

Outline of Syllabus for Semester System (2010-11)
M.Sc.-I - Biosciences

Semester –I

Theory

Bios 101	-	Cell Biology
Bios 102	-	Genetics
Bios 103	-	Gen. Physiology and Tissue culture
Bios 104	-	Environmental Biology

Practicals

Bios 105:

Practical -I-	Cell Biology and Genetics
Practicals-II	Gen. Physiology and Tissue culture
Practicals-III	Environmental Biology

Bios 106: Viva-voce

Semester –II

Theory

Bios 201	-	Biophysics and Instrumentation
Bios 202	-	Biochemistry
Bios 203	-	Organism Physiology
Bios 204	-	Biostatistics and Bioinformatics

Practicals

Bios 205:

Practicals-I	Biochemistry
Practicals-II	Organism Physiology
Practicals-III	Biostatistics and Bioinformatics

Bios 206: Viva-voce

Practical examination shall be conducted by the internal examiners only. However Viva voce examination shall be by the panel where all the internal examiners as well as at least 3 external examiners (one each in each branch i.e. plant science, Animal science and Microbiology) will conduct the extensive viva voce examination.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS FOR M.Sc. Biosciences (Semester wise)

Preamble:

The duration of the course will be two years consisting of four semesters. The first two semesters viz. M.Sc.-I shall include broad based core courses compulsory for all the students. The third and fourth semesters viz. M.Sc-II shall have specialized courses. These specializations shall be Plant Sciences/ Animal Sciences? Microbial Sciences. The degree certificate of the candidate shall clearly indicate the candidate's specialization for their future benefit.

The course content of Semester I and II is divided in to 4 theory papers and two practicals in each. The course content of the II and IV semester where students peruse the specialized course is divided in to 4 theory papers and two practicals in each semester of their respective specialization viz. Plant Sciences/ Animal Sciences? Microbial Sciences. In the fourth semester students will be offered two elective papers in their own specialization. Students will be given option of selecting practicals or dissertation in the elective papers. The weightage of the dissertation will be equivalent to one practical only.

Practical work and Biological field work have to be carried out by the candidate and the journals and certified reports, dissertations to that effect shall be submitted by the candidate as a partial fulfillment of the course. The appropriate field work shall be assigned by the department as deemed fit.

SEMESTER - I
Bio-101- Advanced Cell Biology

Unit – I Methods of Studying Cell

- A. Fixation, embedding, sectioning and staining at
 - i. Light microscopy
 - ii. TEM
- B. Types of Microtomes
 - i. Rotary microtome
 - ii. Freezing Microtome/cryostat
 - iii. Ultra microtome
- C. Microscopy (Design & Functional Mechanism)
 - i. Light, Phase contrast, Interference, fluorescence
 - ii. SEM and TEM
- D. Ultracentrifuge and density gradients.
 - i. Separation of cell organelles.

Unit – II Methods of studying chromosome

- i. Plant (Mitotic & Meiotic)
- ii. Animal Chromosome (Fish and Rat)
- iii. Human Chromosome
- iv. Banding Techniques
- v. Cancer & Chromosome

Unit – III A. Intra Cellular Compartmentalization

- (i) Prokaryotes & Eukaryotes
- (ii) Plasma membrane
- (iii) ER and Golgi complex
- (iv) Lysosomes and peroxisomes
- (v) Nuclear and Nucleolus

B. Specialized functions of organelles

- i. Autonomy of mitochondria
- ii. Autonomy of chloroplast

Unit – IV Advances in Cell Biology

A. Cell Cycle : Overview, control and check point in regulation of cell cycle.

B. Human chromosome disorders :

- i. Autosomal syndromes
- ii. Sex-chromosomal syndromes

C. Cancer :

- i. Oncogene & tumor suppressor gene
- ii. Hayflick limit
- iii. Telomere
- iv. Apoptosis and Cancer

References:

- (1) Cell and Molecular Biology by De Robertis and De Robertis (1994)
- (2) Molecular Biology of cell by Albert & Watson (1994)
- (3) Cell structure and function by Loewy and Gallant (1996)
- (4) Essential of Cell Biology by Alberts, Bray, Hopkin and Jhonson (2004)
- (5) Molecular Cell Biology by Lochish, Berk, Zipursky and Matsudaira (2004)
- (6) Cell and Molecular Biology Concepts and Experiments. G. Karp (2007)

Bios-102 Genetics and Molecular Biology

Unit- I

- a. History of genetics:
- b. Multiple alleles
- c. Polygenetic inheritance
- d. DNA as the genetic material: Experimental evidences

Unit II

- a. Nucleic acids:
 - i. Molecular structure of DNA and RNA
 - ii. Replication of DNA
- b. Mutagenesis:
 - i. Types of mutations
 - ii. Molecular basis of mutation
 - iii. DNA repair

Unit-III:

- a. Transcription
- b. Translation
- c. Genetic code
- d. Operon concept
- e. Mechanism of gene mapping

Unit IV

- a. Gene manipulation:
 - i. Genetic engineering
 - ii. Recombinant DNA technology
 - iii. Techniques
 - iv. Applications
- b. Techniques of evaluation in molecular biology:
 - i. Gel electrophoresis
 - ii. Southern, Northern and Western blotting
 - iii. Probes and tests for detection
 - iv. Polymerase chain reaction

References

1. Genetics E.Altenberg
2. Principles of genetics E.J.Gardener
3. Genetics M.W.Stricberger
4. Principles of Genetics E.W.Sinnott, L.C.Dunn and T.Dobzansky
5. Molecular biology of the cell B. Alberts, D.Bray, J.Lewis, M.Raff, E.Roberts, J.D.Watson
6. Molecular biology of the cell J.D.Watson, NH.Hopkins, J.W.Roberts, J.A. Steits, A.M.Weiner
7. Gene I, II, III, IV & V Benjamin Lewin
8. Molecular biology David Freifelder

Bios 103 General Physiology and Tissue culture

Unit-I

- A. Enzymes :
 - i. Nomenclature
 - ii. Classification
 - iii. Factors regulating Enzyme action
 - iv. Kinetics

- B. b. Vitamins:
 - i. Chemistry
 - ii. Physiology
 - iii. Biological role

Unit-II

- A. Bioluminescence :
 - i. Occurrence
 - ii. Biochemistry
 - iii. Biological role

- B. Chemical coordination

- C. Thermoregulation – comfort zone Physical – chemical & neural regulation & acclimatization.

- D. Stress – Physiology & Adaptation

Unit – III

- A. Brief History

- B. Tools and Techniques
 - i. Lab set up, Instruments
 - ii. Aseptic techniques
 - iii. Sterilization techniques.

- C. Tissue culture media
 - i. Natural Media
 - ii. Synthetic Media

- D. Tissue Disruption
 - i. Monolayer culture
 - ii. Mass culture

Unit – IV

A. Cell line maintenance

- i. Invertebrates
- ii. Cold blooded vertebrates
- iii. Plant cells
- iv. Lymphocytes

B. Techniques for viruses

- i. Avian sarcoma
- ii. Roux sarcoma
- iii. SV – 40
- iv. Human adenoviruses

References:

- | | |
|--------------------------------------|-----------------|
| 1. Principles of Physiology | Ray Hartenstein |
| 2. A review of physiology chemistry | H.A.Harper |
| 3. Cell and tissue culture | Paul John |
| 4. Organ culture | Thomas J. Andre |
| 5. Cell & tissue in culture: Methods | E.N. Wilmer |
| Biology & physiology Vol. I,II&III | |
| 6. Plant tissue & cell culture | H.E.Street |
| -Botanical monograph Vol.11 | |
| 7. Methods in cell biology Vol.6 | D.Prescott |

Bios 104: Environmental Biology

Unit-I

- A. Scope of environmental biology, Introduction to basic themes in environmental biology, Concept and dynamics of ecosystem, Structural and functional aspects of ecosystem,
- B. Physical environment; Ecological factors in terrestrial and aquatic habitats. biotic environment; biotic and abiotic interactions.
- C. production and decomposition in nature – homeostasis in ecosystem.
- D. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Unit II

- A. Concept of energy flow – energy environment-productivity, food chains, food web, trophic levels, metabolism and size of individuals, trophic structure and ecological pyramids – ecosystem energetics.
- B. Principles and concepts of biogeochemical cycles – pattern and basic types, sedimentary cycle. Cycling of elements and organic nutrients, recycle pathways.
- C. Liebig's law of minimum, Shelford's law of tolerance, concept of limiting factors, conditions of existence, ecological indicators.

Unit-III

- A. Population, its growth,. Natality, mortality, population density and indices of relative abundance, population dispersal, population structure growth curves, fluctuations regulation (r and k selection) and interactions in populations.
- B. Biotic community, ecological dominance, community analysis, species diversity, ecotones.
- C. Ecological succession: Types; mechanisms; changes involved in succession; concept of climax.
- D. Community ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

Unit-IV

- A. Applied ecology: Environmental pollution; General introduction of pollution. Water pollution, water purity standards, control and treatment of industrial waste and sewage.
- B. Air pollution: Sources of air pollution, general effects of air pollution on health, green house effect, global environmental change, ozone depletion, acid rains and smog. Thermal pollution: Sources, effects and control of thermal pollution, Radioactive pollution.
- C. biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.

- D. Conservation biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).
- E. Speciation and extinctions; environmental impact assessment;
- F. Sustainable development
- G. Remote sensing and its application in environmental management

References

- | | |
|--|-------------------------------|
| 1. Fundamentals of Ecology | Odum S.P |
| 2. Modern concepts of ecology | Kumar N.D. |
| 3. Elements of ecology | Clarke C.L. |
| 4. Environmental Biology | Altman P.L. & Dittme D.S. |
| 5. Progress in ecology | Raychaudhuri S.P & Gupta D.S. |
| 6. Air pollution | B.K.Sharma & N.Kaur |
| 7. Water pollution | B.K.Sharma & N.Kaur |
| 8. Exploring the environment | S.K.Chadha |
| 9. Environmental degradation in India | S.K.Chadha |
| 10. The state of India's environment | Centre for science & Env. |
| 11. Remote sensing principles and applications | A.N.Patel and Surendra Singh |
| 12. Fundamentals of Ecology | M.C.Dash |
| 13. Environmental Biology | Biswarup Mukherjee |
| 14. Concepts of Ecology | Edward Kormondy |

SEMESTER – II

Bios : 201 Biophysics and Instrumentation

Unit-I (15 hrs.)

- A. Introduction : Units of Measurement
- B. The atom subatomic particles, nuclear atom, atomic symbols, isotopes and isobars, atomic weights and binding energy, atomic spectra and energy level diagrams, periodic law, nature of electron, quantum numbers and atomic orbitals.
- C. Electronic structure of the elements (biologically important elements: H, C, O, P, S, N) atom models.
- D. Structure of organic molecules, linkages, bonds, bond length and bond energy, properties, molecular orbitals.

Unit-II Radioactivity

- A. Radioactive elements
- B. Isotopes and their importance in biological studies, tracer technique.
 - i. Geological age determination
 - ii. Detection and measurement of radioactivity (Geiger-Muller Counter, Scintillation counter, Autoradiography)

Unit-III Electromagnetic radiation (em):

- A. Nature of em spectrum
- B. The em spectrum and absorption
- C. Penetrating capacity of radiation and laws of absorption
- D. Interactions of em radiations with living matter, including ionization by radiations.
- E. Production and utility of U.V., X-rays, Infrared and radio waves.
- F. LASERS and MASERS
- G. Cosmic rays, origin, detection, properties and biological relationship.

Unit-IV Introduction to Analytical Instrumentation

- A. Spectroscopy : Principles and applicability, absorption and action spectra of pigments, nucleic acids, proteins. Introduction to the needs of Biological instruments
- B. Chromatographic techniques: TLC, HPTLC, GC, Column chromatography, Ion Exchange chromatography, HPLC

References :

- | | | |
|----|--|---|
| 1. | Principles of Physical and biological chemistry | J. R. Holum |
| 2. | Tools in biology | E.S. Lenhoff |
| 3. | Biophysics | E.J. casey |
| 4. | Cell Physiology | A.B.Geise |
| 5. | Chemistry : A conceptual Approach | Charles Mortimer |
| 6. | Practical Biochemistry - Principles & Techniques | keith Wilson & John Walker |
| 7. | An Introduction to Spectroscopy for biochemists - | Brown S.B. |
| 8. | Principles and Practice of Modern Chromatographic Methods. | Robards K.,Haddad P.R.,
Jackson P.E. |

Bios 202 Biochemistry

Unit – I

- A. Equivalent and molecular weight, the mole.
- B. Concentration of solution : Molarity, Molality, Normally and percentage method.
- C. Acid-base concepts
- D. Buffer solutions
- E. pH scale and measurement.
- F. Iso-electric point

Unit – II

- A. Colloids and properties of colloids
- B. Isomerisms : Structural isomerism, Stereoisomerisms; Cis-trans isomerism, Optical activity and optical isomerism.
- C. Types of Lipids, Alpha and Beta-Oxidation of fatty acids.
- D. Glyoxylate cycle.

Unit-III

- A. Glycolysis: Glycolytic pathway, evidence of glycolysis, regulation of glycolysis; entry of monosaccharides other than glucose, reversal of glycolysis.
- B. Citric acid cycle: Krebs cycle, electron transport system, oxidative phosphorylation and regulation of ATP production.
- C. HMP shunt pathway and its biological significance

Unit-IV

- A. Amino acid and proteins: Oxidative, non-oxidative degradation and decarboxylation of amino acids, transamination of amino acids.
- B. Urea cycle
- C. Biosynthesis of carbohydrates in animals
- D. Biosynthesis in lipids
- E. Biosynthesis of proteins: Initiation and elongation factors, termination, regulation of protein synthesis, repressor molecules and promoter site.

References

1. General biochemistry J.S.Fruton & S.Simonds
2. Outlines of Biochemistry E.P.Conn & P.K.Stumps
3. Plant Biochemistry J.Bonner & J.E.Vauer
4. Biological Chemistry H.R.Mahlar & E.H.Cordes
5. Text book of biochemistry B.Harrow & A.Mazur
6. Dynamic aspects of biochemistry E.Baldwin
7. Principles of Biochemistry A.L.Lehninger
8. Biochemistry Lubert Stryer
9. Principles of physical and biological chemistry J.R.Holum

Bios 203 Organism Physiology

Section – I

Unit-I

- A. Enzymes :
 - i. Nomenclature
 - ii. Classification
 - iii. Factors regulating Enzyme action
 - iv. Kinetics

- B. b. Vitamins:
 - i. Chemistry
 - ii. Physiology
 - iii. Biological role

Unit-II

- A. Bioluminescence :
 - i. Occurrence
 - ii. Biochemistry
 - iii. Biological role

- B. Chemical coordination

- C. Thermoregulation – comfort zone Physical – chemical & neural regulation & acclimatization.

- D. Stress – Physiology & Adaptation

Section -II

Unit – III

- A. Brief History

- B. Tools and Techniques
 - i. Lab set up, Instruments
 - ii. Aseptic techniques
 - iii. Sterilization techniques.

- C. Tissue culture media
 - i. Natural Media
 - ii. Synthetic Media

- D. Tissue Disruption
 - i. Monolayer culture
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Unit – IV

A. Cell line maintenance

- i. Invertebrates
- ii. Cold blooded vertebrates
- iii. Plant cells
- iv. Lymphocytes

B. Techniques for viruses

- i. Avian sarcoma
- ii. Roux sarcoma
- iii. SV – 40
- iv. Human adenoviruses

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| 6. Plant tissue & cell culture | H.E.Street |
| -Botanical monograph Vol.11 | |
| 7. Methods in cell biology Vol.6 | D.Prescott |

Bios 203A -Animal Physiology

Section-I

Unit I

- A. Nutritional requirements ‘
 - i. Importance
 - ii. Physiology of digestion
 - iii. Function of digestive glands (Salivary glands, Liver, Pancreas & Gall bladder)

- B. Body fluid (Blood, Lymph, Cerebro-spinal fluid)
 - i. Circulation
 - ii. Composition
 - iii. Function
 - iv. Effusions

Unit-II

- A. Endocrine glands and their function, Cordination mechanism
 - i. Thyroid - pancreas
 - ii. Pitutary - Parathyroid
 - iii. Adrenal

Section-II

Unit-III

- A. Physiology of growth & ageing (senescence)
- B. Biological clock – circadian rhythm & physiology
- C. Sensory Mechanism- sense organ, vision, hearing & tactile

Unit-IV

- A. Conduction of nerve Impulse and its molecular mechanism
- B. Muscular contraction - Structure of skeletal, cardiac and smooth muscle, Mechanism of muscle contraction.

References

1. Principles of Physiology Ray Hartenstein
2. A review of physiology chemistry H.A.Harper
3. Comparative animal physiology C.L.Prosser & Brown
4. General and comparative animal physiology E.Florey
5. Animal function and adaptation: Principles Gordon et al.
6. Animal physiology (Adaptation to environment) Knut-Schmidt-Nielsen

Bios 203P – Plant Physiology

Section-I

Unit-I

- A. Photosynthesis
 - i. Light harvesting complexes, Mechanisms of electron transport,
 - ii. Photo protective mechanisms, CO₂ Fixation C₃, C₄ and CAM pathways
- B. Respiration
 - Plant mitochondrial electron transport and ATP synthesis.
- B. Photorespiration

Unit-II

- A. Nitrogen metabolism
 - i. Nitrate and ammonium assimilation, amino acid biosynthesis
 - ii. Role of mineral nutrition in plants
 - iii. Plant hormones

Section-II

Unit-III

- A. Sensory Photobiology
 - i. Structure, function and mechanism action of phytochromes, cryptochromes and phototropins.
 - ii. Stomatal Movement
 - iii. Photoperiodism

Unit-IV

- A. Physiology of seed dormancy and vernalisation.
 - i. Physiology of seed dormancy and vernalisation.
 - ii. Stress physiology : Responses of plants to biotic (pathogen and insects) and abiotic (water, temp. and salt) stresses, mechanisms of resistance to biotic stress and tolerance to abiotic stress.

References

1. An introduction to the principles of plant physiology Stiles Walter & Cooking E.C.
2. Introduction to plant physiology Meyers B.S., Anderson D.G. & Bohing R.H.
3. Plant physiology Meyers B.S. & Anderson D.G.
4. Plant physiology Dieter Hess
5. Advanced plant physiology Malcom B., Wilkins (Ed.)
6. Photosynthesis and photorespiration Hatch M.D., Osmond C.D. Slatues R.O. (Ed.)
7. Photosynthesis Hall D.O & Rai K.K.

Bios 203M – Microbial Physiology

Section-I

Unit I

- (i) Nutrition: bacterial nutrition, nutritional classification of bacteria, transport of nutrients in bacteria –active passive transport. Facilitated diffusion. PEB dependent photophosphotransferase system & other group translocation processes. Regulation of solute transport across cytoplasmic/ membrane in bacteria.
- (ii) Bacterial Growth: Growth curves, mathematical expression of growth, continuous cultures, synchronous growth (diauxic growth).Strategies of cell division.

Unit-II

- (i) Energy production in bacteria: Fundamentals of energy production in microorganisms. Mode of utilization of energy – respiration (aerobic & anaerobic) fermentation (electron transport system. Cytochrome dependent & independent systems).

Section-II

Unit III

- (i) Role of cAMP in the metabolic activities of cell.
- (ii) Introduction to extreme forms of life
- (iii) Stress response in bacteria
- (iv) Sporulation & germination of bacterial spore – its physiology and biochemistry.

Unit IV

- (i) Synthesis of bacterial cell wall. Action of antibiotics and enzymes on cell wall, Cell membrane, Nucleic acid synthesis and protein synthesis
- (ii) Molecular mechanisms of antibiotic action on bacteria.

References:

- | | |
|--|----------------------|
| 1. Bacterial metabolism | H.W.Doell/ 2 Ed. |
| 2. Bacterial metabolism | Gerhard Gottschalck |
| 3. Chemical microbiology (an introduction to microbial physiology) | A.H.Rose |
| 4. Metabolic pathways Vol. VI
Metabolic transport | Lowell E.Hokin (Ed.) |
| 5. Bacterial outer membranes Biogenesis & Fractions | Mass tori Inooye |
| 6. Principles of microbe & cell cultivation | S.John Pirt |
| 7. Continuous cultivation of microorganisms | Malek K.Beran |
| 8. Extreme environments mechanism of microbial | Milton |
| 9. The bacterial spore | Gould & Hurst |

Bios:204 - Biostatistics and Bioinformatics

Unit –I

- A. Introduction to Biostatistics; Use of biometrical methods in biological investigation.
- B. Statistical estimations, median, mean and mode,
- C. Types of probability distribution; (normal, binomial and poisson).
- D. Standard deviation, standard error, coefficient of variations.

Unit-II

- A. Parametric and non-parametric statistics, confidence interval, errors, levels of significance
- B. Chi square 2 x 2 contingency method, t test
- C. Coefficients of association & correlations.
- D. Linear regression
- E. Analysis of variance

UNIT-III

- A. Historical developments of Bioinformatics
- B. Scope of Bioinformatics
- C. Biological literature information access through internet
- D. General overview of Genomics and its applications
- E. General overview of Proteomics and its applications
- F. DNA Micro array
- G. Introduction to Bioinformatics tools and Software
- H. Information regarding Biological databases
 - i. Primary Sequence databases
 - ii. Metabolic pathway databases
 - iii. Protein sequence database
 - iv. Protein structure database

UNIT: IV

- A. Application of Bioinformatics in
 - i. Drug discovery and drug development
 - ii. Molecular medicine
 - iii. Personalization medicine
 - iv. Gene therapy
 - v. Forensic analysis
 - vi. Evolutionary studies
 - vii. Biodiversity

References

- | | |
|---|------------------------------|
| 1. Statistical methods in biology | Bailey M T.J. |
| 2. Statistics for biologists | Campbell R.C. |
| 3. Biostatistics | Arora P.N. & Malhan P.K. |
| 4. Biostatistics | Sai Subramanyam |
| 5. Principles of Bioinformatics | Shanmugavel P. |
| 6. Bioinformatics Databases, tools and algorithms | Orpita Basu & Simminder Kaul |
| 7. Fundamentals of Bioinformatics | Harisha S |
| 8. Bioinformatics | Murthy C.S.V |

Bios 203 – Organismic Physiology

Unit-I

- (1) Growth, Yield and characteristics, Continuous cultivation.
- (2) Strategies of cell division in bacteria
- (3) Stress response
- (4) Nitrogen fixation
- (5) Introduction to extreme forms of life

Unit-II

- (1) Light harvesting complexes
- (2) Mechanisms of electron transport
- (3) Photoprotective mechanisms
- (4) CO₂ fixation-C₃
- (5) C₄ and CAM pathways.
- (6) Bacterial photo synthesis

Unit-III

- (1) Biosynthesis
- (2) Storage
- (3) Breakdown and transport
- (4) Physiological effects and mechanisms of action.

Unit-IV

- (1) Blood corpuscles
- (2) Haemopoiesis and formed elements
- (3) Plasma function
- (4) Blood volume
- (5) Blood volume regulation
- (6) Blood groups
- (7) Haemoglobin
- (8) Immunity
- (9) Haemostasis.

Unit-V

- (1) Neurons
- (2) Action potential
- (3) Gross neuroanatomy of the brain and spinal cord
- (4) Central and peripheral nervous system
- (5) Neural control of muscle tone and posture

VEER NARMAD SOUTH GUJARAT UNIVERSITY
M.Sc. Biosciences Part-I (New under Semester scheme, 2010-11)

Teaching and Examination Scheme for Semester - I

Paper	Teaching Schedule Hrs./wk	University Exam Theory/practical		Internal Exam Theory/practical	Total Theory/Practical
		Duration (hrs.)	Mark		
<u>Theory</u>					
Bios 101 : Cell Biology	4	3	70	30	100
Bios 102: Genetics	4	3	70	30	100
Bios 103 : Gen.Physiology and Tiss culture	4	3	70	30	100
Bios 104 : Environmental Biology	4	3	70	30	100
<u>Practical</u>					
Bios 105 : Practical 1- Cell Biology and Genetics Practical II – Gen.Physiology and Tiss culture Practical III- Environmental Biology Bio 106 : Viva voce	3 x 3 = 9	2 x 5	140	60	200 100
TOTAL	25		420	180	700

VEER NARMAD SOUTH GUJARAT UNIVERSITY
M.Sc. Biosciences Part-I (New under Semester scheme)

Teaching and Examination Scheme for Semester - II

Paper	Teaching Schedule Hrs./wk	University Exam Theory/practical		Internal Exam Theory/practical	Total Theory/Practical
		Duration (hrs.)	Mark		
<u>Theory</u>					
Bios 201 : Biophysics and Instrumentation	3	3	70	30	100
Bios 202: Biochemistry	3	3	70	30	100
Bios 203 : Organism Physiology	3	3	70	30	100
Bios 204 : Biostatistics and Bioinformatics	3	3	70	30	100
<u>Practical</u>					
Bios 105 : Practical 1- Biochemistry Practical II – Organism Physiology Practical III- Biostatistics and Bioinformatics Bios 106 : Viva voce	6 x 2 = 12	2 x 5	140	60	200
TOTAL	24		420	180	700