applications: (i) Law of hydrostatic pressure (ii) Filter pump, Poiseuille's formula.
Surface Tension - Introduction, Difference of pressure across a curved surface, Determination of S.T. by Jaeger's method.

4. Ultrasonic and Acoustics: - 10 periods

Ultrasonic - Piezo – electric effect, Piezo – electric Generator, Magnetostriction effect, Magnetostriction oscillator, Applications of ultrasonic – Depth of sea, Chemical effects, Medical applications.
Acoustics - Reverberation, Acoustical demands of an auditorium, Sabine's Law – Derivation of Reverberation time, conditions of good acoustical designs of room.

References:-

1) Elements of Properties of Matter – D. S. Mathur
(S. Chand , 11 th edition , 1992)
2) Physics for Degree students – C. L. Arora and P.S.Heme
(S. Chand , I st edition 2010)
3) Mechanics and Electrodynamics – Brijlal ,N. Subrahmanyam , Jivan Seshan
(S.Chand , 7 th edition)
4) Text Book of sound – Khanna and Bedi
(Atma Ram and sons, 1989 edition)
5) Text Book of sound – N. Subrahmanyam and Brijlal
(Vikas Publishing House 2 nd Revised edition)

B. Sc. I Year Physics (Semester-I)
(Heat and Thermodynamics)
Course Code – Phy102
Paper – II

Periods – 45 **Marks – 50**

1) Thermal Conductivity: - 10 periods

Transference of heat, Coefficient of thermal conductivity, Rectilinear flow of heat along a metal bar, Methods of radial flow of heat-(i)spherical shell method and (ii)Flow of heat along the wall of a cylindrical tube, comparison of conductivities of different metals.

2) Real Gases and Transport Phenomena: - 12 periods

Real Gases – Introduction, Reason for modification of gas equation, Van der Waals equation of state , comparison with experimental curves, critical constants, constants of Van der Waals equation.

Transport phenomena–Introduction, Mean free path, sphere of influence, and expression for mean free path, variation of mean free path with temperature and pressure, transport phenomena, viscosity, Thermal conductivity (their interrelationship, dependence on temperature and pressure).

3) Thermodynamics: - 12 periods

Adiabatic process, Adiabatic equation of a perfect gas, Isothermal process, Indicator diagram, work done during isothermal process and adiabatic process, reversible and irreversible process, Second law of thermodynamics. (Kelvin and Clausius statement), Heat engines, Carnot's ideal heat engine, Carnot's cycle (work done and Efficiency).

4) Entropy and Thermodynamic relations: - 11 Periods

General notation of entropy, change of entropy is independent of path, change of entropy in reversible and irreversible process, Formulation of second law in terms of entropy, Maxwell's thermodynamical relations, Applications of Maxwell's relations –i) Clausius – Clapeyron equation , ii) T-ds equations.

Reference Books:-

1) Heat Thermodynamics and Statistical Physics - Brijlal, N.Subrahmanyan , P.S. Heme (S.Chand , 2007 Edition) .
2) Text Book of Heat and Thermodynamics–J. B. Rajam, C.L. Arora (S. Chand, 9th Edition)
3) Heat and Thermodynamics– S. S. Singhal, J. P. Agarwala, S.Prakash (Pragati Prakashan)
4) Thermodynamics & Statistical physics-S. L. Kakani

B. Sc. I Year Physics (Semester- II)
(Geometrical and Physical Optics)
Course Code – Phy104
Paper – IV

Periods – 45 **Marks – 50**

1) Geometrical Optics and Optical Instruments: - 12 periods

Cardinal points of optical system - Focal points, Principal points, Nodal points and corresponding planes, coaxial lens system - equivalent focal length and cardinal points.
Huygens's Eyepiece, Ramsden's eyepiece and their cardinal points,

2) Interference: - 10 periods

Interference in thin film due to reflected and transmitted light, wedge shaped thin film, Newton's rings by reflected light, determination of wavelength, Michelson's Interferometer, type of fringes, determination of wavelength and difference in wavelength.

3) Diffraction: 13 periods

Introduction, Diffraction at a thin wire , Fraunhofer diffraction at double slit (Interference and diffraction maxima, minima), Plane Transmission diffraction grating, Determination of wavelength (Normal incidence), Resolving power of optical instruments (Rayleigh's criterion), R. P. of prism and grating.

4) Polarization: - 10 periods

Introduction, Malus law, Double refraction, Huygens's theory of double refraction in uniaxial crystal, Nicol prism.
Optical activity, Fresnel's theory of optical rotation, specific Rotation, Laurentz's half – shade polarimeter, Determination of specific rotation of sugar solution.

Reference Books:-

1) Text Book of optics – N. Subrahmanyam & Brijlal (S. Chand, 1987 Edition)
2) Optics and Spectroscopy – R.Murugeshan, K. Sivaprasath(S. Chand , 7 th Revised Edition)
3) A text book of optics- D. S. Mathur.
4) Optics- Ghatak. IInd edition.

B. Sc. I Year Physics (Semester- II)
(Electricity and Magnetism)
Course Code – Phy105
Paper – V

Periods – 45 **Marks – 50**

1) Vector Algebra : - 12Periods

Dot and cross product (Revision), scalar triple product and it's geometrical interpretation, vector triple product, gradient of a scalar and it's physical interpretation, Divergence and curl of vector function and their physical interpretation, line, surface and volume integrals, Gauss's divergence theorem and Stoke's theorem .

2) Electrostatics: - 13 Periods

Coulomb's Law , Electric field , field due to point charge, flux of electric field, Gauss's law (with proof) , Differential from of Gauss law , electric potential , potential due to a point charge, Potential and field due to electric dipole.

Dielectrics, polarization of dielectric, Gauss's law in dielectrics, Relation between **D**, **E** and **P.**

3) Magnetostatics: - 10 Periods

Magnetic field , Magnetic induction , magnetic flux , Biot-Savart law, Magnetic induction due to straight conductor carrying current , magnetic induction on the axis of solenoid ,Ampere's Law, Differential form Ampere's Law, Moving coil ballistic Galvanometer - expression for charge.

4) Transient Currents: - 10 periods

Growth and decay of current in a circuit containing L and R , charge and discharge of a capacitor through resistor, Growth and decay of charge in LCR circuit.

Reference Books: -

1) Mathematical Methods in physics – D.Biswas(New central book agency , 2009 edition)
2) Electricity and Magnetism – R.Murugeshan(S. Chand, 2008 edition)
3) Electrodynamics – Gupta, Kumar, Singh (Pragati Prakashan, Meerut, 18th edition 2005)
4) Foundations of Electromagnetic Theory-Ritz, Milford, Chirstey IIIrd edition.

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B. Sc. I Semester
Physics paper III (Phy103)
List of experiment

1. Determination of acceleration due to gravity by Kater's pendulum.
2. Y by bending of a beam loaded at center.
3. Determination of Y by Cantilever (Oscillation method)
4. η by Maxwell's needle.
5. M.I. by bifilar suspension.
6. Determination of Y and η of the material of a flat spiral spring.
7. S.I. by Jaeger's method.
8. Determination of coefficient of viscosity by Poisseuille's method.

Note: - At least six experiments should be performed.

B.Sc. II Semester
Physics Paper VI (Phy106)
List of experiment

1. Y by Searle's apparatus.
2. M.I. of fly wheel.
3. Thermal conductivity of bad conductor by Lee's disc method.
4. Study of CRO
   (Measurement of frequency and voltage sensitivity AC/DC.)
5. Field along axis of circular coil.
6. I-H curve.
7. Calibration of spectrometer.
8. Dispersive power of prism.

Note: - At least six experiments should be performed.

Additional activities

a. Demonstration of experiment

1. Signal generator and CRO (sine, Square wave signal, measurement of ac voltage and frequencies.
2. Spectrometer (Reading and scale, observe the spectrum, measure refractive index for different colors).
3. Electromagnetic induction using two coil.
4. Determination of least count and range for at least four measurement instruments.

b. Mini Project /Seminars/ Hands on activities.

1. Students should carry out one mini project or seminar.
2. Study of any two laboratory equipments.

c. Study tour (industrial/research institute)

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Sci./B.Sc. Syll./31/2015

It is hereby notified for information to all the concerned that, on the recommendation of the various Board of Studies, Ad-hoc Boards & Committees the Hon'ble Vice-Chancellor has accepted the **revised semester-wise syllabi in the Faculty of Science as under** on behalf of the Academic Council under Section-14[7] of the Maharashtra Universities Act, 1994 :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Automobile Technology IInd Year, [Three Year Degree Course].	III & IV
[2]	B.Sc. Horticulture IInd Year, [Optional].	III & IV
[3]	B.Sc. Chemistry IIIrd Year, [Optional].	V & VI
[4]	B.Sc. Analytical Chemistry IIIrd Year, [Optional].	V & VI
[5]	B.Sc. Agrochemical & Fertilizer IIIrd Year, [Optional].	V & VI
[6]	B.Sc. Geology IIIrd Year, [Optional].	V & VI
[7]	B.Voc. Multimedia & Animation, [Three Year Degree Course].	I to IV
[8]	B.Voc. [1] Industrial Automation, [2] Automobile & [3] Travel & Tourism, [Three Year Degree Course].	I to VI
[9]	B.Voc. Jewellery Design & Gemology, IInd Year [Three Year Degree Course].	III & IV
[10]	Diploma in Industrial Automation for Community College at University Campus.	

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/6860-7259
Date:- 08-07-2015.

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Director,
Board of College and
University Development.

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2] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter, Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [B.C.S. Unit],
5] The Programmer [Computer Unit-1] Examinations,
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7] The Record Keeper.
Dr. Babasaheb Ambedkar Marathwada University.

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

SYLLABUS

B.Sc. (Chemistry)

THIRD YEAR

SEMESTER SYSTEM

FIFTH / SIXTH SEMETER

[Effective from – June- 2015 **onwards]**

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGBAD

B.Sc. (Chemistry) IN SEMESTER PATTERN FOR THREE YEAR DEGREE

YEAR	SEMESTER	PAPER NUMBER	PAPER TITLE	Hours	MARKS
First	I	Paper – I	Inorganic Chemistry	45	50
		Paper – II	Organic Chemistry	45	50
		Paper – III	Lab Course I	45	50
	II	Paper – IV	Physical Chemistry	45	50
		Paper – V	Inorganic Chemistry	45	50
		Paper – VI	Lab. Course – II	45	50
Second	III	Paper – VII	Organic Chemistry	45	50
		Paper – VIII	Physical Chemistry	45	50
		Paper – IX	Lab. Course-III	90	100
	IV	Paper – X	Inorganic Chemistry	45	50
		Paper – XI	Physical Chemistry	45	50
		Paper – XII	Lab. Course-IV	90	100
Third	V	Paper – XIII	Physical Chemistry	45	50

		Paper – XIV	Organic Chemistry	45	50
		Paper – XV	Lab. Course-V	90	100
	VI	Paper – XVI	Inorganic Chemistry	45	50
		Paper – XVII	Organic Chemistry	45	50
		Paper – XVIII	Lab. Course-VI	90	100

B.Sc. CHEMISTRY

(Three Year Degree Course)

THIRD YEAR

Paper XIII Physical Chemistry Fifth Semester

(45hrs)

3 **Hrs/ Week**

I. Elementary Quantum Mechanics	10 Hrs.
II. Spectroscopy	10 Hrs.
III. Photochemistry	08 Hrs.
IV. Physical Properties and Molecular Structure	10 Hrs.
V. Nano Material	07 Hrs.

Paper XIV Organic Chemistry Fifth Semester

(45hrs)

3 **Hrs/ Week**

I. Spectroscopy	16 Hrs.
II. Organometallic Compounds	08 Hrs.
III. Organic Synthesis via Enolates	13 Hrs.
IV. Fats, Oils and Detergents	08 Hrs.

Paper – XV Lab. Course V Organic Chemistry and

(45 Hrs)

Inorganic Chemistry

(45 Hrs)

B.SC. CHEMISTRY

(Three Year Degree Course)

THIRD YEAR

Paper XVI Inorganic Chemistry Sixth Semester

(45hrs)

3 **Hrs/ Week**

I. Metal-ligand Bonding in Transition Metal Complexes 12 Hrs.

II. Electron Spectra of Transition Metal Complexes 07 Hrs.

III. Organometallic Chemistry 10 Hrs.

IV. Bioinorganic Chemistry 10 Hrs.

V. Chromatography 06 Hrs.

Paper XVII Organic Chemistry Sixth Semester

(45hrs)

3 **Hrs/ Week**

I. Heterocyclic Compounds 13 Hrs.

II. Carbohydrates 10 Hrs.

III. Synthetic Polymers 07 Hrs.

IV. Synthetic Dyes and Drugs 15Hrs.

Paper – XVIII Lab. Course VI Organic Chemistry &

(45 Hrs)

Physical Chemistry

(45 Hrs)

B. SC. THIRD YEAR

Paper XIII Physical Chemistry [Vth Semester]

45 Hrs. (3 Hrs/week)

I Elementary Quantum Mechanics 10 Hrs.

Black body radiation, Planck's radiation law, photoelectric effect, Bohr's modes of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie Hypothesis, the Heisenberg's uncertainty principles, Harmiltonian operator, Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance.

II Spectroscopy 10 Hrs.

Introduction - Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation. Rotational Spectrum - Diatomic molecules, energy levels of a rigid rotor (semi classical principles), selection rule, rotational spectra of rigid diatomic molecule, determination of bond length, numerical problems.

III Photochemistry 08 Hrs.

Introduction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry, Grothus - Drapper law, Stark-Einstein law, Jablonsiki diagram qualitative description of fluorescence, phosphorescence, non-radiative processes (Internal conversion, Intersystem crossing), quantum yield, photosensitized reactions.

IV Physical properties and molecular structure 10 Hrs.

Optical activity and its measurement, dipole moment and its measurement by temperature change method, magnetic property and its measurement by Guoy

balance method, Applications of optical activity, dipole moment and magnetic property for determination of structure of molecule.

V Nano Material **07 Hrs.**

Introduction to nano-materials Methods of Synthesis - i) High energy ball milling, ii) Physical vapour deposition (PVD) iii) Chemical vapour deposition (CVD) iv) Micro emulsion. Synthesis using micro-organisms and plant extract.

B. SC. THIRD YEAR

Paper XIV Organic Chemistry [Vth Semester]

45 Hrs. (3 Hrs/week)

I Spectroscopy 16 Hrs.

Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 2, 2 tribromoethane, ethyl acetate, toluene and Acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques. (Combine and single λ max using woodwordfischer rule)

II Organometallic Compounds 08 Hrs.

Organomagnesium - compounds: Alkyl Magnesium halides-ethyl magnesium bromide formation, structure and chemical reactions. Organozinc compound-dialkyl zinc formation and chemical reactions, organolithium compound- n-butyllithium formation and chemical reactions.

III Organic Synthesis via Enolates. 13 Hrs.

Defination, Active methylene compounds, Preparation of Aceto acetic ester, (Claisen condensation with Mechanism), Acidity of alpha hydrogen, properties and reactions involving formation of mono, di and unsaturated carboxylic acids, also synthesis of ketone, di ketone, 4-methyl uracil from acetoacetic ester, keto-enol tautomerism. Preparation of diethyl malonate, properties and reactions involved in alkylation, formation of mono, di and unsaturated carboxylic acids, and also synthesis of aminoacid and barbituric acids from diethyl malonate.

IV Fats, oils and detergents 08 Hrs.

Natural fats, edible and industrial oils of vegetable origin, manufacture of soyabean oil by solvent extraction method and isolation and uses of essential oils.

Types of animals fats and oils and defination of saponification value, iodine value, and acid value. Detergents: Defination, Introduction and preparation of sodium alkyl sulphonate, alkyl benzene sulphonate, and amide sulphonate, (one example each), Cleansing action of detergent.

B. SC. THIRD YEAR

Semester V **Paper XV**

Organic Chemistry

Lab Course: V **Marks: 50**

Binary Mixture:

Separation and Identification of both components

i) Benzoic Acid + β-naphthol

ii) Salicylic Acid + P- nitro aniline

iii) β-naphthol + Acetanilide

iv) m-nitroaniline + Naphthalene

v) α-naphthol + O-nitroaniline

vi) Cinnamic Acid + Naphthalene

vii) Salicylic Acid + Naphthalene

viii) β-naphthol + m-dinitrobenzene

ix) Cinnamic Acid + P- nitro aniline

x) Salicylic Acid + β-naphthol

Inorganic Chemistry

Lab Course: V **Marks : 50**

1 Inorganic Qualitative Analysis (Semi-Micro Analysis)

(Atleast five mixtures)

2. Separation of calcium and Barium and estimation of Ca-volumetrically .

3. Separation of Cu and Ni from binary mixture solution and estimation of Cu-volumetrically .

4. Estimation of oxalic acid and H_2SO_4 in a given mixture Solution using NaOH and $KMnO_4$ solution.

5. Estimation of Fe by potassium dichromate using diphenyl ammine indicator.

6. Estimation of available chlorine in the given sample of bleaching powder.

7. Separation of calcium and Barium and estimation of Ba-gravimetically.

8. Separation of Cu and Ni from binary mixture solution and estimation of Ni-gravimetrically

B. SC. THIRD YEAR

Paper XVI Inorganic Chemistry [VIth Semester]

45 Hrs. (3 Hrs/week)

1. Metal-Ligand Bonding in Transition Metal Complexes 12 Hrs

Limitations of Valence Bond Theory

An Elementary idea of Crystal Field Theory

Crystal Field Splitting in Octahedral, Tetrahedral and

Square Planar Complexes

Factors affecting Crystal Field Parameters

2. Electronic Spectra of Transition Metal Complexes 7 Hrs

Types of Electronic Transitions

Selection rules for d -d transitions

Spectro -chemical series

Orgel Energy level diagram for d^1, d^5 and d^9

Electronic Spectrum of $[Ti(H_2O)6]^{3+}$ complex ion.

3. **Organometallic Compounds 10 Hrs**

Definition, Nomenclature and classification of Organometallic Compounds

Preparation, Properties, Bonding and Applications of alkyls and aryls of - Li,

Al, Hg, Sn and Ti.

A Brief account of metal - ethylenic Complexes

Nature of bonding in metal carbonyls.

4. Bioinorganic Chemistry **10 Hrs**

Essential and trace elements in biological processes

Metalloporphyrins with special reference to hemoglobin and myoglobin

Biological role of alkali (Na^+, K^+) and alkaline earth metal ions(Mg^{2+}, Ca^{2+}).

Nitrogen fixation

5. Chromatography **06 Hrs**

Definition and classification of chromatography

Paper and Thin Layer Chromatography

Method of Development (Ascending, Descending Chromatography)

Locating Technique (UV-light / Chemicals)

R f value

Comparison between paper and TLC

Applications.

B. SC. THIRD YEAR

Paper XVII Organic Chemistry [VIth Semester]

45 Hrs. (3 Hrs/week)

1. Heterocyclic Compounds 13 Hrs.

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine. Comparison of basicity of pyridine, piperidine and pyrrole. Condensed Heterocyles: Introduction, Preparation of Quinoline (Skraups Synthesis), Isoquinoline (Bischler - Napirlaski) and Indole (Fischer indole Synthesis).

2. Carbohydrates 10 Hrs.

Defination, Introduction and Classification.

Monsaccharides-Interconversion of Glucose and Fructose, chain lengthening, chain shortening of aldoses. Conversion of Glucose in to mannose. Determination of openchain structure of glucose & pyranose ring structure of glucose . Mechanism of Mutarotation and Introduction to disaccharides (maltose, sucrose and lactose) and

Polysaccharides (Starch and cellulose) without involving structure determination.

3. Synthetic Polymers. 07 Hrs.

Introduction, Classification based on nature of synthesis (without mechanism) with examples. (Addition and condensation polymers). Properties, uses and synthesis of polyvinyl chloride, polyvinyl acetate, polystyrene, polyacrylonitrile, Nylon 6, Nylon 66. Introduction to synthetic and natural rubber, properties, uses and synthesis of Buna N., Neoprene and silicon rubber.

4. Synthetic Dyes and Drugs **15 Hrs.**

Synthetic Dyes - Definition, colour and constitution (electronic concept) of dye, classification based on chemical constitution, synthesis of methyl orange, Congo red, malachite green, crystal violet, Alizarin and indigo dyes.

Synthetic Drugs - Defination, introduction, classification of drugs. Properties of ideal drug. Synthesis of chloromycetien,paracetamol,phenacetien,

sulphaguainidine.

B. SC. THIRD YEAR

Semester VI **Paper XVIII**

Organic Chemistry

Lab Course: VI **Marks: 50**

Organic Estimation

i) Estimation of Carbonyl group by hydrazone formation method

ii) Estimation of vitamin C in commercial soft drink / Glucon D

iii) Estimation of ascorbic acid

iv) Estimation of Saponification value of oil

Organic Preparation and its purity by TLC

i) Preparation of Hydrazobenzene from azobenzene.

ii) Preparation of Phthalic anhydride from phthalic acid.

iii) Preparation of 2, 4 dinitrophenyl hydrazone of acetone.

iv) To prepare picrate of Naphthalene.

v) To prepare picrate of Anthracene**.**

Vi) preparation of p – bromo acetanilide from acetanilide

Physical Chemistry

Lab Course: VI **Marks: 50**

Instrumental

1. Determine the Strength of HCl and CH_3COOH in a

given mixture by titrating against strong base conductometrically.

2. Determine the strength of oxalic acid conductometrically

using sodium hydroxide solution.

3. To determine empirical formula of ferric -5-sulphosalicylate

4. Determine the amount of Fe2+ in the given solution potentiometrically

5. To determine the refractive indices of series of salt solutions and to find out concentration of the salt in given unknown solution.

Non-Instrumental

1. To determine the interfacial tension between two immiscible

liquids.

2. To study the effect of addition of an electrolyte NaCl / KCl

on the solubility of benzoic acid at room temperature.

3. To determine the standard free energy change ΔG^0 and

equilibrium constant for the reaction.

$Cu + 2\ Ag+ = Cu^{+2} + 2\ Ag$

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µÖÖ ¯Ö×¸¯Ö¡ÖúÖ«Ö¸ सर्व संबंधीतांना सुचित ú¸ïµÖÖŸÖ µÖŸÖ ú¤ß, x¾Ö–ान विद्याशाखेने x¿Ö±úÖ¸Ã Ö केल्यानुसार ²ÖÃ. ‹ÃÃÖß. / ‹´Ö. ‹ÃÃÖß. ¯Ö£Ö´Ö ¾Ö ×«¢ÖßµÖ ¾ÖÂÖÖ“µÖÖ ÃÖ–ÖÖ×¸Ÿ †³µÖÖÃÖú¤ïÖÖÃÖ †Ö×ïÖ ²ÖÃ. ‹ÃÃÖß. ¯Ö£Ö´Ö ¾ÖÂÖÖ“µÖÖ †³µÖÖÃÖú¤ïÖÖŸÖ ×ú¤¸ïú¤ÖÔ ²Ö¤»Ö ú¤¸ïµÖÖÃÖ विद्यापरिषदेच्या वतीने ´ÖÖ. ú¤»Öगुरु यांनी, त्यांना ¯ÖÖ¯Ÿ† †ÃÖ»Ö»µÖÖ x¾Ö¿ÖÂÖ †×–Öú¤Ö¸ ´ÖÆÖ¸ÖÂ™ x¾Öª¯ÖßŠ अधिनियम-1994 कलम १४(७) अन्वये मान्यता ×¤»Ö»ÖßŠ †ÖÆ. त्या अनुषंगाने सुधारीत तयार ú¤»Ö»µÖÖ †³µÖÖÃÖú¤ïÖÖ“ÖßŠ ¯ÖŸÖ µÖÖ ¯Ö×¸¯Ö¡ÖúÖÖÃÖÖ²ÖŸÖ †Ö¯Ö»µÖÖ ¯ÖœßŠ»Ö ú¤ÖµÖ¾ÖÖÆßÃÖÖŠß ¯ÖÖŠx¾Ö¤µÖÖŸÖ µÖŸÖ †ÖÆ.

√[1]	**B.Sc. Physics**	**Semester-III & IV,**
[2]	**B.Sc. Chemistry**	**Semester-III & IV,**
[3]	**B.Sc. Botany**	**Semester-III & IV,**
[4]	**B.Sc. Zoology with minor changes**	**Semester-I & II,**
[5]	**B.Sc. Zoology**	**Semester-III & IV,**
[6]	**B.Sc. Fisheries**	**Semester-III & IV,**
[7]	**B.Sc. Electronics (Opt.)**	**Semester-III & IV,**
[8]	**B.A./B.Sc. Mathematics**	**Semester-III & IV,**
[9]	**B.Sc. Computer Science**	**Semester-I & II,**
[10]	**B.Sc. Information Technology**	**Semester-I & II,**
[11]	**B.C.A.**	**Semester-I & II,**
[12]	**B.Sc. Computer Science(Opt.)**	**Semester-I & II,**
[13]	**B.Sc. Information Technology(Opt.)**	**Semester-I & II,**
[14]	**B.Sc. Computer Application(Opt.)**	**Semester-I & II,**
[15]	**B.Sc. Computer Maintenance(Opt.)**	**Semester-I & II,**
[16]	**B.Sc. Biotechnology (Progressively)**	**Semester-I to VI,**

[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

[31]	**B.Sc. Geology**	**Semester-III & IV,**
[32]	**B.A. Statistics with minor changes**	**Semester-I & II,**
[33]	**B.A. Statistics**	**Semester-III & IV,**
[34]	**B.Sc. Statistics with minor changes**	**Semester-I & II,**
[35]	**B.Sc. Statistics**	**Semester-III & IV,**
[36]	**B.Sc. Industrial Chemistry**	**Semester-III & IV,**
[37]	**B.Sc. Horticultural**	**Semester-I & II,**
[38]	**B.Sc. Dry land Agriculture**	**Semester-I & II,**
[39]	**B.Sc. Microbiology**	**Semester-III & IV,**
[40]	**M.Sc. Computer Science**	**Semester-I to IV,**
[41]	**M.Sc. Information Technology**	**Semester-I to IV.**

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) **मा. परिक्षा नियंत्रक, परिक्षा विभाग,**
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

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Dr. Babasaheb Ambedkar Marathawada University
Aurangabad

Revised Syllabus of Physics

Optional

B.Sc. II Year

Semester III & IV

Effective for Academic Year 2014-15

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
B.Sc. IInd year Physics Syllabus
(Semester-III and IV)
Revised Syllabus from June 2014

Semester	Course Code	Paper	Title of Paper	Periods	Marks
III	Physics 201	VII	Mathematical , Statistical Physics and Relativity	45	50
III	Physics 202	VIII	Modern and Nuclear Physics	45	50
III	Physics 203	IX	Practical	45	50
III	Physics 204	X	Practical	45	50
IV	Physics 205	XI	General Electronics	45	50
IV	Physics 206	XII	Solid State Physics	45	50
IV	Physics 207	XIII	Practical	45	50
IV	Physics 208	XIV	Practical	45	50

Scheme of Practical Examination and marks

Practical Examination will be conducted annually

Practical Paper IX + X based on theory Paper VII & VIII (50 + 50 = 100 Marks)

Practical Paper XIII + XIV based on theory paper XI & XII (50 + 50 = 100 Marks)

Experiment– 75 marks + Viva-Voce 15 marks + Record Book/ Journals 10 marks= 100 marks

B.Sc. IInd year Physics (Semester-III)
(Mathematical, Statistical Physics and Relativity)
Course code PHY-201
Paper-VII

Period-45 **Marks-50**

1. **Differentiation and ordinary differential equation:**
   Limit of function, partial differentiation, successive differentiation, total differentiation, exact differentiation, chain rule.
   Ordinary differential equation, order and degree of differential equation, solution of first order differential equation, and solution of second order linear differential equation with constant coefficient
   a) Homogeneous equations, b) Inhomogeneous equation, Special case of exponential right hand to find P.I.
2. **Statistical basis and classical statistics:**
   Introduction, probability, principle of equal a priori probability, probability and frequency, some basis rules of probability theory, permutation and combination, macrostates and microstates, phase space, thermodynamic probability, division of compartments into cells, Maxwell-Boltzmann energy distribution law, evaluation of g_i, α and β, M.B. distribution function for ideal gas, M.B. Speed distribution law.
3. **Quantum statics:**
   Need of quantum statistics, Bose-Einstein distribution law, Planck's radiation law, Fermi-Dirac distribution law, electron gas, Fermi level and Fermi energy, E_{FO} for electrons in a metal, comparison of three static, difference between classical and quantum statistics.
4. **Theory of relativity:**
   Introduction, frame of reference, Galilean transformation equations, Michelson Morley experiment, special theory of relativity, Lorentz transformation equation, length contraction, time dilation, addition of velocities, variation of mass-energy equivalence.

Reference Books:

1. Mathematical Physics- Gupta, Kumar
2. Mathematical Physics- B.S. Rajput (PragatiPrakashan)
3. Heat, thermodynamics & statistical Physics- Brijlal, N. Subrahmanyam, P.S. Hemne. S. Chand Publication
4. Text book of heat and thermodynamics- J.B. Rajam& C. L. Arora.
5. Modern physics – R. Murgeshan, KiruthigaShivprasath, S. Chand Publication.

B.Sc. IInd year Physics (Semester-III)
(Modern and Nuclear Physics)
Course code PHY-202
Paper-VIII

Period-45 **Marks-50**

1. **Photoelectric Effect :**
   Introduction, Lenard's method to determine e/m for photoelectrons, Richardson and Compton experiment, Relation between photoelectric current and retarding potential, Relation between velocity of photoelectrons and frequency of light, photoelectric cells- (1) Photo- emissive cell (2) Photo- voltaic cell (3) Photoconductive cell, Applications of photoelectric cells.

2. **X-rays :**
   Introduction, The absorption of X-ray's, Laue's experiment, Bragg's Law, The Bragg's X-ray spectrometer, powder crystal method, The Laue method, X-ray spectra, Main features of continuous X-ray spectrum, Characteristics x-ray spectrum.

3. **Nuclear forces and models :**
   Introduction, Binding energy, Nuclear stability, Nuclear forces , Meson theory of nuclear forces, liquid drop model, shell model, Energy released in Fission , Chain reaction, Atom bomb, Nuclear Reactors, Nuclear fusion, Source of stellar energy.

4. **Particle Accelerators and Detectors :**
   Linear accelerator, Cyclotron, Synchrocyclotron, Betatron, Ionisation chamber, proportional counter, Geiger – Muller counter.

Reference Books:

1. Modern Physics-J. B. Rajan
2. Modern Physics- R. Murugeshan, Er.Kirutyhiga, Sivaprasath. S. Chand Publication
3. Nuclear Physics- Kaplan
4. Nuclear Physics- B.N. Srivastava
5. Atomic and nuclear physics-N. Subramanyan and Brijlal.

B.Sc. IInd year (Semester-III)
Physics Practical
Course code PHY-203
Paper-IX

Marks-50

1. 'h' by Photo cell

2. e/m by Thomson's tube method.

3. Determination of absolute value of B_H and B_V using Earth Inductor

4. Stefan's constant by using thermo couple

5. Measurement of low resistance using potentiometer.

6. Frequency of A.C. mains using sonometer.

7. Specific rotation by Laurent's half shade polarimeter.

8. Cauchy's constant by spectrometer

Note: At least six experiments should be performed.

B.Sc. IInd year (Semester-III)
Physics Practical
Course code PHY-204
Paper-X

Marks-50

1 Thermal conductivity of rubber tube.

2. Study of temperature dependence of total radiation.

3. To draw the histogram of theoretical Gaussian curve.

4. Comparison of capacities by Desauty's method.

5 Velocity of sound using Helmholtz resonator.

6 Surface tension by Ferguson's method.

7 R. P. of Telescope/microscope.

8. Determination of Wavelength of light by Newton's ring

Note: At least six experiments should be performed.

B.Sc. IInd year Physics (Semester-IV)
(General Electronics)
Course code PHY-205
Paper-XI

Period-45 **Marks-50**

1. **Semiconductor :**
   Introduction, Construction, Working and Characteristics of semiconductor diode, Zener diode, Zener diode characteristics, Transistor (PNP and NPN), Transistors characteristics (CE, CB and CC), Construction, Working and Characteristics of FET & MOSFET.

2. **Transistor Biasing and Amplifiers :**
   Transistor biasing, Selection of operating point, bias stability, transistor biasing circuits - fixed bias or base bias, collector feedback bias, emitter feedback bias or self-bias.
   Single stage transistor amplifier, frequency response of RC coupled amplifier, Noise in amplifiers, feedback in amplifiers, Op-Amp characteristics, inverting & non-inverting amplifier, Op-Amp as an adder and subtractor.

3. **Oscillators and Multivibrators:**
   Two port network representation of a transistor, Hybrid parameters or h – parameters, Positive feedback, Basic principle of Oscillators, requirements of feedback, RC Oscillator (Phase shift Oscillator), LC Oscillator (Hartley Oscillator) Transistorised. Astable multivibrator, monostable multivibrator, bistable Multivibrator,

4. **Modulation and demodulation :**
   Modulation, Amplitude modulation, Modulation index, frequency modulation, phase modulation, demodulation, advantages of frequency modulation over amplitude modulation.

Reference Books:

1. Basic principle of electronics- V. K. Mehta.
2. Basic Electronics & Linear circuits- N.N. Bhargawa.
3. An introduction to Electronics edition-II or III – A.P. Malvino.
4. Radio engineering- M.L. Gupta.
5. An introduction of Electronics – K. J. M. Rao.

B.Sc. IInd year Physics (Semester-IV)
(Solid State Physics)
Course code PHY-206
Paper-XII

Period-45 **Marks-50**

1. **Crystal Structure :**
   Introduction, Crystal lattice- plane lattice, space lattice, translation vectors, Unit cell, (primitive, non primitive Wigner-Sietz primitive cell) Basis, symmetry operations, point groups and space groups, type of lattices (two dimensional and three dimensional lattices), lattice directions and planes, Miller indices, Inter planer spacing, simple crystal structure.

2. **Bonding and Band theory of solids :**
   Introduction, concept of inters–atomic forces, cohesive energy and types of bonding, primary bonds- (ionic bonds, covalent bond and metallic bond), secondary bonds- (Vander Walls bonds and hydrogen bonds).
   The Kroning-Penney model, Energy versus Wave vector relationship, different representations (Brillouin zone)

3. **Thermal properties of solids :**
   Classical theory of lattice heat capacity (Concept and comparison with experimental values), Einstein's theory of lattice heat capacity, Debye's model of lattice heat capacity, density of modes, limitations of Debye's model.

4. **Free electron theory of metals and Transport properties:**

   Drude-Lorentz's classical theory, electrical conductivity, thermal conductivity, Wiedemann Franz law, significance of Fermi energy level, Hall effect, Hall voltage and Hall coefficient, experimental determination of Hall coefficient, Importance of Hall effect.

Reference Books:

1. Physics for degree student – C. L. Arora & Dr. P. S. Hemne – S. Chand publication
2. Solid State Physics and Electronics – R. K. Puri & V.K. Babbar- S. Chand publication
3. Fundamentals of Solid State Physics- Saxena, Gupta, Saxena – Pragati prakashan, Meerat
4. Solid State Physics, Revised VIth Editions, S.O. Pallai.
5. Introduction to Solid State Physics, VIIth Edition, C. Kittel.

B.Sc. IInd year (Semester-IV)
Physics Practical
Course code PHY-207
Paper-XIII

Marks-50

1. Energy band gap of semiconductor using thermister.

2. I.V. Characteristics of solar cell.

3. Calibration of bridge wire using Carry-Foster's bridge.

4. Determination of absolute capacity of condenser using B.G.

5. Full wave rectifier with Π filter.

6. Viscosity of liquid using Searle's viscometer.

7. High resistance by leakage through condenser.

8. **V**iscosity of liquid by oscillating disc method

Note: At least six experiments should be performed.

B.Sc. IInd year (Semester-IV)
Physics Practical
Course code PHY-208
Paper-XIV

Marks-50

1 Transistor characteristics in CE configuration.

2. Transistor characteristics in CB configuration

3. Study of CE amplifier

4. Hartly Oscillator using transistor.

5 Wien Bridge Oscillator using transistor/ Op-Amp

6 Op-Amp as adder/substractor

7 JFET characteristics. (r_p, g_m and μ)

8. Self-inductance by Owen's Bridge

Note: At least six experiments should be performed.

Additional activity

1. **Organize study tour industrial/research institute**
2. **Conduct Seminars**

QUESTION PAPER PATTERN

B.Sc. S.Y. (III & IV Semester)

PHYSICS

Time: 2.00 Hours **[Max. Marks: 50]**

NOTE 1. *All Questions carry equal marks*

2. *Use of logarithmic table and electronic pocket calculator is allowed.*

Q1 Chapt.I (Long question) *10marks*

OR

Chapt.II (Long question)

Q2 Chapt.III (Long question) *10 marks*

OR

Chapt.IV (Long question)

Q3 Attempt following *10 marks*

a) Chapt. I (short question)

b) Chapt. II (short question)

Or

a) Chapt. III (short question) *10 marks*

b) Chapt. IV (short question)

Q4 Attempt any two *10 marks*

a) Chapter I Problem

b) Chapter II Problem

c) Chapter III Problem

d) Chapter IV Problem

Q. 5 MCQ *10 marks*

Ten MCQ's having four alternatives based on theory and numerical.
(Minimum two MCQ's from each chapter)

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डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./विज्ञान/अभ्यासक्रम/७४/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, विज्ञान विद्याशाखेने शिफारस केल्यानुसार बी. एस्सी. / एम. एस्सी. प्रथम व द्वित्तीय वर्षाच्या सुधारित अभ्यासक्रमास आणि बी. एस्सी. प्रथम वर्षाच्या अभ्यासक्रमात किरकोळ बदल करण्यास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेल्या विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

[1]	B.Sc. Physics	Semester-III & IV,
[2]	B.Sc. Chemistry	Semester-III & IV,
[3]	B.Sc. Botany	Semester-III & IV,
[4]	B.Sc. Zoology with minor changes	Semester-I & II,
[5]	B.Sc. Zoology	Semester-III & IV,
[6]	B.Sc. Fisheries	Semester-III & IV,
[7]	B.Sc. Electronics (Opt.)	Semester-III & IV,
[8]	B.A./B.Sc. Mathematics	Semester-III & IV,
[9]	B.Sc. Computer Science	Semester-I & II,
[10]	B.Sc. Information Technology	Semester-I & II,
[11]	B.C.A.	Semester-I & II,
[12]	B.Sc. Computer Science(Opt.)	Semester-I & II,
[13]	B.Sc. Information Technology(Opt.)	Semester-I & II,
[14]	B.Sc. Computer Application(Opt.)	Semester-I & II,
[15]	B.Sc. Computer Maintenance(Opt.)	Semester-I & II,
[16]	B.Sc. Biotechnology (Progressively)	Semester-I to VI,
[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

..2..

[31]	B.Sc. Geology	Semester-III & IV,
[32]	B.A. Statistics with minor changes	Semester-I & II,
[33]	B.A. Statistics	Semester-III & IV,
[34]	B.Sc. Statistics with minor changes	Semester-I & II,
[35]	B.Sc. Statistics	Semester-III & IV,
[36]	B.Sc. Industrial Chemistry	Semester-III & IV,
[37]	B.Sc. Horticultural	Semester-I & II,
[38]	B.Sc. Dry land Agriculture	Semester-I & II,
[39]	B.Sc. Microbiology	Semester-III & IV,
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हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

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या परिपत्रकाची एक प्रत :-

१) **मा. परिक्षा नियंत्रक, परिक्षा विभाग,**
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

Revised Syllabus of

B.Sc. Second Year

Zoology [Optional]

Third and Fourth Semester

Effective from 2014-2015

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. Zoology Pattern in Semester System

B. Sc. II Year Zoology

III	ZOL-301	Paper – VII	Vertebrate Zoology	50
	ZOL-302	Paper – VIII	Genetics- II	50
	ZOL-303	Paper – IX	Practical based upon Paper VII	50
	ZOL-304	Paper – X	Practical based upon Paper VIII	50
IV	ZOL-401	Paper – XI	Animal Physiology (Special Emphasis on Mammals)	50
	ZOL-402	Paper – XII	Biochemistry & Endocrinology	50
	ZOL-403	Paper – XIII	Practical based upon Paper XI	50
	ZOL-404	Paper – XIV	Practical based upon Paper XII	50

B. Sc. III Semester

Course Code - ZOL- 301

PAPER: VII

VERTEBRATE ZOOLOGY

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1. Agnatha:- Out line classification, general characters and affinities of Cyclostomata **02**

2. Pisces : - Out line classification and general characters. **08**
   Scoliodon: - External characters, Digestive system, Respiratory system, Blood Vascular System and Nervous System.

3. Amphibia: - Out line classification and general characters. **06**
   Development of frog: - Fertilization Cleavage Blastula Gastulation and formation of germinal layers.
   Neotony in Amphibia
   Parental care in amphibia.

4. Reptilia: - Out line classification and general characters. **06**
   Calotes:-External features, Respiratory system and Blood vascular system.
   Poisonous and non- poisonous snakes.

5. Aves: - Out line classification and general characters. **10**
   Columba livia: - External features, Respiratory system,
   Embryology of chick.-Cleavage Blastula Gastulation and formation of germinal layers and extra embryonic membranes.
   Flight adaptation in birds.
   Migration in Birds.

6. Mammalia: - Out line classification and general characters. **13**
   Ratus ratus: - External features, Blood Vascular System,
   Urino-genital System and Adaptive radiation in mammals.
   Placentation in Mammals.

Total Periods: - 45

B.Sc. III Semester

Course Code - ZOL- 302

PAPER: VIII

GENETICS – II

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1. Genes and its expression :- **08**
   - Definition, concept and function of gene.
   - Transcription of gene: - Initiation, elongation and termination.
   - Genetic code:- Concept of codon, properties of genetic code
   - Translation of gene: - Initiation, elongation and termination.

2. Population Genetics :- **05**
   - Gene Pool., Gene Frequency.
   - Herdy-weinberg's Law.
   - Application of Herdy-weinberg's Law.

3. Human Genetics: - **12**
   - Human chromosomes.
   - Sex linked inheritance- X and Y Linked.
   - Dizygotic and monozygotic twins.
   - Inborn errors in metabolism: - PKU, Albinism.
   - Genetic disorders:- Down's syndrome, Turners' syndrome, Klinefelter's syndrome.
   - Use of human genetics in medical science: - Disease diagnosis Gene therapy and DNA finger printing.

4. Microbial Genetics: - **05**
   - Transformation.
   - Conjugation.
   - Transduction.

5. Genetic Engineering: - **10**
   - Introduction: - Definition, Concept and significance.
   - Restriction enzymes: - Concept and types.
   - Cloning vectors: - Plasmid, cosmid, phase.
   - Construction of r-DNA.
   - Application of r-DNA technology.

Total Periods: - 45

RECOMMENDED BOOKS
VERTEBRATE ZOOLOGY

- A life of Vertebrate – K.Z.Young, ELBS Oxford University Press.
- Modern Text Book of Zoology Vertebrate – R.L.Kotpal, Rastogi Publication Meerut.
- A Text Book of Chordate Zoology – R.C.Dalela –Jaiprakashnath Publication Meerut.
- Chordate Zoology – E.L.Jordan and P.S.Verma, S.Chand and Company New De
- Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill.
- Biological Science, 3rd Ed. D. J. Taylor, N. P. O. Green and G. W. Stout,
- Cambridge Univ. Press. Low priced Ed.
- Verma &Agarwal- chordate Embryology – S.Chand publication.

GENETICS-II

- Genetics. By Verma, PS and Agarwal, VK., S. Chand and Co., New Delhi
- Principles of Genetics. By Sinnott Dunn & Dobzhansky, Tata McGraw Hill, New Delhi, India.
- Genetics. By Gupta, PK., Rastogi Publications, Meerut
- Genetics. By Sarin, C., Tata McGraw Hill, New Delhi.
- Principles of Genetics. By Gardner, EJ, Simmons, MJ and Snustad, DP. John Wiley and sons
- Genetics-Strikberger, Macmillan Pub.
- Principles of Genetics- Tamarin, 7th Ed. Tata McGraw Hill.
- Genetics-- Winchester. Oxford IBH Pub
- Introductions genetic analysis – Griffith et.al.

B.Sc. III Semester

Course Code - ZOL- 303

PAPER: IX

VERTEBRATE ZOOLOGY (Practical)

1.	Museum study of vertebrates. (At least 20).	**05**
2.	Dissection of Scoliodon / Labeo Afferent and efferent, Cranial Nerves. Brain	**03**
3.	Dissection of Rat/ Frog ; Urinogenital system, Arterial system, Venous System, Brain of Rat.	**05**
4.	Mounting of Placoid, Cycloid and Ctenoid scales of fish	**01**
5.	Study of Embryological development of chick according to hours of incubation.	**01**
6.	Visit to Zoological museum/Zoo Park is compulsory and Submission of report	
7.	Write a report on common birds/mammals in your locality, scientific names and economic importance.	
	Total Practical periods: -	**15**

B.Sc. III Semester

Course Code - ZOL- 304

PAPER: X

GENETICS – II (Practical)

1.	Preparation of paper model of DNA and study of DNA structure	**01**
2.	Study of protein synthesis with the help of charts/models.	**02**
3.	Estimation of DNA from animal tissue with the help of Diphenyl amine method.	**02**
4.	Study of preparation of Normal Karyotype of human.	**01**
5.	Karyotypic study of Down's syndrome, Turner's syndrome, Klinefelter's syndrome with the help of photograph.	**02**
6.	Detection of Barr body from epithelial cell.	**01**
7.	Problems on sex linked inheritance.	**02**
8.	Problems based on Hardy – Weinberg's law	**02**
9.	Study of gene frequency and mutants of man ; Attached and free ear lobe. Colour of eye. Rolling of tongue. Blood group frequency.	**02**
	Total Practical periods:-	**15**

Pattern of Question Paper

B.Sc. III Semester

Course Code - ZOL- 301

PAPER: VII

VERTEBRATE ZOOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1&2
	OR	OR
	Long answer question.	Based on chapter 1&2
Q.2.	Long answer question.	Based on chapter 3&4
	OR	OR
	Long answer question.	Based on chapter 3&4
Q.3.	Long answer question.	Based on chapter 5&6
	OR	OR
	Long answer question.	Based on chapter 5&6
Q.4.	Short Notes on:	Based on all chapters
	a)	
	b)	
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper

B.Sc. III Semester

Course Code - ZOL- 302

PAPER: VIII

GENETICS – II

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1&2
	OR	OR
	Long answer question.	Based on chapter 1&2
Q.2.	Long answer question.	Based on chapter 3
	OR	OR
	Long answer question.	Based on chapter 3
Q.3.	Long answer question.	Based on chapter 4&5
	OR	OR
	Long answer question.	Based on chapter 4&5
Q.4.	Short Notes on: a) b)	Based on all chapters
	OR	OR
	Short Notes on: a) b)	Based on all chapters
Q.5.	Multiple choice questions: 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

B.Sc. IV Semester

Course Code - ZOL- 401

PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

1. Digestion :- **07**
   - Brief Introduction to digestive system.
   - Buccal digestion - salivary secretion and digestion.
   - Gastric digestion - gastric secretion and digestion.
   - Intestinal digestion - Pancreatic secretion, bile juices and digestion in Small intestine, digestion and absorption in large intestine.

2. Respiration :- **09**
   - Respiratory organs.
   - Breathing mechanism.
   - Respiratory pigments: - Properties and function of respiratory pigments.
   - External respiration.
   - Internal respiration.
   - Transport of gases.

3. Circulation :- **05**
   - Working of mammalian heart.
   - Blood and its composition.
   - Mechanism of blood clotting.

4. Excretion :- **05**
   - Structure of kidney.
   - Structure of uriniferous tubules.
   - Urine formation: - Ultra filtration selective, re-absorption and tubular secretion.
     Counter current multiplier system.

5. Nerve Physiology :- **06**
   - Structure of nerve cells and neuron.
   - Neurotransmitters.
   - Synapses: - Ultra structure and function.

6. Muscles Physiology :- **05**
   - Ultra structure of smooth muscle, striated muscles, and cardiac muscles.
   - Muscle contraction.
   - Simple twitch and fatigue

7. Reproduction :- **08**
   - Structure of gonads, Gametogenesis.
   - Role of sex hormones in Reproduction.
   - Reproductive cycles – oestrous and menstrual cycle

Total Periods: - 45

B.Sc. IV Semester

Course Code - ZOL- 402

PAPER: XII

BIOCHEMISTRY AND ENDOCRINOLOGY

A-BIOCHEMISTRY

1. Enzymes :- **05**
   Definition, concept and nomenclature,
   Properties, classification,
   Mechanism of enzyme action,
   Factors affecting enzyme action (Temperature, pH, Substrates & Co-enzyme.)

2. Carbohydrates :- **06**
   Definition Classification, monosaccharide, disaccharides, oligosaccharides and polysaccharides.
   Metabolism: - Glucogenesis, Gluconeogenesis, Glycolysis, TCA. & oxidative phosphoration.

3. Proteins :- **06**
   Definition , classification -simple , conjugated and derived proteins,
   Structure of proteins: - Primary, secondary, tertiary and quartery.
   Metabolism: - Deamination and transamination.

4. Lipids: **05**
   Definition, classification, simple, compound and derived lipids.
   Metabolism: - β oxidation and cholesterol biosynthesis .

5. Vitamins: - Sources and deficiency **02**

B- ENDOCRINOLOGY

1. Endocrine system of vertebrates: - **04**
   Introduction: - Definition of endocrine, Paracrine and Autocrine system.
   Significance of endocrine and neuro - endocrine system.

2. Pituitary gland: - Morphology & histological structure, Hormones and their function. **05**

3. Thyroid gland: - Morphology & histological structure, Hormones and their function. **03**

4. Adrenal gland: - Morphology & histological structure, Hormones and their function. **05**

5. Pancreas: - Islets of langarhance- Histological structure **02**
   Hormones and their function.

Total Periods: - 45

RECOMMENDED BOOKS
ANIMAL PHYSILOGY

- William S.Hoar- General and Comparative Physiology, prentice hall of India ltd.
- Wood E.W. Principle of Animal physiology
- Nagbhushnum R.,Sarojini R., Kodarkar M.S. –Animal Physiology
- Verma ,Agarwal & Tyagi-animal physiology
- Moeye K.-Animal Physiology, Cambridge low prize edition.
- Dantzler, W.H. Comparative Physiology (Handbook of Physiology): Vol. 1, 2, (ed.) Oxford University Press, New York, USA
- R. Eckert. Animal Physiology: Mechanisms and Adaptation. W.H.
- Mohan Arora – animal physiology , Himalaya publication
- A.K. Berry. –animal physiology

BIOCHEMISTRY AND ENDOCRINOLOGY

- J.L. Jain –biochemistry S.Chand Publication, meerut
- Lehninger- Biochemistry, Kalyani Publications
- Stryer-Biochemistry, W.H Freeman and Co., New York
- Granner and Rodwell - Harper's Illustrated Biochemistry, Murray, (27th Ed.), McGraw Hill, New York, USA
- Nelson and Cox - Principles of Biochemistry. Lehninger. 2nd Ed. CBS publishers.
- J H Wet - General Biochemistry Wiley Eastern Ltd.
- Rangnatha Rao K-Text Book of Biochemistry, Prentice-Hall of India
- C.B.Powar- Biochemistry – (Himalaya Pub.)
- Das.-Biochemistry
- E.J.W. Barrington, General and Comparative Endocrinology,
- Oxford, Clarendon Press.
- R.H. Williams, Textbook of Endocrinology, W.B. Saunders

B.Sc. IV Semester

Course Code - ZOL- 403

PAPER: XIII

ANIMAL PHYSIOLOGY (PRACTICAL)

1.	To study the digestive enzymes from cockroach/Human Saliva.	**02**
2.	Total count of RBC /WBC from given blood sample.	**04**
3.	Preparation of Heamatin crystals from blood sample.	**01**
4.	Hb% from given blood sample.	**01**
5.	Effect of isotonic, hypotonic, and hypertonic solutions on blood cell (RBCs)	**01**
6.	Detection of nitrogenous west product from the extract of different animals	**01**
7.	Detection of nitrogenous west product in fish/frog water tank.	**01**
8.	Estimation of O_2 consumed by fish in relation to temperature by Wrinkle's method.	**02**
9.	Typographic reading of skeletal muscle properties , heart beating in Toad / Rat. (Demo only)	**01**
10.	Histological study of following. T.S. of Kidney T.S. of Testis T.S. of Ovaries T.S. of Pancreas T.S. of Intestine	**01**
	Total practical periods: -	**15**

B.Sc. IV Semester

Course Code - ZOL- 404

PAPER: XIV

BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

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1. Preparation of solutions of given percentage, normality and molarity. **02**

2. Study of analytical instrument principle and applications. **04**
   pH meter,
   Colorimeter,
   Centrifuge
   Electrophoresis

3. Factors affecting enzymes activity temperature and pH. **02**

4. Detection of amino acid by paper chromatography. **01**

5. Qualitative test for organic compound. **03**
   Carbohydrate.
   Protein.
   Fats.

6. Quantitative estimation of protein from animal tissue using Lawry's method. **02**

7. Study of permanent histological slides of endocrine glands. **02**
   T.S. of Pituitary gland,
   T.S. of Thyroid gland,
   T.S. of Adrenal Gland,
   T.S. of Islets of langarhance.
   T.S. of Testis
   T.S. of Ovaries

Total practical periods: - 15

Pattern of Question Paper

B.Sc. IV Semester

Course Code - ZOL- 401

PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1 & 2
	OR	OR
	Long answer question.	Based on chapter 1 & 2
Q.2.	Long answer question.	Based on chapter 3, 4 & 5
	OR	OR
	Long answer question.	Based on chapter 3, 4 & 5
Q.3.	Long answer question.	Based on chapter 6 & 7
	OR	OR
	Long answer question.	Based on chapter 6 & 7
Q.4.	Short Notes on: a) b)	Based on all chapters
	OR	OR
	Short Notes on: a) b)	Based on all chapters
Q.5.	Multiple choice questions: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	Based on all chapters

Pattern of Question Paper

B.Sc. IV Semester

Course Code - ZOL- 402

PAPER: XII

BIOCHEMISTRY AND ENDOCRINOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question. OR Long answer question.	Based on chapter Sec. A 1 & 2 OR Based on chapter Sec. A 1 & 2
Q.2.	Long answer question. OR Long answer question.	Based on chapter Sec. A 3, 4 & 5 OR Based on chapter Sec. A 3, 4 & 5
Q.3.	Long answer question. OR Long answer question.	Based on chapter Sec. B 1 to 5 OR Based on chapter Sec. B 1 to 5
Q.4.	Short Notes on: a) b) OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q.5.	Multiple choice questions: 1 2 3 4 5 6 7 8 9 10	Based on all chapters

SKELETON OF QUESTION PAPER

B. Sc. III & IV Semester

Course Code - ZOL-303+403

PAPER: IX+XIII

VERTIBRATE ZOOLOGY+ANIMAL PHYSIOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1. Dissect fish……. ...so as to expose it's …….system **20**
OR
Dissect Frog / Rat …….so as to expose it's …….system

Q.2. Estimation of O_2 consumption in relation to temperature. **20**
OR
Detection of any two nitrogenous waste products from the given sample
OR
Total count of RBC/WBC from given blood sample

Q.3. Mounting of ……..scale of fish. **10**
OR
Effect of hypotonic/ isotonic/ hypertonic solution on RBC
OR
Preparation of haematin crystals from given blood sample

Q.4. Identification of given spot
(Museum study -05. Chick embryo - 02 & histology -03) **30**

Q.5. Record books **10**

Q.6. Submission of slide (At least five) **05**

Q.7. Vivo-voce. **05**

SKELETON OF QUESTION PAPER

B.Sc. III & IV Semester

Course Code - ZOL-304+404

PAPER: X + XIV

GENETICS – II + BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1.	Estimation of total DNA from…….. Tissue OR Problems on sex linked inheritance/ Hardy –Weinberg's law.	**20**
Q.2.	Quantitative estimation of Protein from……. Tissue OR Detection of organic compound from given samples A&B .Report the test, observation and results. OR Preparation of DNA model.	**20**
Q.3.	Calculates the RF values of given amino acids. (Using paper chromatography) OR Prepare the solutions of given percentage/normality/ molarity (At lest two types) OR Detection of Barr body from epithelial cells.	**15**
Q.4.	Identify the given spots and comment. (Syndroms-02. Endocrine glands-03)	**30**
Q.5.	Record book	**10**
Q.6.	Viva-voce	**05**

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and University Development.

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Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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S*/-160615/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. (Zoology) Semester System

Third Year (Optional)

(Fifth Semester and Sixth Semester 2015-2016)

Put before A.C. 7.5.15

Dr. S.S. Shinde
15.10.15 Chairman
Zoology

B. Sc. III Year Zoology

V	ZOL-501	Paper –XV	Ecology		50
	ZOL-502	Pape XVI (Elective)	A	Fishery sciences –I	50
			B	Animal culture –I	
			C	Entomology-I	
			D	Parasitic protozoa & helminthes-I	
			E	Computer Application & Laboratory Technology-I	
			F	Biotechnology-I	
			G	Dairy sciences -I	
			H	Poultry Sciences -I	
	ZOL-503	Paper XVII	Practical based upon Paper XV		50
	ZOL-504	Paper XVIII	Practical based upon Paper XVI		50
VI	ZOL-601	Paper XIX	Evolution		
	ZOL-602	Paper XX	A	Fishery sciences –II	50
			B	Animal culture –II	
			C	Entomology-II	
			D	Parasitic protozoa & helminthes-II	
			E	Computer Application & Laboratory Technology-II	
			F	Biotechnology-II	
			G	Dairy sciences -II	
			H	Poultry Sciences -II	
	ZOL-603	Paper XXI	Practical based upon Paper XIX		50
	ZOL-604	Paper XXII	Practical based upon Paper XX		50

B.Sc. V Semester
Course Code - ZOL- 501
PAPER: XV
ECOLOGY

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1. Introduction :- **02**
   - Definition, basic concept, terminology used in ecology.

2. Abiotic environmental factors. **08**
   - Temperature; Concept, temperature fluctuation in different environment. Range of temperature tolerance, effect of temperature on animals, Thermal adaptation.
   - Light-Concept, Light variation in different environment, effect of light on animals.
   - Adaptation to salinity and moisture

3. Biotic environmental factors :- **08**
   - Competition: - Definition, types, intraspecific and interspecific composition.
   - Predation: - Definition, characteristics of predation.
   - Commensalisms: - Definition and types with examples.
   - Mutualism: - Definition and example.
   - Parasitism: - Definition and types with examples.

4. Population :- **06**
   - Definition and basic concepts
   - Characteristics of population; Density, Natality, Mortality, Dispersion and Age distribution.
   - Population growth.
   - Population regulation.

5. Community :- **06**
   - Definition, basic concept and types.
   - Structure of community; producer, consumers and decomposers.
   - Characters; ecological niche, diversity, abundance, dominance, ecotone, edge effect.
   - Community succession; example of succession and climax

6. Ecosystem :- **15**
   - Definition, concept and types.
   - Components of ecosystem,
   - Dynamics of ecosystem: - primary production, secondary production, food chain, food web, tropic level, energy of flow, ecological pyramids.
   - Brief introduction to major ecosystems: - Marine ecosystem, Pond ecosystem, Forest ecosystem and Desert ecosystem.

Total Periods 45

B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - A
FISHERY SCIENCE – I
(Elective Paper)

CAPTURE FISHERIES IN INDIA

1.	**Introduction** Definition and history General characters and classification Concept of blue revolution Importance of fishes.	**05**
2.	Freshwater fisheries. Status of freshwater fisheries, past, present and future Freshwater capture fisheries, cat fishes, rout. Effect of aquatic pollution on fisheries.	**10**
3.	Revering and reservoir fisheries. Major river systems of India Important fisheries of Indian rivers system Major reservoirs of Maharashtra Reservoir fisheries and its management. Exploitation of reservoir fisheries	**10**
4.	Brackish water fisheries Principle fisheries of brackish water, milkfish, mullet, tilapia. Fisheries of the chilka, pulicat and Kolleru Lake	**08**
5.	Marine water fisheries. Oil-sardine Mackeal Ribbon fish fisheries. Bombay-duck Pomfret-fishery	**08**
6.	Application of remote sensing technique in pelagic fisheries.	**04**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – B

ANIMAL CULTURE - I
(Elective Paper)

APICULTURE

1.	Introduction and history	**02**
2.	Status, problems and prospects of Bee-keeping practices	**02**
3.	Systematic position and distribution of different honey bees. a) Wild species b) Domesticated species c) Brief account of honey production	**06**
4.	Organization in colony and polymorphism in Wild species Caste differentiation Division of work	**06**
5.	Life cycle of honey bees Morphology of queen, worker and drone	**06**
6.	Behavior of domesticated bees a) Nesting behavior b) Swarming and colony production c) Communication d) Defense, foraging e) Mating f) Comb construction g) Humidity and temperature control	**08**
7.	Food plants and plant –bee relations. a) Pollination by honey bees.	**04**
8.	Disease, pets, prasites and predators of bees and their control. a) Protozoan diseases-Nosemd Bacterial disease- American and European foul brood Viral disease- sac brood Fungal disease- chalk brood and stone brood b) External mites and dipterans, internal mites c) Bats –was math d) predators- wasps, brinks, rats, lizard, mantis, bears etc. e) Poisoning and pestisidal hazards in bees	**08**
9	bee products and their uses	**03**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - C

ENTAMOLOGY-I
(Elective Paper)

ECONOMIC ENTAMOLOGY

I	Introduction to Economic entamology.	**03**
II	Methods of collection and preservation of insect.	**05**
III	Type study of grasshopper- systematic position, external morphology, digestive, nervous, reproductive system including development.	**08**
IV	Insect –orders (general characters)	**12**
	Thysanura	
	Collembella	
	Lepidoptera	
	Diptera	
	Coeloptera	
	Hymenoptera	
V	House hold and Human insect pest:-	**06**
	Bed bugs, Mosquito, Rat Flea, and House fly, Cockroach, Pediculus.	
VI	Metamorphosis in insect, types of metamorphosis with example.	**05**
VII	Insect Culture (gross study) Apiculture, Sericulture and lac culture	**06**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – D

PARASITIC PROTOZOA AND HELMINTHES - I
(Elective Paper)

A- PARASITIC PROTOZOA

1. Introduction to parasitology :- Definition-Parasite &host, Parasitism, Types of parasites, host-parasite relationship **05**
2. Classification of protozoan parasites. **02**
3. Structure, life cycle, Pathogenecity and control measure of the following;
   - *Entamoeba coli* **03**
   - *Entamoeba gingivalis* **03**
   - *Giardia intestinalis* **03**
   - *Trichomonas vaginalis* **04**
   - *Trypanosoma gambience* 04
   - *Balantidium coli* **03**
   - *Plasmodium vivax* **04**
   - *Plasmodium falcipparium* **04**
   - *Plasmodium ovale* **04**
   - *Plasmodium malariae* ***03***
   - *Eimeria tenella* **03**

Total Periods 45

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY- I
(Elective Paper)

A- COMPUTER APPLICATION

1.	History of computer and their application to biology.	**03**
2.	Operating systems DOS, WINDOWS: Windows XP, Windows 7, and UNIX	**07**
3.	System Units: Mother board, Microprocessor and memory.	**05**
4.	Storage Devices, Input/ output devices.	**04**
5.	Microsoft office (2007): MS-word, MS-Power point, MS- Excel, MS- Publisher.	**05**
6.	Internet: Basics, Internet services, WWW services, E-mail services, Search engines.	**05**
7.	Demonstration of web utilities in biology.	**05**
8.	The introduction to programming.	01
9.	Programming using "C'.	**02**
10.	"C' Data types.	**03**
11.	Simple programs using C.	**05**
	Total Periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – F

BIOTECHNOLOGY – I
(Elective Paper)

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1. Introduction to biotechnology Definition and concept Old and new biotechnology Scope and importance, Biotechnology in India.	**03**
2. Genetic engineering Concept and definition Steps involved in gene cloning Application	**04**
3. Isolation & amplification of desired gene Isolation of DNA from cell Genomic library, cDNA library In vitro synthesis of gene Polymerase chain reaction	**04**
4. Enzymes in gene cloning Restriction enzymes (Nomenclature, type) DNA Ligase, taq polymerase, alkaline phosphates Polymerase etc	**04**
5. Cloning vectors Plasmid, bacteriophase, cosmid YAC, BAC, shuttle vector, Agro bacterium etc	**04**
6. Gene transfer methods Transformation, conjugation, Electrophoration, transfection Liposome mediated gene transfer, Gene gun, microinjection etc	**05**
7. Screening of cloned gene Direct selection, Insertional inactivation method Immunological assay, Autoradiography Colony and plaque blotting	**05**
8. Problems and solutions for gene cloning	**02**
Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - G

DAIRY TECHNOLOGY – I
(Elective Paper)

1.	Milk:-Definition, Composition, Factors affecting composition of milk ➢ Food and Nutritive value of milk ➢ Physico-chemical properties of milk.	**05**
2.	Microbiology of milk:-Introduction ➢ Growth and Destruction of microorganisms ➢ Classification of microorganism.	**05**
3.	Milk and public health: Introduction Safe guarding of milk supply ➢ Clean milk production.	**03**
4.	Buying and collection of milk :- ➢ Introduction , Method of buying, Method of collection ➢ Cooling of milk ➢ Transportation of milk.	**04**
5.	Manufacture, Packaging and storage of Pasteurized milk :- ➢ Introduction., Milk reception operation, Standardization ➢ Pasteurization, Homogeuration. ➢ Packing and storage of milk.	**09**
6.	Judging and grading of milk:-Introduction ➢ Importance and procedures.	06
7.	Indian dairy products :- ➢ Introduction ➢ Importance and Classification	**04**
8.	Khoa :- ➢ Introduction, definition classification and Composition. ➢ Food and Nutritive Value. ➢ Methods of production and defects of khoa.	
9.	Channa :- ➢ Introduction, definition and Composition. ➢ Channa Based sweets, Food and Nutritive Value. ➢ Methods of production.	**04**
10.	Dahi :- ➢ Introduction, definition and Composition. ➢ Channa Based sweets, Food and Nutritive Value. ➢ Methods of production. **Total Periods**	**04** **45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - H

POULTRY SCIENCE- I
(Elective Paper)

1.	Introduction to poultry science.	**02**
2.	Classification of poultry breeds;	**08**
	➢ American	
	➢ Asiatic	
	➢ English	
	➢ Mediterronean.	
3.	Digestive, circulatory, Respiratory and Male and female reproductive system of poultry.	**15**
4.	Formation, structure and nutritive value of eggs.	**06**
5.	Breeding of poultry;	10
	➢ Selection	
	➢ Objective	
	➢ Methods of Selection	
	➢ Mating system.	
6.	Management of incubators	**02**
7.	Hatching of eggs.	**02**
	Total Periods	**45**

B.Sc. V Semester

Course Code - ZOL- 503
PAPER: XVII

ECOLOGY (PRACTICAL)

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1. Estimation of productivity of pond ecosystem using white and dark bottle method. **02**

2. Determine the following parameters of soil. **04**
   - pH
   - Alkalinity
   - Chlorinity
   - Salinity
   -

3. Analysis of DO, CO_2, Salinity, Chlorinity of water sample. **04**

4. Study of animal association ship with example (Charts/photo) -Competition, mutualism, parasitism, predation and commensalisms. **01**

5. Estimation of population density by Quadrate method on field and by Simulation method. **04**

6. Preparation of permanent slides of following
   Spirogyra, Verticella, Odogonium, Daphnia, Cyclops, Mysis, Cypris, keretella

7. Project report: - Forest or fresh water ecosystem.

Total practical periods: - 15

B.Sc. V Semester

Course Code - ZOL- 504
PAPER: XVIII - A

FISHERY SCIENCE – I (PRACTICAL)
(Elective Paper)

I.	Study of freshwater fishes. Major carps Other carps. Cat fishes Clupoides	**03**
2.	Study of brackish water fishes. *Hilsa hilsa, Chanos chanos (milkfish), Latis calcarifer, Tilapia*	**02**
3.	Study of marine ware fishes. Oil sardine Mackerel Ribbon -fish Bombay-duck Pomfret Sole Polynemus	**03**
4.	Water analysis	**05**
5.	Visit to local or any reservoir and marine fish landing centre and student should be submit a project report at the time of practical examination	**02**
	Total practical periods: -	**15**

B.Sc. V Semester

Course Code - ZOL- 504
PAPER: XVIII - B

ANIMAL CULTURE – I (PRACTICAL)
(Elective Paper)

1.	Identification of members of bee family	**03**
2	.study of bee hive	**02**
3	study of different types of bees.	**02**
4	mounting of mouth parts and sting apparatus of honey colony.	**04**
5.	Identification of different types of hives and equipment used in apiculture.	**04**
	Total practical periods: -	**15**

B.Sc. V Semester

Course Code - ZOO- 504
PAPER: XVIII - C

ENTAMOLOGY – I (PRACTICAL)
(Elective Paper)

1.	Collection and preservation of insects	**02**
2.	Dissection –grasshopper-Digestive system, Nervous system, Reproductive system.	**03**
3.	Mounting: - Mouth parts of Grasshopper, Mosquito, Housefly, Cockroach.	**02**
4.	Museum study- five Human insect pest and representatives of orders: Lepidoptera, coleopteran, Odoneta, Hymenoptera, Orthoptera, with examples.	**04**
5.	Collection of insects (at least 15 specimens should be collected and submitted at the time of examination by students)	**04**
	Total practical periods	**15**

B.Sc. V Semester

Course Code - ZOO- 504
PAPER: XVIII - D

PARASITIC PROTOZOA AND HELMINTHES – I (PRACTICAL)
(Elective Paper)

Parasitic protozoa

1. Study of microscopic structure of the following; **03**
   - *Entamoeba coli*
   - *Entamoeba histolytica*
   - *Opalina*
   - *Nyctotherus*
   - *Balantidium coli*
   - *Trichomonas* species
   - *Trypanosoma* species
   - *Plasmodium* species
   - *Eimeria* species.

2. Smear preparation:- Rat/ Fish blood smear (Giemsa stain) **04**

3. Flagellate parasite from rectum of frog and Calotes with giemsa stain. **04**

4. Ciliate parasite from rectum of frog, smear with iron haematoxxyline or tungesto phosphoric acid for Balantidium Nyctotherus and Opalina. **04**

Total practical periods: - 15

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY- I (Practical)
(Elective Paper)

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1. Demonstration of the use of the following devices:- **03**

   Visual Display Unit (VDU), Key board, Mouse, Light pen, Joystick, Printers, Plotters, Disks, CD-Rom.

2. Use of DOS and windows- manipulating files **02**
3. Use of internet, demonstration of various web sites related to biology. **05**
4. Introduction to programming, editing files, programming in "C'. **05**

Total practical periods: - 15

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – F

BIOTECHNOLOGY – I (PRACTICAL)
(Elective Paper)

A) Principle and application of following equipments **04**
1) gel electrophoresis
2) column chromatography
3) high pressure liquid chromatography
4) centrifuge
5) laminar flow
6) spectrophotometer

B) Estimation of total DNA from animal tissue using Diphenylamine method. **02**

C) Estimation of total RNA from animal tissue using orcinol method **02**

D) Isolation of messenger RNA from animal source using affinity chromatography **02**

E) Isolation of total DNA from tissue **01**

F) DNA electrophoresis by agarose gel **02**

G) Demonstration of Animinated methods of following **02**
- Gene cloning
- Restriction digestion of DNA
- Southern blotting techniques
- Northern blotting technique

Total practical periods **15**

B.Sc. V Semester

Course Code - ZOO-504
PAPER: XVIII – G

DAIRY TECHNOLOGY- I (PRACTICAL)
(Elective Paper)

1.	Study of steps for clean and safe milk production.	**01**
2.	Sampling of milk	**01**
3.	Platform test for judging the quality of milk; ✓ Organoleptic test ✓ Temperature ✓ COB test ✓ Alcohol test ✓ Sediment test.	**01**
4.	Determination of fat of milk.	**01**
5.	Determination of SNF and TS of milk.	**01**
6.	Determination of Specific gravity of milk	01
7.	Determination of acidity and ph of milk.	**01**
8.	Staining of Bacteria.	**02**
9.	Methyline blue reduction test (MBR) for milk.	**01**
10.	Standard plate count (SPC) of milk. Detection of adulterants and preservative in milk.	**01**
11.	Preparation of khoa.	**01**
12.	Preparation of Chhans	**01**
13.	Preparation of Dahi.	**02**
	Total practical periods	**15**

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – H

POULTRY SCIENCE- I (PRACTICAL)
(Elective Paper)

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1. To study American Class poultry breeds.	**01**
2. To study Asiatic Class poultry breeds	**01**
3. To study English Class poultry breeds.	**01**
4. To study Mediterranean Class poultry breeds.	**01**
5. To Study the Circulatory system of Poultry.	**02**
6. To Study the Respiratory system of Poultry.	**02**
7. To Study the Digestive system of Poultry.	**02**
8. To Study the Reproductive (Male and Female) system of Poultry	**02**
9. To Study Formation of egg.	**02**
10. To Study Structure of egg.	**01**
Total practical periods	**15**

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 501
PAPER: XV
ECOLOGY

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 to 3
OR	OR
Short Notes on:	Based on chapter 1 to 3
a)	
b)	
Q2. Long answer question.	Based on chapter 4 & 5
OR	OR
Short Notes on:	Based on chapter 4 & 5
a)	
b)	
Q3. Long answer question.	Based on chapter 6
OR	OR
Short Notes on:	Based on chapter 6
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - A
FISHERY SCIENCE – I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 & 2 OR Based on chapter 1 & 2
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 3 & 4 OR Based on chapter 3 &4
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 5 & 6 OR Based on chapter 5 & 6
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Questions: (Answer in One Sentence) 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – B
ANIMAL CULTURE - I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 to 3 OR Based on chapter 1 to 3
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 4 & 5 OR Based on chapter 4 & 5
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 6 & 7 OR Based on chapter 6 & 7
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Questions: (Answer in One Sentence) 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - C
ENTAMOLOGY - I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 to 3
OR	OR
Short Notes on:	Based on chapter 1 to 3
a)	
b)	
Q2. Long answer question.	Based on chapter 4 & 5
OR	OR
Short Notes on:	Based on chapter 4 & 5
a)	
b)	
Q3. Long answer question.	Based on chapter 6 & 7
OR	OR
Short Notes on:	Based on chapter 6 & 7
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Questions: (Answer in One Sentence)	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - D
PARASITIC PROTOZOA AND HELMINTHS – I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 & 2
OR	OR
Short Notes on:	Based on chapter 1 & 2
a)	
b)	
Q2. Long answer question.	Based on chapter 3
OR	OR
Short Notes on:	Based on chapter 3
a)	
b)	
Q3. Long answer question.	Based on chapter 3
OR	OR
Short Notes on:	Based on chapter 3
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Questions: (Answer In One Sentence)	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – E
COMPUTER APPLICATION & LAB. TECHNOLOGY- I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 to 4
OR	OR
Short Notes on:	Based on chapter 1 to 4
a)	
b)	
Q2. Long answer question.	Based on chapter 5 to 7
OR	OR
Short Notes on:	Based on chapter 5 to 7
a)	
b)	
Q3. Long answer question.	Based on chapter 8 to 11
OR	OR
Short Notes on:	Based on chapter 8 to 11
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Questions: (Answer in One Sentence)	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – F
BIOTECHNOLOGY – I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 to 3
OR	OR
Short Notes on:	Based on chapter 1 to 3
a)	
b)	
Q2. Long answer question.	Based on chapter 4 & 5
OR	OR
Short Notes on:	Based on chapter 4 & 5
a)	
b)	
Q3. Long answer question.	Based on chapter 6 to 8
OR	OR
Short Notes on:	Based on chapter 6 to 8
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Questions: (Answer in One Sentence)	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - G
DAIRY TECHNOLOGY- I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. OR Short Notes on: a) b)	Based on chapter 1 to 3 OR Based on chapter 1 to 3
Q2. Long answer question. OR Short Notes on: a) b)	Based on chapter 4 to 6 OR Based on chapter 4 to 6
Q3. Long answer question. OR Short Notes on: a) b)	Based on chapter 7 to 10 OR Based on chapter 7 to 10
Q4. Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5. Short Questions: (Answer in One Sentence) 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – H
POULTRY SCIENCE - I (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. OR Short Notes on: a) b)	Based on chapter 1 & 2 OR Based on chapter 1 & 2
Q2. Long answer question. OR Short Notes on: a) b)	Based on chapter 3 OR Based on chapter 3
Q3. Long answer question. OR Short Notes on: a) b)	Based on chapter 4 to 7 OR Based on chapter 4 to 7
Q4. Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5. Short Questions: (Answer in One Sentence) 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

B.Sc. VI Semester
Course Code – ZOL - 601
PAPER: XIX
EVOLUTION

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1. Concept of organic evolution :- **06**
   - Definition and concept.
   - Theories of organic evolution in brief; Preformation theory, Bear's Law, Biogenetic law, catastrophism, Lamarckism, Darwinism and Germplasm theory.
2. Origin of Life :- **03**
   - Definition, Abiogenesis, Biogenesis.
   - Chemical evolution of life.
3. Evidences of Organic Evolution :- **04**
   - Anatomical evidences.
   - Embryological evidences.
4. Darwinism :- **05**
   - Introduction :- Natural selection theory,
   - Artificial selection theory and sexual selection theory.
5. Elemental forces of evolution :- **07**
   - Mutation: - Concept and role in evolution.
   - Recombination: - Concept and role in evolution.
   - Natural selection: - Concept and role in evolution.
   - Isolation: - Concept and role in evolution.
   - Genetic Drift. : - Concept and role in evolution.
6. Basic patterns of evolution :- **09**
   - Sequential and divergent evolution.
   - Microevolution: - Concept, silent features and mechanism with example.
   - Macro evolution: - Concept, silent features and mechanism with example.
   - Mega evolution: - Concept, silent features and mechanism with example.
7. Species and speciation:- **07**
   - Species: - Morphological concept, Genetical concept, biological concept of species
   - Speciation: - Definition, concept, mechanism of speciation.
   - Allopatric, Sympatric and Parapatric speciation.
8. Fossils :- **04**
   - Definition , fossil formation
   - Types of fossils.

Total Periods 45

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - A
FISHARY SCIENCE – II
(Elective Paper)

FISH CULTURE AND FISH TECHNOLOGY

A. fish culture

1. Introduction **15**
   a) Types of freshwater ponds-perennial and seasonal.
   b) Different types of ponds-nursary, rearing and stoking ponds.
   c) Design, contruction and maintenance of nursery, rearing and stocking ponds.
   d) Productivity of ponds
   e) principles of fish collection
   f) Fish culture methods
   g) Culture – cat fisheries
   h) Sewage fed fisheries

2. Fish crop production (fish diseases) **06**
   Protozoan, fungal, bacterial, viral worms diseases
3. Breeding of fishes **08**
   a) Natural spawning of carps
   c) Artificial breeding by hypophysation
   d) Common carp breeding

B. fish technology

4. Fish preservation and processing **08**
   a) Fish processing methods
   b) Fish –spoilage
   c) Value added products
   d) Sanitation and HACCP

5. Crafts and gears **08**
   a) Different types of gears
   b) Different types of crafts
   c) Preservation of gears

Total Periods 45

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - B
ANIMAL CULTURE – II (Elective Paper)

SERICULTURE

1.	History and general account of sericulture industry	**02**
	Status, scope and problems of sericulture industry in India and Maharashtra.	**02**
1.	Different types of silkworms, their systematic position and distribution.	**03**
2.	life cycle of mulberry silk worm	
3.	Morphology of different stages of B. mori. - Egg and types, larva, pupa, adult.	**03**
4.	structure and working of silk gland	**02**
5.	Food plants.	**10**
	Brief account of food plants required for non –mulbabary silk worms.	
	Systematic position mad morphology of mulberry plant.	
	Selection of variety, preparation of planting material	
	Agro climate condition required for plantation	
	Methods of plantation (mulberry cultivation)	
	Maintenance of mulberry garden (irrigation and rainfed)	
	Common diseases and pest of mulberry and their control.	
	Harvesting and preservation of leaves	
6.	Silk worm rearing	**10**
	Rearing house, model rearing house and others.	
	Rearing equipments and their uses.	
	Disinfection of rearing house and equipments	
	Egg incubation, buck boding and its importance.	
	Hatching and brushing of larvae, methods of brushing	
	Feeding and its schedule	
	Bed cleaning, methods of bed cleaning	
	Role of environmental conditions in rearing	
	Moulting, care taken during moultiong	
	Spacing and its schedule	
	Mounting spinning, harvesting of cocoon	
	Transportation and marketing of cocoon.	
7.	Important diseases, pest of silk worm and their control:-	**04**
	Bacterial, fungal, viral, protozoan	
	Pest predators- beetle, mites, ants, lizards, birds, rats etc	**02**
10.	Introduction to post harvesting technology (reeling)	**06**
	Cocoon stifing, methods of stifing.Preservation and storage of cocoons.Cocoon cooking, methods of cocoon coking	
	Reeling- country charkha, filature.	
11.	Sericulture as agro cottage, employment generating village industry.	**01**
12.	Economics of sericulture.	**01**
	Total Periods	**45**

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - C
ENTAMOLOGY – II
(Elective Paper)

PEST MANAGEMENT

I	Pest –Definition, types of pest, agricultural, veterinary and medical pest.	**06**
II	Study of major crop pest: - Classification, Characters. Jawar- Stem borer, Midge flies Cotton- Red cotton bug, pink bollworm Groundnut-White grub, pod sucking bug Sugarcane- Pyrilla, Stem borer.	**12**
III	Study of Stored grain pests: Rice weevil, pulse bettle	**08**
IV	Control measures of insect pest. Methods of control measures-Chemical, Biological, integrated pest management.	**08**
V	Migration of insect.	**03**
VI	Insecticides and plant protection appliances like Hand compression spray, Hand rotating duster, bucket pump	**08**
	Total Periods	**45**

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - D
PARASITIC PROTOZOA AND HELMINTHES – II
(Elective Paper)

B- PARASITIC HELMINTHES

1.	General characters and classification of helminthes	**02**
2.	Structure ,life history, pathogenecity and control measure of the following;	
	➢ *Schistosoma haematobium*	**03**
	➢ *Amphilina*	**02**
	➢ *Taenia Saginata*	**02**
	➢ *Echinococcus granulossus*	**02**
	➢ *Trichinella spiralis*	**03**
	➢ *Enterobius vrmicularis*	**03**
	➢ *Ancylostoma duodenale*	**02**
	➢ *Wuchereria bancroftii*	**03**
	➢ *Dracunculus medinensis.*	**01**
3.	Gross morphology of Trematoda Cestoda and Nematode.	**06**
4.	Reproductive organs of Trematodes Cestodes and Nematodes.	**06**
5.	Body wall of Trematodes Cestodes and Nematodes.	**06**
	Total periods: -	**45**

B.Sc. VI Semester

Course Code – ZOL - 602

PAPER: XX - E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY - II

(ELECTIVE PAPER)

B-MEDICAL LABORATORY TECHNOLOGY

1. Basic Laboratory principles and procedure. **08**

Introduction

Laboratory management system.

Responsibility of laboratory worker.

Laboratory safety and aids and Training of technician.

2. Basic requirement of Laboratory. **12**

Glassware, solution and reagent, equipment and instruments.

(Autoclave, Hot air oven, Incubator, Water bath Centrifuge, Colorimeter, PH meter, Haemoglobometer, Micrometer, Glocometer.)

3. Routine examination of body fluids. **10**

Collection and examination procedure /method with special reference to clinical significance.

Blood, HB percentage, WBC, RBC count, Homeostasis (mechanism of blood coagulation).

Urine- Physical examination (Color and Odour),Chemical examination

(Protein, Glucose, Bilurubin, Uroblinogene Blood, Ketone bodies, Acetone bodies)

Sputum- Microscopic examination.

Semen- Microscopic examination, Sperm count, Sperm motility, Sperm morphology, Examination for the presence of semen.

4. Basic histopathological techniques. **10**

Collection, fixation, preparation of tissue for section

Staining and observations with critical comments.

5. Scope and importance of laboratory technique in clinical field of medical science. **05**

Total Periods: - 45

B.Sc. VI Semester Course

Code - ZOL - 602
PAPER: XX – F
BIOTECHNOLOGY - II
(Elective paper)

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1. Animal cell culture **06**
   - Basic requirements, Culture media & sterilization
   - Contamination and sterilization of laboratory.
   - Application and limitations of cell culture

2. Manipulation of reproduction and transgenic animals **05**
   - Invitro fertilization, nuclear transplantation (Dolly sheep)
   - Transgenic animals –methods
   - (Retroviral vector method, microinjection and ES cell methods)

3. Protein engineering **06**
   - Site-directed mutagenesis (Cassette mutagenesis oligonucliotide directed)
   - Applications of mutagenesis, Hybrodoma technology
   - Commercial production of enzymes

4. Gene therapy and DNA fingerprinting **06**
   - Introduction, ex vivo, in vivo gene therapy
   - Antigene &antisence gene therapy
   - DNA fingerprinting

5. Human disease-diagnosis using biotechnology **02**

6. Applications of biotechnology **06**
   - Agriculture
   - Medicine
   - Industry

Total Periods: - 45

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - G
DAIRY TECHNOLOGY – II
(Elective paper)

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1. Concentrated indigenous dairy products :- **08**
   - Definition, Composition, Methods of production and yield of Peda, Burfi, Rabdi, Basundi and Gulabjamun.
2. Fermented indigenous dairy product: - **05**
   - Definition, Composition, Methods of production and yield of Chakka, Shrikhand and Shrikhand wadi.
3. Frozen indigenous dairy product: - **06**
   - Definition Composition, Methods of production and yield of Kulfi, Malai ka Barf.
4. Fat rich indigenous dairy product: - **06**
   - Definition Composition, Methods of production and yield of Butter and Ghee.
5. Special milk :- **10**
   - Definition Composition and Methods of production of Milk Shake, Flowered milk, Toned milk, Fortified milk, Recombined milk and Soya milk.
6. Study of microbial toxins in dairy products **05**
7. Role of dairy industry as on entrepreneur for development of small scale industry. **05**

Total Periods
45

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - H
POULTRY SCIENCE - II
(Elective Paper)

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1. Poultry Management ; **10**
   - Brooder management.:- Housing, sanitation&hygine,litter, Temperature space
   - Grower management.
   - Layer management.
   - Rising of Broilers.
2. Housing for poultry; **14**
   - selection site for poultry form
   - Free range or extensive system.
   - Semi intensive system.
   - Intensive system.
   - Folding System
3. Feeding of poultry. **05**
   Requirement of poultry feed, feed ingredients, Conventional and nonconventional poultry feed
4. Processing of poultry products. Preservation of poultry products. **05**
5. Marketing of poultry products. **03**
6. Poultry diseases; **08**
   Parasitic, Protozoan
   Bacterial, Fungal.

Total Periods 45

B.Sc. VI Semester
Course Code – ZOL - 603
PAPER: XXI
EVOLUTION (PRACTICAL)

1. Embryological evidences of evolution with the help of slide/chart/pictures.	**02**
2. Adaptive modification in feets of birds and mouth parts of insects	**02**
3. Study of successive stages of evolution with the help of models/charts ➢ Horse ➢ Human	**02**
4. Discussion on patterns of speciation with the help of charts /pictures. ➢ Allopatric speciation ➢ Sympatric speciation.	**02**
5. Study the homologous and analogous organs.	**04**
6. Study of natural selection using *E.coli* bacteria against antibiotics (Tetramycin/ Penicillin)	**01**
7. Study of geographical era.	**02**
Total Practical periods	15

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII – A
FISHARY SCIENCE – II (PRACTICAL)
(Elective Paper)

1.	Primary productivity of ponds (plankton studies).	**02**
2	identification, classification and culturaable significance of following. Catla, rohu, mrigal, catfishes, exotic canoj	**03**
3	Collection and identification of fish parasites and worms.	**04**
4	Removal of fish pituitary gland and preparation of pituitary extract	**02**
5	Identification of crafts and gears. Gill net, Rampanni, Satpalti, Machwa, Catamaran.	**02**
6.	A visit to fish farm and fish processing centre is compulsory.	**02**
	Total Practical Periods	**15**

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII – B
ANIMAL CULTURE – II (PRACTICAL)
(Elective Paper)

1.	Different stages of silk worm from egg to adult.satges (egg, sheet diff. ages of the larvae, pupa and adult.)	**03**
2.	Dissection of the silkworm to study the internal anatomy and mounting the silk glands, mounting of mouth parts spinner ate spiracle etc.	**02**
3.	Study of disease causing pests of larvae, pupa and adult.	**03**
4.	Equipment needed in silkworm rearing centre.	**02**
5	mulberry leaves and utilization and study of mulberry varieties.	**02**
6.	Preparation of model of life cycle of *bombex mori* and submition at the time of Examination.	**03**
	Total Practical Periods	**15**

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII – C
ENTAMOLOGY – II (PRACTICAL)
(Elective Paper)

1.	Collection, preservation and identification of Major crop pests (any five) Jawar- Stem borer, Midge flies. Cotton- Red cotton bug, pink bollworm Groundnut-White grub, pod sucking bug Sugarcane- Pyrilla,	**05**
2.	Identification of common stored grain pests. A- Rice Weevil B- Rice bettle C- Grain moths	**02**
3.	Study of common plant protection appliances like Sprayers and dusters.	**02**
4.	Collection of major crop pests in locality and submission at the time of examination.	**04**
5.	Visit of an agricultural Field and field study report.	02
	Total Practical Periods	**15**

B.Sc. VI Semester Course
Code – ZOL - 604
PAPER: – XXII - D
PARASITIC PROTOZOA AND HELMINTHES – II (PRACTICAL)
(Elective Paper)

B-PARASITIC HELMINTHES

1. Study of microscopic structure of the following; **03**
   - ✓ *Schistosoma* Species
   - ✓ *Fasciola hepatica*
   - ✓ Redai larva
   - ✓ Cercaria larva
   - ✓ V.S. Body wall of Fasciola.
   - ✓ *Mehrorchis*
   - ✓ *Ganeo*
   - ✓ *Tremorchis*
   - ✓ *Paramphistomum*
   - ✓ *Taenia Saginatta*
   - ✓ *Echinococcus granulosus*
   - ✓ Scolex of *Taenia solium* and *Taenia saginatta.*
   - ✓ Mature proglottids
   - ✓ Gravid proglottids
   - ✓ Hexacanth Larva
   - ✓ Body wall of tape worm
   - ✓ *Enterobius vermicularis*
   - ✓ *Ascaris lumbricoides* (Specimen)
   - ✓ T.S. of Body wall of *Ascaris*
   - ✓ T.S. of *Ascaris* Male and Female
   - ✓ *Ancylostoma* W.M.
   - ✓ Microfilaria W.M.
   - ✓ T*richinella spiralis*
2. Collection preservation staining and identification of the Trematode parasite from the rectum of frog. **04**
3. Collection preservation staining and identification of the Cestode parasite from the chick intestine **04**
4. Collection, preservation, mounting and identification of the Nematode parasite from the vertebrate. **04**

Total Practical periods: - 15

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII - E
COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY – II
(PRACTICAL)
(Elective Paper)

MEDICAL LABORATORY TECHNOLOGY

1. Study of laboratory equipments. **02**
   Autoclave, hot air oven, incubator water bath,
   Centrifuge, refrigerator, colorimeter, PH meter,
   Haemoglobinometer, microtome, and Glocometer.
2. Preparation of various reagents and fixatives. **02**
3. Histological techniques: preparation of biological material,
   Fixing, embedding sectioning, staining, and mounting. **02**
4. Study of blood pressure apparatus, stethoscope. **03**
5. Blood analysis- Hb percentage
   , Counting of WBC and RBC, Homeostasis. **03**
6. Urine analysis- Protein, Glucose, Bilurubin, Blood,
   Ketone bodies, Acetone bodies,
   Or any other normal and abnormal constituent. **03**

Total Practical periods: - 15

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII – F
BIOTECHNOLOGY- II (PRACTICAL)
(Elective Paper)

A-	Sterilization of glassware and chemicals in tissue culture	**03**
B-	Preparation of culture media and sterilization	**02**
C-	Assay of cell viability using dye.	**02**
D-	Effect of pH on acid phosphatase activity	**02**
E-	Study of chromosomal aberration	**01**
F-	Pure Culture of airborne/water bacteria.	**02**
G-	Study of antibiotic resistant /susceptibility of bacterial culture.	**01**
H-	Demonstration of Animinated methods of following Nuclear transplantation Hybrodoma technique DNA fingerprinting Bt- cotton	**02**
	Total Practical Periods	**15**

B.Sc. VI Semester Course
Code - ZOL- 604
PAPER: XXII – G
DAIRY TECHNOLOGY- II (PRACTICAL)
(Elective Paper)

1.	Preparation of Peda.	**01**
2.	Preparation of Burfi.	**01**
3.	Preparation of Rabdi.	**01**
4.	Preparation of Bassundi.	**01**
5.	Preparation of Gulab Jamun.	**01**
6.	Preparation of Chakks.	**01**
7.	Preparation of Shrikhand.	**02**
8.	Preparation of Shrikhandwadi.	**01**
9.	Preparation of Kulfi.	**01**
10.	Preparation of Butter (Makhan).	**01**
11.	Preparation of Ghee.	**01**
12.	Preparation of Milk Shake.	**01**
13.	Flavored milk.	**01**
14.	Soya Milk.	**01**

Total Practical Periods 15

B.Sc. VI Semester
Course Code - ZOL- 604
PAPER: XXII - H
POULTRY SCIENCE – II (PRACTICAL)
(Elective Paper)

1.	To study Poultry housing system.	**03**
2.	To identify and study feed ingredients	**02**
3.	To preservation of eggs.	**02**
4.	To study Protozoan diseases.	**01**
5.	To study parasitic diseases.	**01**
6.	To study Bacterial diseases.	**01**
7.	To study fungal diseases.	**01**
8.	to compute ration for chicken	**01**
9.	to identify equipments in poultry farm	**01**
10.	visit to poultry farm	**01**

Total Practical Periods 15

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 601
PAPER: XIX
EVOLUTION

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 to 4
OR	OR
Short Notes on:	Based on chapter 1 to 4
a)	
b)	
Q2. Long answer question.	Based on chapter 5 to 6
OR	OR
Short Notes on:	Based on chapter 5 to 6
a)	
b)	
Q3. Long answer question.	Based on chapter 7 to 8
OR	OR
Short Notes on:	Based on chapter 7 to 8
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - A
FISHARY SCIENCE - II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 OR Based on chapter 1
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 2 & 3 OR Based on chapter 2 &3
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 4 & 5 OR Based on chapter 4 & 5
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Question (Answer in One Sentence): 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - B
ANIMAL CULTURE – II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. OR Short Notes on: a) b)	Based on chapter 1 to 7 OR Based on chapter 1 to 7
Q2. Long answer question. OR Short Notes on: a) b)	Based on chapter 8 to 10 OR Based on chapter 8 to 10
Q3. Long answer question. OR Short Notes on: a) b)	Based on chapter 11 to 13 OR Based on chapter 11 to 13
Q4. Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5. Short Question (Answer in One Sentence): 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - C
ENTAMOLOGY – II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 & 2
OR	OR
Short Notes on:	Based on chapter 1 & 2
a)	
b)	
Q2. Long answer question.	Based on chapter 3 & 4
OR	OR
Short Notes on:	Based on chapter 3 & 4
a)	
b)	
Q3. Long answer question.	Based on chapter 5 & 6
OR	OR
Short Notes on:	Based on chapter 5 & 6
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Question (Answer in One Sentence):	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code – ZO - 602
PAPER: XX - D
PARASITIC PROTOZOA & HELMINTHS – II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 & 2
OR	OR
Short Notes on:	Based on chapter 1 & 2
a)	
b)	
Q2. Long answer question.	Based on chapter 2
OR	OR
Short Notes on:	Based on chapter 2
a)	
b)	
Q3. Long answer question.	Based on chapter 3 to 5
OR	OR
Short Notes on:	Based on chapter 3 to 5
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Question (Answer in One Sentence):	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - E
COMPUTER APPLICATION & LABORATORY TECHNOLOGY – II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1 & 3
OR	OR
Short Notes on:	Based on chapter 1 & 3
a)	
b)	
Q2. Long answer question.	Based on chapter 2
OR	OR
Short Notes on:	Based on chapter 2
a)	
b)	
Q3. Long answer question.	Based on chapter 4 & 5
OR	OR
Short Notes on:	Based on chapter 4 & 5
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Short Question (Answer in One Sentence):	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - F
BIOTECHNOLOGY – II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 & 2 OR Based on chapter 1 & 2
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 3 & 4 OR Based on chapter 3 & 4
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 5 & 6 OR Based on chapter 5 & 6
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Question (Answer in One Sentence): 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX – G
DAIRY SCIENCE - II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 & 2 OR Based on chapter 1 & 2
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 3 & 4 OR Based on chapter 3& 4
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 5 to 7 OR Based on chapter 5 to 7
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Question (Answer in One Sentence): 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX – H
POULTRY SCIENCE-II (Elective Paper)

Time: 02:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 OR Based on chapter 1
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 2 & 5 OR Based on chapter 2 & 5
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 3, 4 & 6 OR Based on chapter 3, 4 & 6
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Short Question (Answer in One Sentence): 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

B.Sc. V + VI Semester
Course Code - ZOL- 503 + 603
PAPER: XVII + XXI
ECOLOGY + EVOLUTION (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of .....of water sample. (DO/ CO_2,/salinity/Chorinity) OR Estimation of primary productivity of pond water OR Estimation of .....of Soil sample. (Alkalinity / Chlorinity / Salinity)	**20**
Q.2	study of natural selection of E.coli against.....antibiotics OR Comment on successive stages of evolution of Horse/ man	**20**
Q.3	Calculate the population density of given sample using Quadrate method. OR Identify and comment on homologous organs and analogous organs. (Any two)	**10**
Q.4	Identify the given spots and comment on it. (Embryological evidence -01, Adaptive modification- 02, Animal associationship- 02)	**25**
Q.5	submission of permanent slides (At least five)	**10**
Q.6	Record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504+604
PAPER: XVIII – A + XXII – A
FISHERY SCIENCES-I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of .....from given water sample. (DO, Alkalinity, chlorinity, Hardness, etc.)	**15**
Q.2	Identify any four primary producers from given sample OR Dissection of .....fish to expose its pituitary gland.	**15**
Q.3	Collection and Identification of .....parasites from fish. OR Identify and comments on crafts and gars.	**15**
Q.4	Identify and comments on given Spots. (Major carp-03, brackish water-02, Marine water-03 culturable -02)	**30**
Q.5	submission of project report	**10**
Q.6	record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-50 4+ 604
PAPER: XVIII – B + XXII – B
ANIMAL CULTURE –I& II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Identify the types of bee hives and equipments used in apiculture. OR Identify and comments on bee hive.	**15**
Q.2	Dissection of silkworm so as to expose its silk gland	**15**
Q.3	Mounting of supplied material and write procedure followed.	**10**
Q.4	Identification of given pests of silkworm and write their consequences.	**10**
Q.5	Identify the given spots and comments on it (Equipments in apiculture-02, silkworm stages-01, types of bee -02)	**25**
Q.6	submission of model	**10**
Q.7	record book	**10**
Q.8	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504 + 604
PAPER: XVIII – C + XXII – C
ENTAMOLOGY – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Dissection of ----------system of grasshopper. Leave the well labeled Diagram of the same.	**15**
Q.2	study of major crop pest	**15**
Q.3	Mounting / temporary preparation of supplied material	**10**
Q.4	Identify and describe (any five) (Stored grain pest-03, plant protection appliances-02)	**15**
Q.5	Identify and comment on given spots. (Insect specimen-03, human insect pest-02)	**20**
Q.6	submission of collected insect and agricultural and field report	**10**
Q.7	record book	**10**
Q.8	vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504 + 604
PAPER: XVIII – D + XXII – D
PARASITIC PROTOZOA & HELMINTHS – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	collect and identify .....protozoan from rectum of	**25**
	OR	
	Prepare the blood Smear and identify parasitic protozoa from it.	
Q.2	Dissect .....and identify ..... helminthes (Frog rectum /chick intestine).	**20**
	OR	
	Dissect the given fish and identify the Helminthes from it.	
Q.3	Identify the given helminthes larvae and comment on it.	**10**
Q.4	identify the given spots and comments on it	**30**
Q.5	record book	**10**
Q.6	vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL- 504 + 604
PAPER: XVIII – E + XXII – E
COMPUTER APPLICATION AND
LABOLATORY TECHNIQUES –I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Demonstrates any five DOS commands on computer and writes their syntax. OR Demonstrate and use of any two window commands	**20**
Q.2	Give WBC/ RBC count of given blood sample write the procedure OR Find out the constitute of given urine sample and write the procedure	**20**
Q.3	prepare the data sheet of given data on Excel sheet OR Search..... on internet and show to Examinar. (Keyword related to zoology like ecosystem, urine formation, gene etc)	**10**
Q.4	preparation of given solutions /fixative and write procedure followed for it. OR Preparation of block of given tissue for microtome	**10**
Q.5	Identify the given Spots and comments on it. (Computer hard-were - 03/ lab. Instruments -2)	**25**
Q.6	Record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504+604
PAPER: XVIII – F + XXII – F
BIOTECHNOLOGY – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of total DNA from .....tissue of ..... OR Isolation of messenger RNA from.....tissue of..... OR Isolation of total DNA from..... tissue of	**25**
Q.2	preparation of culture media for animal culture OR Sterilization of ..... for tissue culture and write procedure. (Chemical / glassware/ lab) OR Effect of pH on acid phosphatase activity and Record the observation	**25**
Q.3	writes principle and application of..... OR Assay of cell viability using.....dye. OR Observation of susceptibility/resistant of..... antibiotic to bacterial stain.	**20**
Q.4	study of chromosomal aberration	**15**
Q.5	Record book	**10**
Q.6	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504+604
PAPER: XVIII – G + XXII – G
DAIRY SCIENCES – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Insure the quality of given milk sample using.....methods (At least two methods) OR Determine the amount of fat in given milk sample.	25
Q.2	Prepare .....from milk	20
Q.3	Determine the .....of milk (any one) (Acidity, TS, SNF, MBR, SPC) OR Prepare ..... from milk.	10
Q.4	Identify and comments on following spots. (Milk products)	30
Q.5	Record book	10
Q.7	vivo-vice.	05

Skeleton of question paper
B.Sc. V+VI Semester
Course Code - ZOL-504 + 604
PAPER: XVIII – H + XXII – H
POULTRY SCIENCES –I & II (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Identify and comment of given poultry breed OR Identify and comment on .....system of poultry. Leave the well labeled diagram of it.	**20**
Q.2	Identify and comment on equipments in poultry farm.	**20**
Q.3	Identify the Stages of egg formation and comment on it. OR Explain the poultry house system.	**15**
Q.4	Identify the given spots and comment on it. (Food ingredients-05/disease causing agents-05)	30
Q.5	Record book	**10**
Q.6	vivo-vice	**05**

RECOMMENDED BOOKS

ECOLOGY

- Chapman – Ecology- Cambridge low prize Edition.
- Verma and Agarwal- Principles of ecology
- Koromondy, E.J. Concepts of ecology. Prentice Hall, New Delhi.
- Clarke, G.L. Elements of Ecology, John Wiley & Sons, New York.
- Odum, E.P. -Fundamentals of Ecology. W.B. Saunders, Philadelphia.
- Krebs, C.J. -Ecology. Harper & Row, New York.
- Jorgensen, S.E.- Fundamentals of Ecological modeling. Elsevier, New York.
- P.D. Sharma- Ecology and Environment
- Dutta –Fundamentals of Ecology

EVOLUTION

- Dobzhansky, Th. Genetics and origin of Species. Colombia University Press
- Dobzhansky, Th., F.J. Ayala. G.L. Stebbens and J.M. Valentine.
- Evolution, Surjeet Publication, Delhi.
- Futuyama, D.J. Evolutionary Biology. Sinauer Associates, INS
- Publishers, Sunderland
- Jha, A.P. Genes and Evolution, John Publication, New Delhi
- King, M. Species Evolution – the role of chromosomal change.
- The Cambridge University Press, Cambridge.
- Merrel, D.J. Evolution and genetics. Oxford University Press, New
- York
- Strikberger, M.W. Evolution. Jones and Bartett Publishers,
- Boston, London.
- Moody –An introduction to evolution
- Lull organic evolution
- P.K.Gupta- Ecology, genetics and Evolution
- Savage- Evolution
- Tomer and Singh – organic evolution, Rastogi Publication, merrut

FISHERY SCIENCES-I AND II

- Fish and fisheries of India – V.G Jhingran, Hindustan pub. Cor.india.
- Tropica fish farming- D.K.Belsare, Environmental publication, karad.
- Aquaculture – J.E.Bardach, J.H. Ryther,W.O. McLarney, Wiley Inter science A science of John Wiley and sons INC, New York.
- Text book of Fish Culture – Breeding and Cultivation of Fish- Marcel Huet, Fishing News books ltd. Farhman, Survey, England.

- Fish Farming Hand Book- E.E. Brown and J.B. graatzzek. VI Pub.
- Freshwater fish pond culture and management – M. Chakroff Scientific Publisher Jodhpur.
- A text book of aquaculture-M.S. Reddy, Discovery publication house New Delhi.
- Encyclopedia of Fishes and Fisheries in India –A.K. Pandey, G.S. Sandu.Vol.IV Anmol publication ,New Delhi
- Freshwater Aquaculture- R.K.Rathi, Scientific Publisher Jodhpur.
- A Hand Book of fish farming- S.C. Agarwal, Narendra publication house, New Delhi.
- Methods of physico chemical analysis of water- Gottermanet.al.
- Induced breeding of carps – H. Choudhary and S.B.Singh.
- An introduction to fishes- S.S.Khana, central book depot. Allahabad.
- Manual of Methods in Fish Biology- S.P. Biswas, South Asian Publ. new, Delhi.
- Diseases of fish- Van Duiten Jr. Jitte book Landan.

ANIMAL CULTURE [APICULTURE]

- Beekeeping in India – klhadi and village industries board gov. of maharastra
- Techniques of bee keeping- CBR and training institute, pune.
- Invertebrate zoology –kotpal
- Anatomy of honeybee- syodross.R.E.

ANIMAL CULTURE [SERICULTURE]

- Hand book of practical sericulture-Narshiihannu and Ullal
- Agro cottage industry – sericulture – C.J.Hiware.
- Tropical sericulture – tazima
- Sericulture manuals- 1st to 4th FAO publication.
- Bulletins of CSR and IT, Mysore

BIOTECHNOLOGY I&II

- Primrose, S. B. and Twyman, R. M., -Principles of Gene Manipulation and Genomics, (7th Ed. 2006), Blackwell Publishing, West Sussex, UK
- Bernard R. and Jack- Molecular Biotechnology: Principles and application of recombinant DNA, ASM Press, Herndon, USA
- R.C.Dubey & Maheshori - Biotechnology,S.Chand Publication
- B.D.Singh- Biotechnology-Himalaya publication
- Verma &Agarwal -Genetic engineering-S.Chand Publication
- Click Molecular Biotechnology
- Mayer R.A.-Molecular biology and Biotechnology
- satyanarayana-biotechnology.-

DAIRY TECHNOLOGY I&II

- S.K.De – outline of Dairy technology
- R.P. Aneja And et.al-Indian milk products,
- P.R.Gupta – Dairy Indian yearbook.(2007)

Dr. S. S. Shinde.
B.O.S. Chairman
Zoology

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/NP/B.Sc.-Ist Yr./SEM.-I & II/157/2013

It is hereby notified for information of all concerned that, on the recommendations of the Boards of Studies, Ad-hoc Boards, and Faculty of Science, the **Academic Council at its meeting held on 25-03-2013** has accepted the **following revised syllabi for B.Sc. First Year progressively under the Faculty of Science** :-

Sr. No.	*Revised Syllabus*	
[1]	*B.Sc. [Physics]*	*Semester- I & II,*
[2]	*B.Sc. [Dairy Science & Technology]*	*Semester- I & II,*
[3]	*B.Sc. [Industrial Chemistry]*	*Semester- I & II,*
[4]	*B.Sc. [Geology]*	*Semester- I & II,*
[5]	*B.Sc. [Chemistry]*	*Semester- I & II,*
[6]	*B.Sc. [Botany]*	*Semester- I & II,*
[7]	*B.Sc. [Electronics] Science*	*Semester- I & II,*
[8]	*B.Sc. [Fisheries]*	*Semester- I & II,*
[9]	*B.Sc. [Microbiology]*	*Semester- I & II,*
[10]	*B.A. [Statistics]*	*Semester- I & II,*
[11]	*B.Sc. [Statistics]*	*Semester- I & II,*
[12]	*B.Sc. [Zoology]*	*Semester- I & II,*
[13]	*B.Sc. [Textile and Interior Decoration]*	*Semester- I & II,*
[14]	*B.Sc. [Home Science]*	*Semester- I & II,*
[15]	*B.A. / B.Sc. [Mathematics]*	*Semester- I & II.*

This is effective from the **Academic Year 2013-2014** and onwards.

These **syllabi are available on the University Website www.bamu.net**

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/NP/B.Sc.-IST YEAR/
Sem-I & II/2013/5132-541
A.C.S.A.I.No.327[9].

Date:- 08-05-2013.

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Director,
Board of College and
University Development.

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Copy forwarded with compliments to :-

1] **The Principals, affiliated concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above all syllabi on University Website [www.bamu.net].**

Copy to :-

1] The Controller of Examinations,

2] The Superintendent, [B.Sc. Unit],

3] The Superintendent, [B.A. Unit],

4] The Superintendent, [Eligibility Unit],

5] The Programmer [Computer Unit-1] Examinations,

6] The Programmer [Computer Unit-2] Examinations,

7] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,

8] The Public Relation Officer,

9] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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S/-080513/-*

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

REVISED SYLLABUS

OF

B.Sc. (Chemistry)
FIRST YEAR
SEMESTER SYSTEM

FIRST & SECOND SEMESTER

[Effective from - June, 2013-14 onwards]

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGBAD

B.Sc. (Chemistry) IN SEMESTER PATTERN FOR THREE YEAR DEGREE

YEAR	SEMESTER	PAPER NUMBER	PAPER TITLE	Hours	MARKS
First	I	Paper - I	Inorganic Chemistry	45	50
		Paper - II	Organic Chemistry	45	50
		Paper - III	Lab Course I	45	50
	II	Paper – IV	Physical Chemistry	45	50
		Paper – V	Inorganic Chemistry	45	50
		Paper – VI	Lab. Course – II	45	50
Second	III	Paper – VII	Organic Chemistry	3	50
		Paper – VIII	Physical Chemistry	3	50
		Paper - IX	Lab. Course-III	3	100
	IV	Paper – X	Inorganic Chemistry	3	50
		Paper – XI	Physical Chemistry	3	50
		Paper – XII	Lab. Course-IV	3	100
Third	V	Paper - XIII	Physical Chemistry	3	50
		Paper – XIV	Organic Chemistry	3	50
		Paper – XV	Lab. Course-V	3	100
	VI	Paper – XVI	Inorganic Chemistry	3	50
		Paper – XVII	Organic Chemistry	3	50
		Paper – XVIII	Lab. Course-VI	3	100

	Note : For Theory Paper 1 Credit = 15 Periods and for practicals paper 1 Credit = 30 periods

B.Sc. Chemistry
(Three Year Degree Course)

First Year		**First Semester**
Paper I	**Inorganic Chemistry**	**(45 Hrs)** **3 Hrs. / Week**
I	Atomic Structure	**15 Hrs.**
II	Periodic Properties	**10 Hrs.**
III	S - Block Elements	**10 Hrs.**
IV	P - Block Elements	**10 Hrs.**
Paper II	**Organic Chemistry**	**(45 Hrs)** **3 Hrs / Week**
I	Structure and Bonding	**06 Hrs.**
II	Mechanism of Organic reactions	**10 Hrs.**
III	Stereo - Chemistry	**10 Hrs.**
IV	Alkanes	**04 Hrs.**
V	Alkenes	**06 Hrs.**
VI	Arenes and Aromaticity	**05 Hrs.**
VII	Alkyl and Aryl Halides	**04 Hrs.**
Paper III	**Lab Course I**	**(45 Hrs.)** **3 Hrs / Week**

First Year		**Second Semester**
Paper-IV	**Physical Chemistry**	**(45 Hrs)** **3 Hrs. / Week**
I	Mathematical Concepts	**06 Hrs.**
II	Gaseous State	**08 Hrs.**
III	Liquid State	**06 Hrs.**
IV	Solid State	**07 Hrs.**
V	Colloidal State	**08 Hrs.**
VI	Chemical Kinetics and Catalysis	**10 Hrs.**
Paper-V	**Inorganic Chemistry**	**(45 Hrs)** **3 Hrs / Week**
I	Chemistry of Noble gases	**05 Hrs.**
II	Chemical Bonding	**20 Hrs.**
III	Nuclear Chemistry	**10 Hrs.**
IV	Theory of volumetric analysis.	**10 Hrs.**
Paper-VI	**Lab Course-II**	**(45 Hrs.)** **3 Hrs / Week**

First Semester

Paper I **Inorganic Chemistry** **(45 Hrs)**
3 Hrs. / Week

I **Atomic Structure:** **15 Hrs.**

Atomic orbital's, Quantum numbers, Heisenberg uncertainty principle, shapes of s, p, d orbital's. Aufbau and Pauli exclusion principles. Hund's multiplicity rule. Electronic configurations of the elements, Bohr's atomic model (Qualitative aspect only).

II **Periodic Properties:** **10 Hrs.**

Atomic and Ionic radii, Ionization Energy, Electron affinity and Electro negativity. Trends in periodic table and application in predicting and explaining the chemical behavior.

III **S-Block Elements:** **10 Hrs.**

Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their functions in biosystems.

IV **P - Block Elements:** **10 Hrs.**

Comparative Study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides oxides of groups 13-16. Interhalogen compounds and its types.

First Semester

Paper-II **Organic Chemistry** **(45 Hrs)**
3 Hrs. / Week

I. **Structure and Bonding:** **6 Hrs.**

Localized and delocalized chemical bond; charge transfer complexes, resonance, hyper conjugation, inductive effect, hydrogen bonding, conjugative effect, steric effect.

II **Mechanism of Organic Reactions:** **10 Hrs.**

Homolytic and heterolytic bond breaking. Types of reagents eletrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates - carbocations, carbanions, free radicals (with two examples each).

III **Stereochemistry of Organic Compounds :** **10 Hrs.**

- Concept of Isomerism - Types of isomerism
- Optical Isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds.
- Relative and absolute configuration, sequence rules, D and L and R and S systems of nomenclature.
- Geometric Isomerism - Determination of configuration of geometric isomers. E and Z system of nomenclature, geometric isomerism in oximes and alicylic compounds.

IV **Alkanes :** **04 Hrs.**

Methods of formation (Koble reaction, Corey - House reaction and decarboxylation of carboxylic acids)

Physical properties and Chemical reactions of alkanes

Chlorination, Nitration, Sulphonation, Catalytic oxidation.

V **Alkenes :** **6 Hrs.**

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration and oxidation with $KMnO_4$. Polymerization of alkenes with one example each.

VI **Arenes and Aromaticity:** **5 Hrs.**

Nomeclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain structure of benzene : molecular formula and Kekule structure.

Resonance Structure, MO Picture.

Aromaticity : The Huckel rule, aromatic ions

Aromatic electrophilic substitution: General Pattern of the mechanism (Nitration, halogenations and Sulphonation) and Friedel Crafts reaction.

VII **Alkyl and Aryl halides:** **4 Hrs.**

Polyhalogen Compounds: Chloroform, Carbon tetrachloride. Methods - formation of aryl halides, nuclear and side chain reaction.

First Semester

Paper-III Lab Course-I 45 Hrs. 3 Hrs / Week

I Volumetric Analysis : 10 Hrs.

- Preparation of 0.1N. NaOH solution and its standardization by given oxalic acid solution.
- Preparation of 0.1 N oxalic acid solution and its standardization by given $KMNO_4$ solution.

II Inorganic Qualitative Analysis : 15 Hrs.

- Identify two acid and two basic radical from the given binary mixture.

a] $CdSO_4 + NH_4Cl$ b] $BaCO_3 + Al_2 (NO_3)_3$

c] $ZnCO_3 + KBr$ d] $MnCO_3 + MgSO_4$

e] $NiSO_4 + MgCO_3$

III Physical Chemistry 20 Hrs.

- **Eudiometer : Determination of Equivalent weight of mg.**
  weight of mg.
- **Viscometer : To Determine Viscosity of given liquid (Water / Ethanol) by viscometer .**
- **Staglanometer: To determine surface tension of given liquid.**
- **Chemical Kinetics: *To study the effect of acid strength on the hydrolysis of an ester.**
  ***To determine the specific reaction rate of the hydrolysis methy1 / ethy1 acetate catalyzed by hydrogen ions at room temperature.**

Colorimeter :- Verification of Lambert-Beer's law using Spectrophotometer. [Colorimeter].

Second Semester

Paper-IV **Physical Chemistry** **(45 Hrs) 3 Hrs. / Week**

I **Mathematical Concepts :** **06 Hrs.**

Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like k^x e^x, x^n, sin x, log x; maxima and minima, partial differentiation.

II **Gaseous States:** **08 Hrs.**

Postulates of kinetic theory of gases, kinetic gas equation, Deduction of Gas Laws : Boyles Law, Charles Law, Grahams Law of diffusion, Avogadro's hypothesis, deviation from ideal behavior, van der Waals equation of state. Critical Phenomena : PV isotherms of real gases.

III **Chemicals Kinetics and Catalysis:** **10 Hrs.**

Chemical Kinetics and its scope, rate of reaction, factors influencing the rate of reaction - concentration, temperature, pressure, solvent, light, catalyst concentration dependence of rates. Derivation of rate law and characteristics of simple chemical reactions - zero order, first order, second order, Pseudo order, half life. Effect of temperature on rate of reaction. Arrhenius equation, concept of activation energy.

Catalysis : Definition, types, and characteristics of catalysis, homogeneous, heterogeneous catalysis - Enzyme catalysis and its application.

IV **Liquid State:** **6 Hrs.**

Intermolecular forces, structure of liquids (a qualitative description).

Differnce between solids, liquids and gases.

Liquid Crystals: Classification, structure of nematic and cholestric phases.

V **Solid State :** **7 Hrs**

Types of solids, Amorphous, crystalline and difference between them, Miller Indices.

Laws of crystallography - (i) Law of constancy of interfacial angels (ii)Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg equation.

VI **Colloidal State :** **8 Hrs**

- Definition of colloids, classification of colloids.
- Solids in liquids (sols) : properties - kinetic, optical and electrical; stability of colloids, protective action. Hardy - Schulze Law.
- Liquids in liquids (emulsions) : types of emulsions, preparation.
- Liquids in Solids (gels) : classification, preparation and properties, general applications of colloids.

Second Semester

Paper-V **Inorganic Chemistry - II** **45 Hrs**
3 Hrs. / Week

I **Chemistry of noble gases :** **5 Hrs.**

Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

II **Chemical Bonding:** **20 Hrs.**

(A) Covalent Bond - Valence theory and its limitations, directional characteristic of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, Valence shell electron pair repulsion (VSEPR) theory of NH_3, SF_4, CIF_3, ICI_2 and H_2O. MO theory, homonuclear (He, N_2 and O_2) and heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electro negativity difference.

(B) Ionic Bonds - Definitions, Factors affecting ionic bond formation.

(C) Hydrogen bonding, Van-der-Waals forces, Metallic bond and its free electron concept.

III **Nuclear Chemistry:** **10 Hrs.**

Definition; Atomic number, mass number, Isotopes, Isobars mass defect and Binding Energy, Packing fraction N/Z ratio, Radio activity, properties of α, β and γ, Artificial transmutation. Applications with respect to trans-uranic elements, carbon dating.

IV **Theory of volumetric Analysis:** **10 Hrs.**

Types of titrations, volumetric apparatus, calibration of pipette and burette. Indicators used in pH - titrations, oxidizing agents used in titrations.
Theory of Internal, External and self indicators for redox titration.

Second Semester

Paper-VI

Lab Course-II **45 Hrs**
(3 Hrs. / Week)

I **Organic Qualitative Analysis:** **30 Hrs.**

Nature / Functional group / Element / Derivative / Physical constant

* Benzoic acid, * salicylic acid, * β-naphthol, * p-nitroaniline,

* Naphthalene, * Acetanilide.

II **Organic Estimation:** **15 Hrs.**

- Phenol by Bromination
- Estimation of basicity, molecular weight of organic acid (oxalic/acetic acid)

First Semester / Second Semester
Question Paper Pattern for Practical

Lab. Course-I+II Time : 06 Hrs.
Paper-III+VI Max. Marks : 100.

Q.1.	a]	Inorganic Volumetric Analysis.	... 10 Marks
	b]	Inorganic Qualitative Analysis.	... 20 Marks
Q.2.	a]	Organic Qualitative Analysis	... 20 Marks
	b]	Organic Estimation.	... 10 Marks
Q.3.	a]	Eudiometer / Viscometer / Staglanometer	... 15 Marks
	b]	Kinetics (Hydrolysis) / Spectrophtometer (Colorimeter)	... 15 Marks
Q.4.		Record Book and Viva-Voce	... 10 Marks.

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या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, x¾Ö–ान विद्याशाखेने x¿Ö±ÚÖ¸ÃÖ केल्यानुसार **²ÖßB. ‹ÃÃÖßB. / ‹´Ö. ‹ÃÃÖßB. ¯ÖÆÖ´Ö ¾Ö x«¢ÖßµÖ ¾ÖÅÖÖ“µÖÖ ÃÖ–ÖÖx¸ŸÖ †³यासक्रमास आणि ²ÖßB. ‹ÃÃÖßB. ¯ÖÆÖ´Ö ¾ÖÅÖÖ“µÖÖ †³यासक्रमात किरकोळ ²दल करण्यास विद्यापरिषदेच्या वतीने ´ÖÖ. कुलगु¹ यांनी, Ÿµ֐ना प्राप्त असलेलµÖÖ विशेष अधिकार ´ÖÆÖ¸ÖÅ™ x¾Ö ªÖ¯ÖßšÖ अधिनियम-1994 कलम 14(7) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अ³यासक्रमाची प्रत या परिपत्रकासो²ात आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.**

[1]	B.Sc. Physics	Semester-III & IV,
✓ [2]	B.Sc. Chemistry	Semester-III & IV,
[3]	B.Sc. Botany	Semester-III & IV,
[4]	B.Sc. Zoology with minor changes	Semester-I & II,
[5]	B.Sc. Zoology	Semester-III & IV,
[6]	B.Sc. Fisheries	Semester-III & IV,
[7]	B.Sc. Electronics (Opt.)	Semester-III & IV,
[8]	B.A./B.Sc. Mathematics	Semester-III & IV,
[9]	B.Sc. Computer Science	Semester-I & II,
[10]	B.Sc. Information Technology	Semester-I & II,
[11]	B.C.A.	Semester-I & II,
[12]	B.Sc. Computer Science(Opt.)	Semester-I & II,
[13]	B.Sc. Information Technology(Opt.)	Semester-I & II,
[14]	B.Sc. Computer Application(Opt.)	Semester-I & II,
[15]	B.Sc. Computer Maintenance(Opt.)	Semester-I & II,
[16]	B.Sc. Biotechnology (Progressively)	Semester-I to VI,
[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

..2..

[31]	B.Sc. Geology	Semester-III & IV,
[32]	B.A. Statistics with minor changes	Semester-I & II,
[33]	B.A. Statistics	Semester-III & IV,
[34]	B.Sc. Statistics with minor changes	Semester-I & II,
[35]	B.Sc. Statistics	Semester-III & IV,
[36]	B.Sc. Industrial Chemistry	Semester-III & IV,
[37]	B.Sc. Horticultural	Semester-I & II,
[38]	B.Sc. Dry land Agriculture	Semester-I & II,
[39]	B.Sc. Microbiology	Semester-III & IV,
[40]	M.Sc. Computer Science	Semester-I to IV,
[41]	M.Sc. Information Technology	Semester-I to IV.

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) मा. परिक्षा नियंत्रक, परिक्षा विभाग,
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

-=**=-

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

REVISED SYLLABUS

OF

B.Sc. Chemistry
SECOND YEAR
[Optional]

Third & Fourth Semester

[Effective for - June, 2014-15]

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGBAD

B.Sc. (Chemistry) IN SEMESTER PATTERN FOR THREE YEAR DEGREE

YEAR	SEMESTER	PAPER NUMBER	PAPER TITLE	Hours	MARKS
First	I	Paper - I	Inorganic Chemistry	45	50
		Paper - II	Organic Chemistry	45	50
		Paper - III	Lab Course I	45	50
	II	Paper – IV	Physical Chemistry	45	50
		Paper – V	Inorganic Chemistry	45	50
		Paper – VI	Lab. Course – II	45	50
Second	III	Paper – VII	Organic Chemistry	45	50
		Paper – VIII	Physical Chemistry	45	50
		Paper - IX	Lab. Course-III	90	100
	IV	Paper – X	Inorganic Chemistry	45	50
		Paper – XI	Physical Chemistry	45	50
		Paper – XII	Lab. Course-IV	90	100
Third	V	Paper - XIII	Physical Chemistry	45	50
		Paper – XIV	Organic Chemistry	45	50
		Paper – XV	Lab. Course-V	90	100
	VI	Paper – XVI	Inorganic Chemistry	45	50
		Paper – XVII	Organic Chemistry	45	50
		Paper – XVIII	Lab. Course-VI	90	100

B.Sc. Chemistry

(Three Year Degree Course)

First Year		**First Semester**
Paper I	**Inorganic Chemistry**	**(45 Hrs)** **3 Hrs. / Week**
I	Atomic Structure	**15 Hrs.**
II	Periodic Properties	**10 Hrs.**
III	S - Block Elements	**10 Hrs.**
IV	P - Block Elements	**10 Hrs.**
Paper II	**Organic Chemistry**	**(45 Hrs)** **3 Hrs / Week**
I	Structure and Bonding	**06 Hrs.**
II	Mechanism of Organic reactions	**10 Hrs.**
III	Stereo - Chemistry	**10 Hrs.**
IV	Alkanes	**04 Hrs.**
V	Alkenes	**06 Hrs.**
VI	Arenes and Aromaticity	**05 Hrs.**
VII	Alkyl and Aryl Halides	**04 Hrs.**
Paper III	**Lab Course I**	**(45 Hrs.)** **3 Hrs / Week**

B.Sc. Chemistry
(Three Year Degree Course)

First Year		**Second Semester**
Paper-IV	**Physical Chemistry**	**(45 Hrs)** **3 Hrs. / Week**
I	Mathematical Concepts	**06 Hrs.**
II	Gaseous State	**08 Hrs.**
III	Liquid State	**06 Hrs.**
IV	Solid State	**07 Hrs.**
V	Colloidal State	**08 Hrs.**
VI	Chemical Kinetics and Catalysis	**10 Hrs.**
Paper-V	**Inorganic Chemistry**	**(45 Hrs)** **3 Hrs / Week**
I	Chemistry of Noble gases	**05 Hrs.**
II	Chemical Bonding	**20 Hrs.**
III	Nuclear Chemistry	**10 Hrs.**
IV	Theory of volumetric analysis.	**10 Hrs.**
Paper-VI	**Lab Course-II**	**(45 Hrs.)** **3 Hrs / Week**

B.Sc. Chemistry
(Three Year Degree Course)

Second Year (Third Semester)

Paper VII	**Organic Chemistry**	**Third Semester** (**45 hrs**) **3Hrs / Week**
1	Alcohols	06 Hrs
2	Phenols	06 Hrs
3	Aldehydes and Ketones	10 Hrs
4	Carboxylic Acids	09 Hrs
5	Organic Compounds' of Nitrogen	14 Hrs
Paper VIII	**Physical Chemistry**	**(45 hrs) 3Hrs / Week**
1	Thermodynamics-I	15 Hrs
2	Thermodynamics-II	20 Hrs
3	Chemical Equilibrium	10 Hrs
Paper IX	**Lab Course III (Physical / Inorganic)**	**90 Hrs**

Second Year (Fourth Semester)

Paper X	**Inorganic Chemistry**	**Fourth Semester**
		(45 hrs)
		3Hrs / Week
1	Chemistry of Elements of First Transition series	10 Hrs
2	Coordination compounds	10 Hrs
3	Chemistry of Lanthanides	06 Hrs
4	Chemistry of Actinides	05 Hrs
5	Acids and Bases	06 Hrs
6	Non Aqueous solutions	08 Hrs

Paper XI	**Physical Chemistry- II**	**(45 hrs)**
		3Hrs / Week
1	Phase Equilibrium	15 Hrs
2	Electro-Chemistry-I	15 Hrs
3	Electro-Chemistry-II	15 Hrs

Paper XII	**Lab Course IV (Physical / Organic)**	**90 Hrs**

B.Sc. (Second Year)
(Third Semester)

Organic Chemistry Paper VII 45 Hrs

1) Alcohols: 06 Hrs.

Definition: *Monohydric Alcohols:* Methods of Formation by reduction of Aldehydes, Ketones, Carboxylic Acids and Esters (one e.g. each) Acidic Nature, Reactions of Alcohols.

Dihydric Alcohols: Method of Formation of Ethylene Glycol-industrial method and From Alkenes using Oso_4, Chemical Reactions of Ethylene Glycol-nitration, Acylation, Oxidation (Using Pb (OAc)4 without Mechanism Pinacol-Pinacolone rearrangement, *Trithydric Alcohols:* Preparation of Glycerol from propane, Reactions of Glycerol.

2) Phenols: 06 Hrs.

Preparation of Phenol from Cholorobenzene, Cumene and Benzene Sulphonic Acid, Physical properties, Acidic Nature of Phenol, Resonance stabilization of Phenoxide Ion. Reactions of Phenols-Electrophilic Aromatics Substitution, Acylation, Carboxylation (Without Mechanism) Reactions with Mechanism-intermolecular Fries Rearrangement, Claisen Rearrangement, Gattermann Synthesis and reamer Tiemann Reaction.

3) Aldehydes and Ketones: 10 Hrs.

Aldehydes: Preparation of Aldehydes from Acid Chloride, Gattermann-Koch Synthesis *Ketones*-Preparation from Nitriles and from Carboxylic Acid, Physical Properties of Aldehydes and Ketones. Mechanism of Nucleophilic Additions to Carbonyl Group with particular emphasis on Benzoin, Aldol Knoenenagel condensations, Mannich Reactions. Use of Acetals as Protecting Group. Oxidation of Aldehydes using Chromium Trioxide, Baeyer-Villeger Oxidation of Ketones.

4) Carboxylic Acids: 09 Hrs.

Acidity of Carboxylic Acids, Effects of substituent's of substituents on Acid strength, preparation of Acetic Acid from Co2 from Nitriles, from Acid Chloride, Anhydride, Ester and Amide. Physical Properties and reactions of Carboxylic Acids-Synthesis of Acid Chloride, Ester and Amide, Hell-Volhard-Zelinsky Reaction. Reduction using LiAIH4, Mechanism of Decarboxylation, hydroxyl Acids-Malic, Tartaric and Citric Acid. Methods of Formation and Chemical reactions of Acrylic Acid.

5) Organic Compounds of Nitrogen: **14 Hrs.**

Preparation of *Nitroalkanes.* Nitration of Benzene and Their Reduction in Acidic, Neutral and Basic Media.

Amines-Basicity of Amines, Amine Salt as PTC. Preparation of Alkyl and Aryl Amines (Reduction of Nitro Compounds', Nitriles) Reductive Amination, Hoffmann Bromamide Reactions. Reactions of Amines-Electrophilic Aromatic Substitution in *Aryl amines,* Reactions of Amines with Nitrous Acid.

B.Sc. (Second Year)
(Third Semester)

Physical Chemistry Paper VIII 45 Hrs (3 Hrs/week)

1) Thermodynamics: I 15 Hrs.

Definition: *of Thermodynamic Terms:* System, Surrounding types of system, intensive and extensive properties. Thermodynamic Process, Concept of heat and work. Work done in reversible and irreversible process, concept of maximum work (W_{max}), Numerical Problems.

First law of Thermodynamics: Statement, Definition of Internal energy and Enthalpy.

Heat capacity, heat capacities at constant volume pressure and their relationship. Calculation of W,q, du and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Numerical problems, Hess's law of heat Summation and its application.

2) Thermodynamic-II: 20 Hrs.

Second Law of Thermodynamics: Need for the law, different statement of the law Carnot Cycle and its efficiency, Numerical Problems. Carnot Theorem.

Concept of Entropy: Definition, Physical significance, Entropy as a State Function, Entropy change in Physical change, Entropy as criteria of Spontaneity & Equilibrium Entropy Change in Ideal Gases. Gibbs and Helmholtz Functions: Gibbs Function (G) and Helmoltz Function (A) as Thermodynamic Quantities. A and G as criteria for Thermodynamic Equilibrium and Spontaneity, their Advantage over Entropy change. Variation A with P, V and T.

3) Chemical Equilibrium: 10 Hrs.

Equilibrium Constant and Free Energy. Thermodynamic Derivation of Law of Mass Action. Le Chatelier's Principle. Reaction Isotherm and Reaction Isochore. Clapeyron Equation, Clausius-Clapeyron Equation and its Application.

B.Sc. (Second Year)

(Third Semester)

Lab Course-III

Paper IX **90 Hrs (6 Hrs/week)**

Section A (Physical Chemistry)

Non Instrumental (Any Five)

i.	To determine critical solution temperature of Phenol- water system.
ii.	To determine solubility of benzoic acid at different Temperature and determine H of dissolution process.
iii.	To determine heat of neutralization (△ Hn) of Na OH and HCl
iv.	To determine heat of neutralization (△ Hn) of Na OH and Acetic acid.
v.	Partition coefficient of Benzene-water system using benzoic acid.
vi.	To determine the equilibrium constant for the reaction: KI + I_2 --- > KI_3.
vii.	Determine the molecular mass of polymer from viscometry measurements.
viii.	To investigate the Kinetics of iodination of Acetone.

Section B (Inorganic Chemistry)

Gravimetric Estimation: (Any Three)

i.	Estimation of Zinc gravimetrically as Zinc ammonium phosphate ($ZnNH_4PO_4$)
ii.	Estimation of Mn gravimetrically as Manganese Ammonium Phosphate ($MnNH_4PO_4$)
iii.	Estimation of Nickel gravimetrically as Ni-DMG
iv.	Estimation of Barium gravimetrically as Ba-Chromate ($BaCrO_4$)
v.	Estimation of Aluminum as Aluminum Oxinate.
vi.	To determine the equilibrium constant for the reaction: KI + I_2-KI_3
vii.	Determine the molecular mass of polymer from viscometry measurements.
viii.	To investigate the Kinetics of Iodination of acetone.

Complexometric Titration: (Any Two)

i.	Estimation of Zinc by EDTA solution using EBT indicator.
ii.	Estimation of Nickel by EDTA using Murexide indicator
iii.	Estimation of copper by EDTA using fast sulphon black F indication
iv.	Estimation of Lead By EDTA using Xylenol Orange indicator.

B.Sc. (Second Year)
(Fourth Semester)

(Inorganic Chemistry) Paper X 45 Hrs (3 Hrs/week)

1) Chemistry of Elements of First Transition Series: 10 Hrs.

General Characteristic features of d-block elements. Properties of the elements of the first transition series: Ionic Size, Atomic Size, Metallic properties, Ionization potential, magnetic properties, Oxidation State.

2) Co-ordination Compounds: 10 Hrs

Werner's Co-ordination Theory and its experimental verification effective atomic Number concept, chelates, nomenclature of co-ordination compounds, isomerism in co-ordination compounds, valence bond theory of transition metal complexes.

3) Chemistry of Lanthanide Elements: 06 Hrs.

Occurrence and Isolation of Lanthanides,Electronic Configuration Oxidation states, Ionic Radii, Lanthanide Contraction and its Consequences.

4) Chemistry of Actinides: 05 Hrs.

Occurrence, Position in the periodic table, Electronic configuration. Oxidation State, chemistry of separation of Np, Pu and Am from U

5) Acids and Bases: 06 Hrs.

Arrhenius, Bronsted-Lawry, The Lux-Flood, Solvent System and Lewis Concept of Acids and Bases

6) Non- Aqueous Solvents: 08 Hrs.

Physical Properties of a solvent, Types of Solvents and their general Characteristics, Reaction in Non-Aqueous Solvents with reference to liquid NH_3 and liquid SO_2.

B.Sc. (Second Year)
(Fourth Semester)

Physical Chemistry-II Paper XI 45 Hrs (3 Hrs/week)

1) Phase Equilibrium: 15 Hrs.

Statement and Meaning of the Terms*: Phase, Component,* Degree of Freedom, Derivation of Phase Rule Equation. Phase Equilibria of the One Component System: Water System. Phase Equilibria of Two Components System: Solid-Liquid Equilibria, Simple Eutectic Pb-Ag. System Desilverisation of Lead.

Solid Solutions: Compound Formation with congruent Melting Point (Mg-Zn) and Incongruent Melting Point ($FeCl_3$-H_2O) System. Freezing Mixture, Acetone-Dry Ice.

Liquid-Liquid Mixture: Raoult's Law and Henry's Law.

Ideal and Non-Ideal system. Azeotropes: HCl-H_2O and Ethanol-Water System.

Partially Miscible Liquids: Phenol-Water, Trimethyl Amine-Water, Nicotine-water System, Lower and Upper consulate Trimethyl Amine-Water, Nicotine-water system, Lower and Upper Consulate Temperature. Effect of Impurity on Consulate Temperature.

2) Electro Chemistry-I 15 Hrs.

Electrical Transport: Conduction in metals and in Electrolyte Solutions. Specific Conductance and equivalent conductance, measurement of equivalent conduction, variation of equivalent and specific conductance with dilution. Numerical problems. Kohlrausch's law and its application. Arrhenius Theory of Electrolyte Dissociation and its limitations. Weak and Strong Electrolytes, Ostwald's Dilution Law, its use and Limitations. Transport Number: Definition, Determination by Hittorfs Method and Moving Boundary Method. Conductometric Titration: Types and its advantages.

3) Electrochemistry-II **15 Hrs**

Types of Reversible Electrodes: Gas- Metal Ion, Metal-Metal Ion, Metal-Insoluble salt Anion and Redox Electrodes. Nernst Equation, Derivation of Cell, E.M.F. and single Electrode potential, Standard Hydrogen Electrode, Reference Electrodes, Standard Electrode Potential, Sign Conventions, Electro-Chemical Series and its significance. Electrolytic and Galvanic Cells, Reversible and Irreversible Cells, Conventional Representation of Electro Chemical Cells. E.M.F. of a cell and its measurement, Calculation of Thermodynamic Quantities of Cell Reactions (G, H and K)

Definition of pH, pKa-Determination of pH using SHE and Glass Electrode by Potentiometer method. Buffer-Acidic and Basic Buffers, Mechanism of Buffer Action, Henderson-Hasselbalch equation.

Corrosion: Dry (Atmospheric) Corrosion and Wet (Electro-Chemical) Corrosion Electrochemical Theory of Corrosion.

B.Sc. (Second Year)
(Fourth Semester)

Lab Course-IV Paper XII 90 Hrs (3 Hrs/week)

Section A: Physical Chemistry

Instrumentation: (Any Five)

i. To determine normality and strength of HCI using (0.1N) NaOH Solution Conductometrically.

ii. To determine normality and strength of acetic acid using (0.1N) NaOH solution Conductometrically.

iii. To determine normality and strength of HCI using (0.1N) NaOH solution by pH-metrically.

iv. To verify Lambert-Beers Law using $KMn0_4$ solution.

v. To estimate the amount of Sugar using Polarimeter.

vi. To determine refractive index of ethanol water system.

vii. To determine indicator constant of indicator colorimetrically.

Section B: Organic Chemistry

Organic Derivatives:- **Preparation, Crystallization and Physical Constant. (Any Three)**

i.	Acetyl Derivatives	:	a) Aniline	b) Salicylic Acid
ii.	Benzoyl Derivatives	:	a) Aniline	b) B-naphtol
iii.	Hydrolysis Derivatives	:	a) Ethyl Benzoate	b) Aspirin
iv.	Bromo-Derivatives	:	a) Phenol	b) Cinnamic Acid
v.	Reduction Derivatives	:	a) M-dinitrobenzene	
vi.	Osazone Derivatives	:	a) Sucrose	b) Glucose

Organic Estimations: (Any Two)

i. Estimation of nitro group by reduction.

ii. Estimation of glucose.

iii. Estimation of ester by hydrolysis.

iv. Estimation of amides by hydrolysis.

Pattern of Question Paper

B.Sc. Second Year

Lab Course-III Physical and Inorganic Chemistry.

Paper-IX

Time: 06.00 Hours **Max.Marks:100**

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Section A (Physical Chemistry) **50 marks**

Q.1 a. To determine critical solution temperature of phenol water system. **25 Marks**

Or

b) Determine the molecular mass of polymer from viscometer measurements.

Or

C) Partition coefficient of Benzene water system using benzene acid.

Or

d) To investigate the Kinetics of Iodination of Acetone.

Q.2.a. To determine solidity of benzene acid at different temperature and determine H of dissolution process **25 Marks**

Or

b) To determine Hn of NaOH and CH_3COOH.

Or

c) To determine Hn of NaOH and HCl.

Or

d) To determine the equilibrium constant for the reaction $KI+I_2$ -----→ KI_3.

Section B (Inorganic Chemistry)

Q.3 a. Estimation of Zn gravimetrically as Zn NH_4 PO_4 **20 Marks**

Or

b) Estimation of Mn gravimetrically as Mn NH_4 PO_4.

Or

C) Estimation of Barium gravimetrically as $BaCrO_4$.

Or

d) Estimation of Nicked gravimetrically as Ni-DMG.

Or

e) Estimation of Aluminium as Aluminium oxalate.

Q.4. a Estimation of Zinc by EDTA solution using EBT indicator. **20 Marks.**

Or

b. Estimation of Nickel by EDTA solution using Murexide indicator.

c. Estimation of Copper by EDTA Solution using test sulphon black F indicator.

Q.5 Record Book / Viva-Voce **10 Marks.**

Pattern of Question Paper

B.Sc. Second Year

Lab Course-IV Physical and organic Chemistry

Paper-XII

Time: 06.00 Hours **Max.Marks:100**

=--==--= =--= =--= =--= =--= =--= =--= =--= =--= =--= =--= =--=

Section A (Physical Chemistry) 50 marks

Q.1 a. To determine normality and strength of HCl using (0.1N) NaOH solution Conductometrically. **25 Marks**

Or

b) To determine normality and strength of CH_3COOH using (0.1N) NaOH solution Conductometrically.

Or

C) To determine Refractive Index of Ethanol-water system.

Or

d) To estimate the amount of sugar using Polarimeter.

Q.2.a. To determine normally and strength of HC1 using (0.1N) NaOH solution by pH-metrically. **25 Marks**

Or

b) To Verify Lambert-Beers Law using $KMnO_4$ solution.

Or

c) To determine Indicator constant of Indicator colorimetric ally.

Section B (Organic Chemistry) 40 Marks.

Q.3 a. Estimation of Nitro group by reduction. Zn gravimetrically as Zn NH_4PO_4 **25 Marks**

Or

b) Estimation of glucose Mn gravimetrically as Mn NH_4PO_4.

Or

C) Estimation of Ester by hydrolysis.

Or

d) Estimation of amide by hydrolysis.

Q.4. a Preparation of (organic derivative) **15 Marks.**
Its crystallization and physical constant of the prepared derivative.

Q.5. Record Book / Viva-Voce 10 Marks

-=**=-

S*/-090414/-
S*/-020514/-

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./विज्ञान/अभ्यासक्रम/७४/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, विज्ञान विद्याशाखेने शिफारस केल्यानुसार बी. एस्सी. / एम. एस्सी. प्रथम व द्वितीय वर्षाच्या सुधारित अभ्यासक्रमास आणि बी. एस्सी. प्रथम वर्षाच्या अभ्यासक्रमात किरकोळ बदल करण्यास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेल्या विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

[1]	B.Sc. Physics	Semester-III & IV,
[2]	B.Sc. Chemistry	Semester-III & IV,
[3]	B.Sc. Botany	Semester-III & IV,
[4]	B.Sc. Zoology with minor changes	Semester-I & II,
[5]	B.Sc. Zoology	Semester-III & IV,
[6]	B.Sc. Fisheries	Semester-III & IV,
[7]	B.Sc. Electronics (Opt.)	Semester-III & IV,
[8]	B.A./B.Sc. Mathematics	Semester-III & IV,
[9]	B.Sc. Computer Science	Semester-I & II,
[10]	B.Sc. Information Technology	Semester-I & II,
[11]	B.C.A.	Semester-I & II,
[12]	B.Sc. Computer Science(Opt.)	Semester-I & II,
[13]	B.Sc. Information Technology(Opt.)	Semester-I & II,
[14]	B.Sc. Computer Application(Opt.)	Semester-I & II,
[15]	B.Sc. Computer Maintenance(Opt.)	Semester-I & II,
[16]	B.Sc. Biotechnology (Progressively)	Semester-I to VI,
[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

..2..

[31]	**B.Sc. Geology**	**Semester-III & IV,**
[32]	**B.A. Statistics with minor changes**	**Semester-I & II,**
[33]	**B.A. Statistics**	**Semester-III & IV,**
[34]	**B.Sc. Statistics with minor changes**	**Semester-I & II,**
[35]	**B.Sc. Statistics**	**Semester-III & IV,**
[36]	**B.Sc. Industrial Chemistry**	**Semester-III & IV,**
[37]	**B.Sc. Horticultural**	**Semester-I & II,**
[38]	**B.Sc. Dry land Agriculture**	**Semester-I & II,**
[39]	**B.Sc. Microbiology**	**Semester-III & IV,**
[40]	**M.Sc. Computer Science**	**Semester-I to IV,**
[41]	**M.Sc. Information Technology**	**Semester-I to IV.**

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) **मा. परिक्षा नियंत्रक, परिक्षा विभाग,**
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. First Year

Zoology [Optional]

With minor Changes

First and Second Semester

Effective from 2014-2015

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. Zoology Pattern in Semester System

B. Sc. I Year Zoology

Semester	Course Code	Paper No.	Title of Paper	Marks
I	ZOL-101	Paper – I	Protozoa to Annelida	50
	ZOL-102	Paper – II	Cell Biology	50
	ZOL-103	Paper – III	Practical based upon Paper I & II	50
II	ZOL-201	Paper – IV	Arthropoda to Echinodermata And Protochordata	50
	ZOL-202	Paper – V	Genetics - I	50
	ZOL-203	Paper – VI	Practical based upon Paper IV & V	50

B. Sc. II Year Zoology

III	ZOL-301	Paper – VII	Vertebrate Zoology	50
	ZOL-302	Paper – VIII	Genetics- II	50
	ZOL-303	Paper – IX	Practical based upon Paper VII	50
	ZOL-304	Paper – X	Practical based upon Paper VIII	50
IV	ZOL-401	Paper – XI	Animal Physiology (Special Emphasis on Mammals)	50
	ZOL-402	Paper – XII	Biochemistry & Endocrinology	50
	ZOL-403	Paper – XIII	Practical based upon Paper XI	50
	ZOL-404	Paper – XIV	Practical based upon Paper XII	50

B. Sc. III Year Zoology

V	ZOL-501	Paper –XV	Ecology		50
	ZOL-502	Pape XVI (Elective)	A	Fishery sciences –I	50
			B	Animal culture –I	
			C	Entomology-I	
			D	Parasitic protozoa & helminthes-I	
			E	Computer Application & Laboratory Technology-I	
			F	Biotechnology-I	
			G	Dairy sciences -I	
			H	Poultry Sciences -I	
	ZOL-503	Paper XVII	Practical based upon Paper XV		50
	ZOL-504	Paper XVIII	Practical based upon Paper XVI		50
VI	ZOL-601	Paper XIX	Evolution		
	ZOL-602	Paper XX	A	Fishery sciences –II	50
			B	Animal culture –II	
			C	Entomology-II	
			D	Parasitic protozoa & helminthes-II	
			E	Computer Application & Laboratory Technology-II	
			F	Biotechnology-II	
			G	Dairy sciences -II	
			H	Poultry Sciences -II	
	ZOL-603	Paper XXI	Practical based upon Paper XIX		50
	ZOL-604	Paper XXII	Practical based upon Paper XX		50

B. Sc. First Semester

Course Code - ZOL- 101

Zoology Paper: I

PROTOZOA TO ANNELIDA

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1. Introduction to animal kingdom **03**
   Definition of Zoology, Outline classification
   Protozoa, Parazoa, Metazoa and Major Phyla.

2. Protozoa : - General characters **09**
   Plasmodium vivax: - Structure of sporozoite, Life cycle;
   pathogenecity, Control, Prevention and Treatment of Malaria.
   Entamoeba histolytica: Structure, Life cycle and Control.
   Euglena: Morphology and Reproduction.
   Paramicium: Morphology and Reproduction

3. Porifera : - General characters **08**
   Sycon (Scypha): - Morphology, Different types of cells in sycon,
   canal system in Porifera.

4. Coelenterata: - General characters **06**
   Obelia: - Morphology of Obelia colony,
   Development of Hydra,
   Polymorphism in coelenterates.

5. Helminths: - General characters **12**
   Fasciola hepatica: - Structure, Life cycle, Pathogenecity & Control Measures
   Taenia solium: - Structure of scolex, Mature and gravid proglottids, Life cycle,
   pathogenecity, and control measures.
   Ascaris lumbricoides: - Structure of male & female, Life cycle,
   Pathogenecity & control measures.

6. Annelida: - General characters **07**
   Leech: - Morphology, Digestive, Excretory & Reproductive systems.

Total Periods: - **45**

B. Sc. First Semester

Course Code - ZOL- 102

Zoology Paper: II

CELL BIOLOGY

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1. General structure of cell. **12**
   - Structure of prokaryotic cell.
   - Ultra structure of eukaryotic cell.
   - Cell Cycle, Mitosis, Meiosis

2. Organization of cell **20**

   A) Study of Various cell organelles
   - Plasma Membrane: - Structure, unit membrane theory and function.
   - Endoplasmic reticulum: - Structure and function.
   - Golgi Bodies: - Structure and function
   - Mitochondria: - Morphology, Ultra-Structure, function and biogenesis.
   - Nucleus: - Structure and function.
   - DNA Structure.
   - Types of RNA
   - Lysosome: - Structure, function and polymorphism
   - Ribosome: - Structure and function

   B) Cytology of Cancer, Types of Cancer.

3. Methods in Cell Biology (in brief) **13**

   A) Light Microscope
   - Phase contrast microscope
   - Electron microscope

   B) Micro techniques, (Microtomy) Fixation & Staining.

Total Periods: - 45

Recommended books
Protozoa to Annelida

- Kotpal, R.L. Modern Text Book of Zoology Invertebrates, Rastogi Publication, Meerut.
- Parker & Hashwell, Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors. New Delhi.
- E.L. JORDEN & P.S. VERMA, Invertebrate Zoology, S. Chand & Co. Ltd. New Delhi.
- Hickman C. P. Jr., Hickman & L.S. Roberts. Integrated principles of zoology, Mosby college publication. St. Louis.
- Ayur, E.K., And T.N. Ananthakrishnan, Manual of zoology Vol. I, Invertebrata, Part I and II S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
- Balinsky, an Introduction to Embryology (CBS College Publishers).
- Grant- Biology of Development Systems (Holt. Reihart, Winston).
- Dr. S.S. Lal Practical Zoology Invertebrates 9th edition Rastogi Publications Meerut.

Cell biology

- Albert B. et.al - Molecular Biology of the cell (Sinauer)
- Lodish. H. et al – Molecular Cell Biology.
- Gupta P.K. Cell and Molecular Biology Rastogi Publication Meerut.
- Dr. S.P. Singh, Dr. B.S. Tomar, Cell Biology 9th revised edition Rastogi Publication Meerut.
- Gerald Karp Cell and Molecular biology- Concepts and Experiments. John Wiley, 2007.

B. Sc. First Semester

Course Code - ZOL- 103

Zoology Paper: III

PROTOZOA TO ANNELIDA & CELL BIOLOGY (PRACTICAL)

1.	Study of slides from Ciliates, Opalinates, and Flagellates(any five)	**01**
2.	Study of museum specimen and slides from Porifera to Annelida. (Three from each phyla)	**02**
3.	Dissection: Dissection of Leech for Digestive, Excretory & Reproductive systems. Dissection of Earthworm for Nervous System & Reproductive system	**05**
4.	Mounting of any five of the following. Sponge spicules, Gemmule, Obelia colony, Jaws of Leech. Spermatica, testes nerve ring of Earthworm, Parapodia of Nereis.	**01**
5.	Study of cell organelles by using Models, Charts, Slides & Electron micrographs.	**01**
6.	Squash preparation of Onion root tip to study Mitosis.	**01**
7.	Preparation of polytene chromosome in chironomous larva/fruit flies.	**01**
8.	Microtechnique: - Fixation, dehydration, Block preparation, Microtomy and Staining of Vertebrate tissue.	**02**
9.	Study of Microscopy: - Simple, Compound, & Phase Contrast Microscope	**01**
	Total Practical Periods: -	**15**

Pattern of Question Paper

B. Sc. First Semester

Course Code – ZOL- 101

Zoology Paper: I

PROTOZOA TO ANNELIDA

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1& 2
	OR	OR
	Short Notes on:	Based on chapter 1 & 2
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 3 & 4
	OR	OR
	Short Notes on:	Based on chapter 3 & 4
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 5&6
	OR	OR
	Short Notes on:	Based on chapter 5&6
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper

B. Sc. First Semester

Course Code – ZOL- 102

Zoology Paper: II

CELL BIOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1
	OR	OR
	Short Notes on:	Based on chapter 1
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 2
	OR	OR
	Short Notes on:	Based on chapter 2
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 3
	OR	OR
	Short Notes on:	Based on chapter 3
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

B. Sc. Second Semester

Course Code – ZOL- 201

Zoology Paper: IV

ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA

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1. Arthropoda: - General characters **15**
   Prawn: - Structure, Digestive, Nervous, & Reproductive systems.
   Cockroach: External Characters, Digestive, Respiratory and Reproductive systems.

2. Mollusca: - General characters **06**
   Pila: - External Characters, Respiratory, Circulatory, Nervous and Reproductive systems

3. Echinodermata: - General characters **10**
   Asterias (Sea Star): - Morphology of oral & aboral view, Water vascular system, Reproductive system including development.

4. General characters and Classification of Protochordata **14**
   Amphioxus: - External features, Digestive, Circulatory, Reproductive systems including development.
   Hemichordata: - General characters and affinities
   Herdmania: - General characters and morphology

Total Periods: - 45

B. Sc. Second Semester

Course Code – ZOL- 202

Zoology Paper: V

GENETICS – I

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1. Elements of heredity & variation Definition of genetics and variation Mendel's laws of heredity in short	**04**
2. Gene interaction Definition- modifications in Mendelian phenotypic ratio like, Epitasis Supplementary gene Complementary gene	**05**
3. Multiple Alleles Coat Colour in rabbit. ABO Blood group in man, Rh factor	**05**
4. Cytoplasmic inheritance. Definition of maternal effect. Coiling shell in snail (Limnea peregra) Male sterility. CO_2 sensitivity in Drosophila. Kappa particles in Paramecia.	**08**
5. Sex Determination Chromosome theory in sex determination Genic balance theory of sex determination Triploid intersexes and Gynandromorphs in Drosophila. Sex linked inheritance: X linked and Y linked	**08**
6. Mutation Brief introduction Gene mutation: - Definition and classification Chromosomal aberration (structural & numerical) Spontaneous & induced mutation	**15**
Total Periods: -	**45**

Recommended Books.
ARTHROPODA TO ECHINODERMATA &PROTOCHORDATA

- Kotpal, R.L. Modern Text Book of Zoology Invertebrates, Rastogi Publication, Meerut.
- Parker & Hashwell, Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors. New Delhi.
- E.L. JORDEN & P.S. VERMA, Invertebrate Zoology, S. Chand & Co. Ltd. New Delhi.
- Hickman C. P. Jr., Hickman & L.S. Roberts. Integrated principles of zoology, Mosby college publication. St. Louis.
- Ayur, E.K., And T.N. Ananthakrishnan, Manual of zoology Vol. I, Invertebrata,
- Part I and II S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
- Balinsky, An Introduction to Embryology (CBS College Publishers).
- Grant- Biology of Development Systems (Holt. Reihart, Winston).
- Dr. S.S. Lal Practical Zoology Invertebrates 9th edition Rastogi Publications Meerut.

GENETICS - I

- P.K. Gupta, Genetics- Rastogi Publications Meerut.
- P.K. Gupta, Genetics Classical to Modern- Rastogi Publications Merrut.
- Verma P.S. and V.K. Agarwal, Genetics, S.Chand and Publication.
- Levin O.D. and Lewin R. Biology of Gene McGraw Hill Troppan Co.Ltd.
- Gunther S. Stent. Molecular Genetics McMillan Publication Co.Inc.
- Goodenough V. Genetics New York, Holt Rinchart and Winston.
- Winchester, Genetics Oxford HBH Publication.
- Strikberger, Genetics McMillan Publication
- Sinnott Dunn and Dobzansky- Principles of Genetics

B. Sc. Second Semester

Course Code – ZOL- 203

Zoology Paper: VI

ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA & GENETICS – I (PRACTICAL)

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1. Study of museum specimen & slides of relevant Invertebrates & Protochordata. (At least 3 from each phyla)	**03**
2. Dissections: Dissection of Prawn for Nervous system Dissection of Cockroach for Digestive and Nervous Systems. Dissection of Pila for Nervous system. Dissection of Sea Star for Water Vascular System.	**05**
3. Mounting of any five of the following. Mouthparts of Cockroach, Mosquito, House fly, Bed bug and Honeybee. Salivary glands of cockroach. Redula of Pila, Pedicillaria of Star fish.	**01**
4. Culture of Drosophila- experimental organism in genetics Observation of common mutants of drosophila	**01**
5. Determination of human blood groups A, B, AB, and O, Rh factor.	**01**
6. Major and minor problems in genetics	**04**
Practical Periods: -	**15**

Pattern of Question Paper

B. Sc. Second Semester

Course Code – ZOL- 201

Zoology Paper: IV

ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1
	OR	OR
	Short Notes on:	Based on chapter 1
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 2 & 3
	OR	OR
	Short Notes on:	Based on chapter 2 & 3
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 4
	OR	OR
	Short Notes on:	Based on chapter 4
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper

B. Sc. Second Semester

Course Code – ZOL- 202

Zoology Paper: V

GENETICS - I

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question. OR Short Notes on: a) b)	Based on chapter 1 to 3 OR Based on chapter 1 to 3
Q.2.	Long answer question. OR Short Notes on: a) b)	Based on chapter 4 & 5 OR Based on chapter 4 & 5
Q.3.	Long answer question. OR Short Notes on: a) b)	Based on chapter 6 OR Based on chapter 6
Q.4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q.5.	Multiple choice questions: 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

Skeleton of question paper

B. Sc. I & II semester

Course Code - ZOL- 103 & 203

Zoology Paper: III + VI

PROTOZOA TO ECHINODERMATA

AND PROTOCHORDATA, CELL BIOLOGY AND GENETICS - I (PRACTICAL)

Time: - **4:00 hrs** **Total marks**:-**100**

Q.1.	Dissect the……so as to expose it's ……..system	**20**
Q.2.	Mounting of squash preparation of Onion root tip, identify the stage and give the reasons OR Mounting of Salivary glands from Chironomus larva / Fruit fly.	**10**
Q.3.	Mounting of the given material	**05**
Q.4.	Genetics – Major problem	**15**
Q.5.	Identify the given spots and comments on it (Protozoa to Echinodetrmata & Protochordata, cell organelles and common mutants)	**30**
Q.6.	Submission of permanent slides	**05**
Q.7.	Record book	**10**
Q.8.	Vivo-vice	**05**

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B. Sc. III Semester

Course Code - ZOL- 301

PAPER: VII

VERTEBRATE ZOOLOGY

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1. Agnatha:- Out line classification, general characters and affinities of Cyclostomata **02**

2. Pisces : - Out line classification and general characters. **08**
   Scoliodon: - External characters, Digestive system, Respiratory system, Blood Vascular System and Nervous System.

3. Amphibia: - Out line classification and general characters. **06**
   Development of frog: - Fertilization Cleavage Blastula Gastulation and formation of germinal layers.
   Neotony in Amphibia
   Parental care in amphibia.

4. Reptilia: - Out line classification and general characters. **06**
   Calotes:-External features, Respiratory system and Blood vascular system.
   Poisonous and non- poisonous snakes.

5. Aves: - Out line classification and general characters. **10**
   Columba livia: - External features, Respiratory system,
   Embryology of chick.-Cleavage Blastula Gastulation and formation of germinal layers and extra embryonic membranes.
   Flight adaptation in birds.
   Migration in Birds.

6. Mammalia: - Out line classification and general characters. **13**
   Ratus ratus: - External features, Blood Vascular System, Urino-genital System and Adaptive radiation in mammals.
   Placentation in Mammals.

Total Periods: - 45

B.Sc. III Semester

Course Code - ZOL- 302

PAPER: VIII

GENETICS – II

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1. Genes and its expression :- **08**
   - Definition, concept and function of gene.
   - Transcription of gene: - Initiation, elongation and termination.
   - Genetic code:- Concept of codon, properties of genetic code
   - Translation of gene: - Initiation, elongation and termination.

2. Population Genetics :- **05**
   - Gene Pool., Gene Frequency.
   - Herdy-weinberg's Law.
   - Application of Herdy-weinberg's Law.

3. Human Genetics: - **12**
   - Human chromosomes.
   - Sex linked inheritance- X and Y Linked.
   - Dizygotic and monozygotic twins.
   - Inborn errors in metabolism: - PKU, Albinism.
   - Genetic disorders:- Down's syndrome, Turners' syndrome, Klinefelter's syndrome.
   - Use of human genetics in medical science: - Disease diagnosis Gene therapy and DNA finger printing.

4. Microbial Genetics: - **05**
   - Transformation.
   - Conjugation.
   - Transduction.

5. Genetic Engineering: - **10**
   - Introduction: - Definition, Concept and significance.
   - Restriction enzymes: - Concept and types.
   - Cloning vectors: - Plasmid, cosmid, phase.
   - Construction of r-DNA.
   - Application of r-DNA technology.

Total Periods: - 45

RECOMMENDED BOOKS
VERTEBRATE ZOOLOGY

- A life of Vertebrate – K.Z.Young, ELBS Oxford University Press.
- Modern Text Book of Zoology Vertebrate – R.L.Kotpal, Rastogi Publication Meerut.
- A Text Book of Chordate Zoology – R.C.Dalela –Jaiprakashnath Publication Meerut.
- Chordate Zoology – E.L.Jordan and P.S.Verma, S.Chand and Company New De
- Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill.
- Biological Science, 3rd Ed. D. J. Taylor, N. P. O. Green and G. W. Stout,
- Cambridge Univ. Press. Low priced Ed.
- Verma &Agarwal- chordate Embryology – S.Chand publication.

GENETICS-II

- Genetics. By Verma, PS and Agarwal, VK., S. Chand and Co., New Delhi
- Principles of Genetics. By Sinnott Dunn & Dobzhansky, Tata McGraw Hill, New Delhi, India.
- Genetics. By Gupta, PK., Rastogi Publications, Meerut
- Genetics. By Sarin, C., Tata McGraw Hill, New Delhi.
- Principles of Genetics. By Gardner, EJ, Simmons, MJ and Snustad, DP. John Wiley and sons
- Genetics-Strikberger, Macmillan Pub.
- Principles of Genetics- Tamarin, 7th Ed. Tata McGraw Hill.
- Genetics-- Winchester. Oxford IBH Pub
- Introductions genetic analysis – Griffith et.al.

B.Sc. III Semester

Course Code - ZOL- 303

PAPER: IX

VERTEBRATE ZOOLOGY (Practical)

1.	Museum study of vertebrates. (At least 20).	**05**
2.	Dissection of Scoliodon / Labeo Afferent and efferent, Cranial Nerves. Brain	**03**
3.	Dissection of Rat/ Frog ; Urinogenital system, Arterial system, Venous System, Brain of Rat.	**05**
4.	Mounting of Placoid, Cycloid and Ctenoid scales of fish	**01**
5.	Study of Embryological development of chick according to hours of incubation.	**01**
6.	Visit to Zoological museum/Zoo Park is compulsory and Submission of report	
7.	Write a report on common birds/mammals in your locality, scientific names and economic importance.	
	Total Practical periods: -	**15**

B.Sc. III Semester

Course Code - ZOL- 304

PAPER: X

GENETICS – II (Practical)

1.	Preparation of paper model of DNA and study of DNA structure	**01**
2.	Study of protein synthesis with the help of charts/models.	**02**
3.	Estimation of DNA from animal tissue with the help of Diphenyl amine method.	**02**
4.	Study of preparation of Normal Karyotype of human.	**01**
5.	Karyotypic study of Down's syndrome, Turner's syndrome, Klinefelter's syndrome with the help of photograph.	**02**
6.	Detection of Barr body from epithelial cell.	**01**
7.	Problems on sex linked inheritance.	**02**
8.	Problems based on Hardy – Weinberg's law	**02**
9.	Study of gene frequency and mutants of man ; Attached and free ear lobe. Colour of eye. Rolling of tongue. Blood group frequency.	**02**
	Total Practical periods:-	**15**

Pattern of Question Paper

B.Sc. III Semester

Course Code - ZOL- 301

PAPER: VII

VERTEBRATE ZOOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1&2
	OR	OR
	Long answer question.	Based on chapter 1&2
Q.2.	Long answer question.	Based on chapter 3&4
	OR	OR
	Long answer question.	Based on chapter 3&4
Q.3.	Long answer question.	Based on chapter 5&6
	OR	OR
	Long answer question.	Based on chapter 5&6
Q.4.	Short Notes on:	Based on all chapters
	a)	
	b)	
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper

B.Sc. III Semester

Course Code - ZOL- 302

PAPER: VIII

GENETICS – II

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1&2
	OR	OR
	Long answer question.	Based on chapter 1&2
Q.2.	Long answer question.	Based on chapter 3
	OR	OR
	Long answer question.	Based on chapter 3
Q.3.	Long answer question.	Based on chapter 4&5
	OR	OR
	Long answer question.	Based on chapter 4&5
Q.4.	Short Notes on: a) b)	Based on all chapters
	OR	OR
	Short Notes on: a) b)	Based on all chapters
Q.5.	Multiple choice questions: 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

B.Sc. IV Semester

Course Code - ZOL- 401

PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

1. Digestion :- **07**
   - Brief Introduction to digestive system.
   - Buccal digestion - salivary secretion and digestion.
   - Gastric digestion - gastric secretion and digestion.
   - Intestinal digestion - Pancreatic secretion, bile juices and digestion in Small intestine, digestion and absorption in large intestine.

2. Respiration :- **09**
   - Respiratory organs.
   - Breathing mechanism.
   - Respiratory pigments: - Properties and function of respiratory pigments.
   - External respiration.
   - Internal respiration.
   - Transport of gases.

3. Circulation :- **05**
   - Working of mammalian heart.
   - Blood and its composition.
   - Mechanism of blood clotting.

4. Excretion :- **05**
   - Structure of kidney.
   - Structure of uriniferous tubules.
   - Urine formation: - Ultra filtration selective, re-absorption and tubular secretion.
     Counter current multiplier system.

5. Nerve Physiology :- **06**
   - Structure of nerve cells and neuron.
   - Neurotransmitters.
   - Synapses: - Ultra structure and function.

6. Muscles Physiology :- **05**
   - Ultra structure of smooth muscle, striated muscles, and cardiac muscles.
   - Muscle contraction.
   - Simple twitch and fatigue

7. Reproduction :- **08**
   - Structure of gonads, Gametogenesis.
   - Role of sex hormones in Reproduction.
   - Reproductive cycles – oestrous and menstrual cycle

Total Periods: - 45

B.Sc. IV Semester

Course Code - ZOL- 402

PAPER: XII

BIOCHEMISTRY AND ENDOCRINOLOGY

A-BIOCHEMISTRY

1. Enzymes :- **05**
   Definition, concept and nomenclature,
   Properties, classification,
   Mechanism of enzyme action,
   Factors affecting enzyme action (Temperature, pH, Substrates & Co-enzyme.)

2. Carbohydrates :- **06**
   Definition Classification, monosaccharide, disaccharides, oligosaccharides and polysaccharides.
   Metabolism: - Glucogenesis, Gluconeogenesis, Glycolysis, TCA. & oxidative phosphoration.

3. Proteins :- **06**
   Definition , classification -simple , conjugated and derived proteins,
   Structure of proteins: - Primary, secondary, tertiary and quartery.
   Metabolism: - Deamination and transamination.

4. Lipids: **05**
   Definition, classification, simple, compound and derived lipids.
   Metabolism: - β oxidation and cholesterol biosynthesis .

5. Vitamins: - Sources and deficiency **02**

B- ENDOCRINOLOGY

1. Endocrine system of vertebrates: - **04**
   Introduction: - Definition of endocrine, Paracrine and Autocrine system.
   Significance of endocrine and neuro - endocrine system.

2. Pituitary gland: - Morphology & histological structure, Hormones and their function. **05**

3. Thyroid gland: - Morphology & histological structure, Hormones and their function. **03**

4. Adrenal gland: - Morphology & histological structure, Hormones and their function. **05**

5. Pancreas: - Islets of langarhance- Histological structure **02**
   Hormones and their function.

Total Periods: - 45

RECOMMENDED BOOKS
ANIMAL PHYSILOGY

- William S.Hoar- General and Comparative Physiology, prentice hall of India ltd.
- Wood E.W. Principle of Animal physiology
- Nagbhushnum R.,Sarojini R., Kodarkar M.S. –Animal Physiology
- Verma ,Agarwal & Tyagi-animal physiology
- Moeye K.-Animal Physiology, Cambridge low prize edition.
- Dantzler, W.H. Comparative Physiology (Handbook of Physiology): Vol. 1, 2, (ed.) Oxford University Press, New York, USA
- R. Eckert. Animal Physiology: Mechanisms and Adaptation. W.H.
- Mohan Arora – animal physiology , Himalaya publication
- A.K. Berry. –animal physiology

BIOCHEMISTRY AND ENDOCRINOLOGY

- J.L. Jain –biochemistry S.Chand Publication, meerut
- Lehninger- Biochemistry, Kalyani Publications
- Stryer-Biochemistry, W.H Freeman and Co., New York
- Granner and Rodwell - Harper's Illustrated Biochemistry, Murray, (27th Ed.), McGraw Hill, New York, USA
- Nelson and Cox - Principles of Biochemistry. Lehninger. 2nd Ed. CBS publishers.
- J H Wet - General Biochemistry Wiley Eastern Ltd.
- Rangnatha Rao K-Text Book of Biochemistry, Prentice-Hall of India
- C.B.Powar- Biochemistry – (Himalaya Pub.)
- Das.-Biochemistry
- E.J.W. Barrington, General and Comparative Endocrinology,
- Oxford, Clarendon Press.
- R.H. Williams, Textbook of Endocrinology, W.B. Saunders

B.Sc. IV Semester

Course Code - ZOL- 403

PAPER: XIII

ANIMAL PHYSIOLOGY (PRACTICAL)

1.	To study the digestive enzymes from cockroach/Human Saliva.	**02**
2.	Total count of RBC /WBC from given blood sample.	**04**
3.	Preparation of Heamatin crystals from blood sample.	**01**
4.	Hb% from given blood sample.	**01**
5.	Effect of isotonic, hypotonic, and hypertonic solutions on blood cell (RBCs)	**01**
6.	Detection of nitrogenous west product from the extract of different animals	**01**
7.	Detection of nitrogenous west product in fish/frog water tank.	**01**
8.	Estimation of O_2 consumed by fish in relation to temperature by Wrinkle's method.	**02**
9.	Typographic reading of skeletal muscle properties , heart beating in Toad / Rat. (Demo only)	**01**
10.	Histological study of following. T.S. of Kidney T.S. of Testis T.S. of Ovaries T.S. of Pancreas T.S. of Intestine	**01**
	Total practical periods: -	**15**

B.Sc. IV Semester

Course Code - ZOL- 404

PAPER: XIV

BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

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1. Preparation of solutions of given percentage, normality and molarity.	**02**
2. Study of analytical instrument principle and applications. pH meter, Colorimeter, Centrifuge Electrophoresis	**04**
3. Factors affecting enzymes activity temperature and pH.	**02**
4. Detection of amino acid by paper chromatography.	**01**
5. Qualitative test for organic compound. Carbohydrate. Protein. Fats.	**03**
6. Quantitative estimation of protein from animal tissue using Lawry's method.	**02**
7. Study of permanent histological slides of endocrine glands. T.S. of Pituitary gland, T.S. of Thyroid gland, T.S. of Adrenal Gland, T.S. of Islets of langarhance. T.S. of Testis T.S. of Ovaries	**02**
Total practical periods: -	**15**

Pattern of Question Paper

B.Sc. IV Semester

Course Code - ZOL- 401

PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question.	Based on chapter 1 & 2
	OR	OR
	Long answer question.	Based on chapter 1 & 2
Q.2.	Long answer question.	Based on chapter 3, 4 & 5
	OR	OR
	Long answer question.	Based on chapter 3, 4 & 5
Q.3.	Long answer question.	Based on chapter 6 & 7
	OR	OR
	Long answer question.	Based on chapter 6 & 7
Q.4.	Short Notes on: a) b)	Based on all chapters
	OR	OR
	Short Notes on: a) b)	Based on all chapters
Q.5.	Multiple choice questions: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	Based on all chapters

Pattern of Question Paper

B.Sc. IV Semester

Course Code - ZOL- 402

PAPER: XII

BIOCHEMISTRY AND ENDOCRINOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q.1.	Long answer question. OR Long answer question.	Based on chapter Sec. A 1 & 2 OR Based on chapter Sec. A 1 & 2
Q.2.	Long answer question. OR Long answer question.	Based on chapter Sec. A 3, 4 & 5 OR Based on chapter Sec. A 3, 4 & 5
Q.3.	Long answer question. OR Long answer question.	Based on chapter Sec. B 1 to 5 OR Based on chapter Sec. B 1 to 5
Q.4.	Short Notes on: a) b) OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q.5.	Multiple choice questions: 1 2 3 4 5 6 7 8 9 10	Based on all chapters

SKELETON OF QUESTION PAPER

B. Sc. III & IV Semester

Course Code - ZOL-303+403

PAPER: IX+XIII

VERTIBRATE ZOOLOGY+ANIMAL PHYSIOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1. Dissect fish…… ...so as to expose it's ……system **20**
OR
Dissect Frog / Rat …….so as to expose it's ……system

Q.2. Estimation of O_2 consumption in relation to temperature. **20**
OR
Detection of any two nitrogenous waste products from the given sample
OR
Total count of RBC/WBC from given blood sample

Q.3. Mounting of ……..scale of fish. **10**
OR
Effect of hypotonic/ isotonic/ hypertonic solution on RBC
OR
Preparation of haematin crystals from given blood sample

Q.4. Identification of given spot
(Museum study -05. Chick embryo - 02 & histology -03) **30**

Q.5. Record books **10**

Q.6. Submission of slide (At least five) **05**

Q.7. Vivo-voce. **05**

SKELETON OF QUESTION PAPER

B.Sc. III & IV Semester

Course Code - ZOL-304+404

PAPER: X + XIV

GENETICS – II + BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1. Estimation of total DNA from…….. Tissue **20**
OR
Problems on sex linked inheritance/ Hardy –Weinberg's law.

Q.2. Quantitative estimation of Protein from……. Tissue **20**
OR
Detection of organic compound from given samples A&B .Report the test, observation and results.
OR
Preparation of DNA model.

Q.3. Calculates the RF values of given amino acids. **15**
(Using paper chromatography)
OR
Prepare the solutions of given percentage/normality/ molarity
(At lest two types)
OR
Detection of Barr body from epithelial cells.

Q.4. Identify the given spots and comment. **30**
(Syndroms-02. Endocrine glands-03)

Q.5. Record book **10**

Q.6. Viva-voce **05**