

“Education for Knowledge, Science and Culture”  
-Shikshanmaharashi Dr. Bapuji Salunkhe



**DEPARTMENT OF BIOTECHNOLOGY (OPTIONAL)**

**B.Sc. Part III**

**Semester V & VI**

Semester	Paper No.	Course code	Course title	No. of Credits
V			Plant & environment biotechnology	4
			Large scale manufacturing process	
VI			Advance in Biotechnology	4
			ATC & cell metabolism	

**CBCS Syllabus to be implemented from**

**June 2020 onwards**



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**Shri Swami Vivekanand Shikshan Sanstha's**  
**VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)**  
**Department of Biotechnology Optional**  
**The academic year 2020-21 B.Sc. III Biotechnology Optional**  
**COS for Semester V And VI**

Semester	Course outcome
Semester V	
Paper V	<b>DSC 1009 E1- Plant Biotechnology &amp; Environmental Biotechnology</b> CO1. Formulate media to produce plantlets on an industrial scale CO2. Produce transgenic plants with high quality. CO 3. Describe the concept of toxicity. CO4. Discover different ways of Bioremediation.
Paper VI	<b>DSC 1009 E2 -Large scale manufacturing process</b> CO 1. Discriminate various types of fermentation medium with respect to product formation. CO2. Design a Fermenter for appropriate fermentation. CO3. Enumerate steps of downstream processing to purify industrially important product. CO4. Choose the correct method for qualitative & quantitative analysis of end product.
Semester VI	
Paper VII	<b>DSC 1009 F1 Advances in Biotechnology</b> CO 1. Generate new strategies of gene therapies CO2. Construct a drug molecule. CO3. Illustrate various biochemical techniques. CO 4. Understand various tracer techniques & and their applications
Paper VIII	<b>DSC 1009 F2 ATC and Cell metabolism</b> CO 1. Compare various pathways in Cell. CO2. Elaborate virus reproduction cycles to develop strategies for antiviral therapies CO 3. Produce transgenic animals for economic importance CO 4. Become a good entrepreneur to set up ATC-based industries.
SEC Sem V	Entrepreneurship development CO:1. students get knowledge about business organizations by completing the course students can incubate their business idea CO:2. Students can understand concepts of business finance. Students can become successful entrepreneurs
SEC Sem VI	Ecology CO1:Energy transfer in the ecosystem, To understand different industrial indicators of pollution CO2:Able to understand concepts of ecosystem and able to illustrate bioremediation to abatement of pollution



*[Signature]*  
**HEAD**  
**DEPARTMENT OF BIOTECHNOLOGY (OPTIONAL)**  
**VIVEKANAND COLLEGE, KOLHAPUR**  
**(AUTONOMOUS)**

## Subject details B.Sc. III Optional Biotechnology

Semester	Course code	Course title	Credits	Marks
V	DSE-1009 E1	Plant & environment biotechnology	4	100
	DSE-1009 E2	Large scale manufacturing process	4	100
	SEC	Entrepreneurship development	2	50
	AECC –E-1501	English	4	50
VI	DSE-1009 F1	Advance in Biotechnology	4	100
	DSE1009 F2	ATC & cell metabolism	4	100
	SEC	Ecology	2	50
	AECC-F-1501	English	4	50
	Practical	III & IV	8	100
	Practical	V & VI	8	100
		<b>Total credits (SEM V+VI) Including SEC ,AECC</b>	<b>44</b>	<b>800</b>





**Vivekanand College Kolhapur,(Autonomous)**

**B.Sc.- III BIOTECHNOLOGY (OPTIONAL)**

**CBCS syllabus with effect from June 2020**

S.N.	Semester V DSE-1009-E1 Plant and Environmental Biotechnology	Total lect.60
	<b>CREDIT-I</b>	15
1	Conventional and Non conventional fuel and environmental impact Modern fuel-Biogas , Bioethanol ,Biodiesel production Global environmental problems-Green house effect, ozone depletion, acid rain Waste- Define, Types- solid and liquid waste Solid waste management <b>Waste water treatment-</b> Primary treatment- Screening, grinding, grit removal, flocculation, sedimentation, coagulation Secondary treatment- aerobic (Trickling filter, activated sludge, stabilization pond) and anaerobic (Up flow anaerobic sludge digestion) Tertiary treatment- chemical, precipitation	
	<b>CREDIT-II</b>	15
2	<b>Bioremediation-</b> Define, Types, Example- hydrocarbon , dye, heavy metal, pesticides  Bioremediation in Agriculture (Composting and vermicompost)  Concept of Biopesticides, Biosorbtion, Phytoremediation <b>Bioleaching-</b> Types, Chemistry and examples- Copper and Uranium  <b>Introduction to Biofertilizer-</b> Inoculants of Rhizobium, Azotobacter, , Frankia, Cyanobacteria, Phosphate solubilizer with method of application	



	<b>Section II</b> <span style="color: red;">PTC</span>	
	<b>Credit III</b>	15
3	<p><b>Concept &amp; Historical Background</b>  Conventional and Non conventional methods for crop improvement  Landmarks in plant tissue culture  Concept of cell theory, Cellular totipotency, Differentiation, Dedifferentiation, Redifferentiation, Regeneration.</p> <p><b>Scope, recent advance &amp; applications of PTC</b></p> <p><b>Infrastructure &amp; organization of Lab</b>  Different work areas  Equipments &amp; Instruments required</p> <p><b>Media &amp; culture preparation</b>  Role of micro &amp; macro nutrients, Vitamins, amino acid, Hormones, activated charcoal, Solidifying agents.  Culture Conditions- pH, Temperature, Humidity.</p> <p><b>Aseptic Techniques</b>  Sterilization of Media, Reagent &amp; Glassware  Surface sterilization of explants</p> <p><b>Practical applications of tissue and organ culture</b> - Application in agriculture, application in horticulture and forestry, pharmaceutical ,research,paliobotany applications in industries, transgenic plants.</p>	
	<b>Credit IV</b>	15
4	<p><b>Callus Culture</b>  Introduction, principle, morphology &amp; internal structure, protocol, factors affecting.</p> <p><b>Somatic embryogenesis</b>  Introduction, principle, protocol, factors affecting, applications.</p> <p><b>Suspension Culture</b>  Introduction, principle, protocol, growth measurement, synchronization, applications.</p> <p><b>Pathways for clonal propagation</b></p> <p><b>Organogenesis</b>  Introduction, principle, protocol, factors affecting, applications.</p> <p><b>Haploid culture</b>  Introduction, principle, protocol, applications, advantages of pollen culture over anther culture</p> <p><b>Concept of Somaclonal Variation</b></p> <p><b>Concept Protoplast culture</b></p>	



Reference book:

1. Environmental biotechnology- InduShekhar Thakur.
2. Environmental biotechnology-Chattergy.
3. Environmental biology-Verma& Agarwal.
4. Environmental chemistry-B.K.Sharma.
5. Environmental Pollution- Peavy& Rowe.
6. Environmental problems & solutions- Asthana & Asthana.
7. Environmental science-SiagoCanninham.
8. Environmental biotechnology-S.N.Jogdand.
9. Water engineering- Treatment dispose & reuse-Metcalf & Eddy.
10. Environmental Biotechnology-C.S.K Mishra &Juwarkar
- 11.Introduction to plant tissue culture-M.K.Razdan
12. Plant tissue culture – Theory & practice- S.S.Bhojwani&M.K.Razdan
13. Crop improvement in biotechnology-H.S.Chawala
14. Plant tissue culture-Kalyankumardey
15. Textbook of biotechnology- R.C.Dubey
16. Plant tissue culture- U .Kumar.
17. Biotechnology- B.D.Singh





	<b>DSE-1009-E2- Large scale manufacturing process</b>	Total lect.60
	<b>Credit I</b>	15
1	<p><b>Concept of Bioprocess engineering and fermentation technology</b></p> <p><b>Basic design of fermentator</b> , its construction material and accessories associated with Fermentor, Fermentation media</p> <p><b>Types of Fermentor-</b> Tube tower Fermentor, bubble cap Fermentor, fluidized bed Fermentor, Air lift Fermentor</p> <p>Concept of sterilization of fermentation media, equipment and air</p> <p><b>Screening of industrially important microorganism-</b> Primary and Secondary screening, Pure culture techniques</p> <p>Stain improvement by mutation, Genetic engineering, Genetic recombination</p> <p>Maintenance of industrially important microorganism. culture collection centre in India Examples</p>	
	<b>Credit II</b>	15
2	<p><b>Scale up-</b>Bench studies, pilot studies, industrial scale</p> <p>Use of computer in fermentation, Building of inoculums, pitching</p> <p>Types of fermentation-Continues, Batch, Solid state fermentation</p> <p>Downstream processing- Centrifugation, Distillation, Solvent extraction, Filtration, Ultra filtration, Precipitation, Ion Precipitation, Ion exchange chromatography, Gel filtration , Affinity chromatography, crystallization and drying</p> <p><b>Assay –</b></p> <p>Physico chemical assay- Gravimetric, Spectrophotometric, Chromatographic</p> <p>Microbiological assay-Diffusion assay, Turbidometric assay, Metabolic assay, end point determination assay, enzymatic assay</p> <p><b>Introduction to Quality control</b></p>	



	<b>Section II</b>	
	<b>Credit III</b>	15
3	<b>Specific fermentation:</b> • Citric acid Fermentation Penicillin fermentation L-Lysine fermentation L-Asparaginase fermentation Single cell protein- Spirulina Amylase production Vinegar production Bread fermentation Xanthan gum fermentation Vitamin B12 Lactic acid fermentation	
	<b>Credit IV</b>	15
4	<b>Alcoholic fermentation-</b> Red wine and Beer fermentation Cheese fermentation. Fermentation economics <b>Intellectual property rights-</b> Introduction Patents- Introduction , Criteria and process of patenting Trademarks, Trade secrets Copyrights	

Reference books-

1. Comprehensive Biotechnology volume 3 – Murray Moo- Young
2. Basic Biotechnology- Colin Ratledge & Bijon Kritinsen, cambridge university press ,UK
3. Industrial Microbiology – casida
4. Principles of Fermentation technology-Whittekhar
5. Industrial Microbiology- Prescott & duns
6. Industrial Microbiology- A.H.Patel
7. Industrial Microbiology-Pepler & Perlman





Sr. no.	Semester VI	Total lect.60
	<b>DSE- 1009 F1 Advances in Biotechnology</b>	
	<b>Credit I</b>	15
1	<p><b>Cell disruption methods</b>-Grinding, abrasive presses, Enzymatic method, sonication.</p> <p><b>Centrifugation</b> Introduction and basic principle of sedimentations Types of centrifuges, Types of Centrifugation- Differential centrifugation, density Gradient centrifugation .</p> <p><b>Separation of proteins by precipitation</b>-Salt precipitation - procedure and methodology of Salting out by Ammonium sulphate. Organic solvent precipitation</p> <p><b>Dialysis</b></p> <p><b>Chromatographic methods</b> – Principle, methodology and applications of 1 Gel Filtration method 2 Ion exchange chromatography 3 Affinity chromatography 4 Gas liquid chromatography (GLC) 5 High Performance Liquid chromatography</p>	
	<b>Credit II</b>	15
2	<p><b>Electrophoresis.</b> Introduction, types and general principle Supporting media – (Agarose. poly acryl amide gel) Electrophoresis of protein SDS-PAGE electrophoresis- Methodology and Applications. Isoelectric focusing</p> <p><b>Tracer technique;-</b> Introduction – Radioactivity, radioisotopes, types of radiation (<math>\alpha</math>, <math>\beta</math>, <math>\gamma</math>), half-life period of radioisotope. Methods of measurement of radioactivity Gas ionization, Solvent excitation- Liquid scintillation counter Autoradiography Applications of radioisotopes in biological system Spectroscopic method – Principle. Instrumentation and applications 1. Infra red spectroscopy 2. Florescence spectroscopy 3. Atomic spectroscopy</p>	



	<b>Section II</b>	
	<b>Credit III</b>	15
3	<p><b>Techniques in gene biotechnology-</b>  <b>DNA fingerprinting</b> –Introduction, Genetic marker          Use of minisatellite and microsatellite, Multilocus and single locus probes.Scheme for DNA fingerprinting and applications</p> <p>Concept of Chromosome walking and jumping, Gene targeting          Human gene therapy-          Types of gene therapy- 1.Somatic gene 2.Germ line Methods of gene transfer-(Virus vector , non viral approach Limitations)</p> <p>Antisense therapy- Introduction, Principle, Application</p>	
	<b>Credit IV</b>	15
4	<p><b>BIOINFORMATICS</b>          Computer use in Biology- Internet, Networking- HTTP, HTML,WAN,LAN,MAN</p> <p><b>Information resource-</b> National Center for Biotechnology Information(NCBI) , European Bioinformatics Institute (EBI), Sequence retrieval system- Entrez, DBGet</p> <p><b>Genomics-</b> Human Genome Project- Goal, Application, Introduction to nucleic acid database- Gene Bank, EMBL , DDBJ</p> <p><b>Introduction to Proteomics, Primary protein sequence database</b> – SWISS-PROT, PIR, MIPS, NRL-3D, Tr EMBL</p> <p><b>Introduction to secondary protein sequence database-</b> PROSITE, PROFILE, PRINT,Pfam, BLOCK, IDENTIFY</p> <p><b>Other database-</b> Literature database, Pub Med</p> <p>Introduction to structural database- Protein databank (PDB) ,</p> <p><b>Introduction to Molecular docking , Homology modelling</b></p>	

References:-

1. Practical Biochemistry principles and techniques – Wilson and Walkar
2. Protein purification –Robert Scoop



3. Biophysical Chemistry –Nath Upadhyay
4. Textbook of Biotechnology- R.C.Dubey
5. Textbook of Biotechnology- B.D.Singh
6. Gene Biotechnology -S.N.Jogdand
7. Gene Manipulation – Old and Primrose
8. Introduction to Bioinformatics – Rastogi.
9. Introduction to Bioinformatics- T. K. Attwood.



<b>DSE- 1009 F2Animal tissue culture and cell metabolism</b>		Total lect .60
<b>Section I</b>		
<b>Credit I</b>		15
1	<p><b>Historical Background</b> Landmarks in Animal tissue culture Scope, recent advances &amp; applications of ATC</p> <p><b>Requirements of Animal cell culture</b> Overview of ATC Lab Infrastructure, Substrate for cell growth, Equipments required for animal cell culture (Laminar air flow, CO2 incubator, Centrifuge, Inverted microscope).</p> <p><b>Sterilization of Glassware's, Equipments &amp; culture media</b> Glassware sterilization, reagent and media sterilization, sterility testing.</p> <p><b>Culture media</b> Natural media, synthetic media (serum containing media, serum free media, balanced salt solution, media constituent, complete culture media, physicochemical properties of media).</p>	
<b>Credit II</b>		15
2	<p><b>Conceptual Background</b> Biology and Characterization- Characteristics of cultured cells, cell adhesion, cell proliferation, cell differentiation, metabolism of cultured cells, Initiation of cell culture, Evolution and development of cell lines.</p> <p><b>Basic technique of mammalian cell culture</b> Isolation of tissue, disaggregation of tissue, measurement of viability, primary cell culture, Cell lines, Maintenance of cell culture, Subculture, Stem cell cultures. Scale up in monolayer- Roller bottle culture, Spinner Culture, Microcarrier culture</p> <p><b>Organ and Histotypic culture</b> Types and maintenance of organ culture, Histotypic culture</p>	
<b>Section II</b>		
<b>Credit III</b>		15
3	<p>General Metabolism- Introduction, Definition, Reactions of Metabolic Pathways. Methods for study of Metabolic Pathways by using radioisotopes, by using mutants, in vitro studies.</p> <p><b>– Metabolism of Carbohydrates</b> 1- Carbohydrate metabolism- Reactions, Energetics Significance, of-Glycolysis 2- Reactions, significance of Pentose Phosphate Pathway 3- Reactions &amp; Energetics of TCA Cycle.</p> <p><b>Lipid Metabolism</b> 1 Biosynthesis of Saturated Fatty acid- Palmitic Acid 2 <math>\beta</math>-Oxidation of Fatty acid - Palmitic Acid</p> <p><b>Respiratory Electron Transport Chain</b> 1 Components of ETC</p>	





	<p>2.Mechanism of ATPgeneration – Chemical coupling hypothesis , Chemiosmotic hypothesis.</p> <p style="text-align: center;"><b>Credit IV</b></p>	
	<p><b>Protein and Nucleotide Metabolism.</b></p> <ol style="list-style-type: none"> <li>1. Uera cycle</li> <li>2. Purine biosynthesis (Denovo and Salavage pathway)</li> <li>3. Purine degradation</li> <li>4. Pyrimidine biosynthesis</li> <li>5. Pyrimidine degradation</li> </ol> <p>Regulation of purine and pyrimidine metabolism</p> <p><b>Virology-</b> Inroduction. Types of viruses on the basis of Host &amp; type of Nucleic acid General Characteristics of Viruses. <b>General Structures of Viruses-</b> TMV, Adeno virus, T4 Bacteriophage-</p> <p><b>Reproduction ofViruses-</b> .1- Adeno virus .2- Bacteriophages- T4, 3. <math>\lambda</math>- Phage</p> <p><b>Isolation &amp; Cultivation of Plant &amp; Animal Viruses-</b> Tissue culture &amp;Embryonated Eggs</p>	15

Reference book-

1. Animal cell culture- Fresheny.
2. Biotechnology – B.D.Singh.
3. Biotechnology- R.C.Dubey.
4. Gene Biotechnology- S.N.Jogdand
5. Biochemistry – LubertStrayer.
6. Principles of Biochemistry- Lehninger.
7. Virology- Luria & Delbruck. 4. Fundamentals of Biochemistry- J.L.JainS.Chand
8. Animal cell culture- Fresheny.



<b>Practical III.IV.V.VI</b>	
S.N.	Practical titles
<b>Techniques in plant and animal tissue culture</b>	
1	Laboratory organization and general techniques in PTC
2	Preparation of MS media , stock solution and medium
3	Aseptic seed germination
4	Micro propagation stage I- Initiation of micropropagation Shoot tip culture ,auxiliary bud culture
5	Micro propagation stage II- structure and multiplication of culture
6	Callus culture techniques- Initiation of culture and callus morphology
7	Suspension culture technique- Initiation of culture, growth requirement
8	Anther Culture technique
9	ATC laboratory design and equipment used in ATC
10	Animal cell culture media preparation sterilization, washing, packing
<b>Techniques in Environmental biotechnology</b>	
11	Determination of BOD
12	Determination of COD
13	Isolation of <i>Rhizobium</i> from root nodules
14	Isolation of <i>Azotobacter</i> from soil
15	Isolation of PSB from soil
16	Determination of hardness of water
17	Determination of oligodynamic effect of copper on pathogen
<b>Techniques from microbiology Bioprocess</b>	
18	Screening of Amylase Producers from Soil
19	Production of amylase by submerged culture method. Estimation of amylase activity by DNSA method
20	Isolation of vitamin B12 mutant
21	Bioassay of antibiotic
22	Bioassay of vitamin B12
23	Estimation of citric acid from lemon juice
24	production of ethanol by using immobilized yeast cells and determination of alcohol content by specific gravity method
25	Production of xanthan gum from xanthomonas



	<b>Techniques from advanced biotechnology</b>
26	Purification of protein by gel filtration chromatography
27	Purification of protein by ion exchange chromatography
28	Immobilization of invertase by using sodium alginate ,study of invertase activity by DNSA method
29	Estimation of alcohol by potassium dichromate method
30	Demonstration of SDS -PAGE of protein
31	Demonstration of thermocycler
32	Isolation of coli phages
33	Transformation of E.Coli
34	Determination of molecular weight of DNA
35	Browsing and understanding of NCBI web page Introduction of literature database -Pubmed
36	Protein structure exploring database – Protein Data Bank (PDB) and use of Rasmol to three dimensional structure of protein
37	Exploring nucleic acid databases
38	Separation of plant pigments by adsorption chromatography
39	Study of Human genome project
40	Determination of total dissolved solid from waste water sample
	Practical VI
	<b>Project</b>



<b>B.Sc III Biotechnology Optional Semester -V</b>		
<b>ENTREPRENEURSHIP DEVELOPMENT</b>		
Credit I	<b>INTRODUCTION</b>	(10)
	Meaning, Needs and Importance of Entrepreneurship, Promotion of entrepreneurship, Factors influencing entrepreneurship, Features of a successful Entrepreneurship.	
	<b>ESTABLISHING AN ENTERPRISE</b>	12
	Forms of Business Organization, Project Identification, Selection of the product, Project formulation, Assessment of project feasibility.	
Credit II	<b>FINANCING THE ENTERPRISE (15 Periods)</b>	15
	Importance of finance / loans and repayments, Characteristics of Business finance, Fixed capital management: Sources of fixed capital, working capital its sources and how to move for loans, Inventory direct and indirect raw materials and its management.	
	<b>MARKETING MANAGEMENT</b>	10
	Meaning and Importance, Marketing-mix, product management – Product line, Product mix, stages of product like cycle, marketing Research and Importance of survey, Physical Distribution and Stock Management.	
<b>SUGGESTED READING</b>		
1. Holt DH. Entrepreneurship: New Venture Creation.		
2. Kaplan JM Patterns of Entrepreneurship.		
3. Gupta CB, Khanka SS. Entrepreneurship and Small Business Management, Sultan Chand & Sons.		





<b>B.Sc III Semester VI (Optional) Biotechnology</b>		
<b>Skill Enhancement Course</b>		
<b>ECOLOGY AND ENVIRONMENT MANAGEMENT</b>		
<b>Credit I</b>		
	<p>Our Environment: Geological consideration of Atmosphere, Hydrosphere, Lithosphere. Scope of Ecology. Development &amp; Evolution of Ecosystem. Principles &amp; Concepts of Ecosystem.</p> <p>Structure of ecosystem. Strata of an ecosystem. Types of ecosystem including habitats.</p> <p>Biological control of chemical environment.</p> <p>Energy transfer in an Ecosystem. Food chain, food web, Energy budget, Production &amp; decomposition in a system.</p> <p>Ecological efficiencies, trophic structure &amp; energy pyramids, Ecological energetic, Bio-geochemical cycles (N,C,P cycles)</p>	1 5
<b>Credit II</b>		
	<p>Pollution &amp; environmental Health related to Soil, Water, Air, Food, Pesticides, Metals, Solvents, Radiations ,Carcinogen, Poisons. Detection of Environmental pollutant. Indicators &amp; detection systems. Bio-transformation, Plastic, Aromatics, Hazardous wastes Environmental cleanup</p> <p>Environmental biotechnologies, Biotechnologies in protection and preservation of environment.</p> <p>Bioremediation, Waste disposal</p>	1 5
<b>Practical</b>		
1	Study of all the biotic and abiotic components of any simple ecosystem natural pond or terrestrial ecosystem or human modified ecosystem.	
2	Study of the types of soil, their texture by sieve method and rapid tests for pH, chlorides, nitrates, carbonates and organic carbon	
3	Principle of GPS (Global Positioning System).	
4	Study any five endangered/ threatened species- one from each classes	



### SCHEME OF MARKING FOR (THEORY)

Sem	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
5	DSE-1009-E1	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)
5	DSE-1009-E2	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)
6	DSE- 1009 F1	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)
6	DSE- 1009 F2	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)

### SCHEME OF MARKING (CIE) Continues Internal Evaluation

Sem	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
5	DSE-1009-E1	20	Semester wise	One	As per instruction	35% (7marks)
5	DSE-1009-E2	20	Semester wise	One	As per instruction	35% ( 7marks)
6	DSE- 1009 F1	20	Semester wise	One	As per instruction	35% (7marks)
6	DSE- 1009 F2	20	Semester wise	One	As per instruction	35% ( 7marks)

### SCHEME OF MARKING (PRACTICAL)

Sem	Course	Marks	Evaluation	Section	Standard of passing
V and VI	Practical III,IV,V,VI	200	Annual	As per instruction	35% (72marks)

\*A separate passing is mandatory









**Q. 6. Attempt any four.**

**(16 Marks)**

- i.
- ii.
- iii.
- iv.
- v.
- vi.

**Instructions to paper setters :** Equal weight age should be given to all units

**For Continues Internal Evaluation : (20 Marks)**

Mandatory 1) Presenty----- ( 5 marks)

**Select any one for B.Sc.III-----(15 marks)**

- 1) Unit test
- 2) Home assignment
- 3) Project
- 4) Seminar

\*Yet it is not finalized

**NATURE OF QUESTION PAPER AND DISTRIBUTION OF MARKS**

**PRACTICAL EXAMINATION**

**Practical III, IV, V,VI**

**First day**

Q.1 Major experiment 20

Q.2 Minor experiment 10

Q.3 Spotting 10

Q.4 Viva-voce 10



**Second day**

Q.5 Major experiment 20

Q.6 Minor experiment 10

Q.7 Minor experiment 10

Q.8 Journal 10

**Third day**

Q.1 Major experiment 20

Q.2 Minor experiment 10

Q.3 Spotting 10

Q.4 Viva-voce 10

Practical VI -Project presentation for ..... 50M

1. Project report	25M
2. Project Presentation	15M
3. Oral	10M
TOTAL MARKS	200 M

