



(For the candidates admitted from the academic year 2018-2019 onwards)

Semester	Course	Course Code	Title of the Course	Ins. Hours/ Weeks	Credit	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
I	Core Course – I	18MPMB1CC1	Research Methodology	6	4	3	25	75	100
	Core Course – II	18MPMB1CC2	Advanced Microbiology	6	4	3	25	75	100
	Core Course – III	18MPMB1CC3	Teaching and learning skills	6	4	3	25	75	100
	Core Course – IV	18MPMB1CC4	Paper on Topic of Research (The syllabus will be prepared by the Guide and the examination will be conducted by the COE)	6	4	3	25	75	100
				Total		<b>16</b>			
II	----	18MPMB2DW	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks		8				200
			Total		<b>8</b>				<b>200</b>
			Grand Total		<b>24</b>				<b>600</b>

**SEMESTER – I**  
**CORE COURSE I - RESEARCH METHODOLOGY**

**Course Code: 18MPMB1CC1**  
**Hours: 6**  
**Credit: 4**

**Total Marks: 100**  
**External Marks: 75**  
**Internal Marks: 25**

**Objectives**

- To learn the writing of scientific articles
- Importance of the advanced instruments and their simple operating procedure (SOP)
- To gain the knowledge on modern molecular techniques

**Unit I – Introduction of Research**

Research: Types, research process and steps in it, hypothesis, research proposals and aspects. Research design: need, problem definition, sampling procedures, variables, research design concepts, literature survey and review, research design process, errors in research. Research modeling: Types of models, model building and stages, data consideration and testing, heuristic and simulation modeling. Report writing: Pre-writing considerations, thesis writing, formats of report writing, formats of publications in research journals – JCI – impact factor and h-index.

**Unit II - Design of Experiments**

Design of experiments: Objectives, strategies, factorial experimental design, designing engineering experiments, basic principles - replication, randomization, blocking, guidelines for design of experiments. Single factor experiment: Hypothesis testing, analysis of variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, degrees of freedom, confidence interval; ANOVA for random effects model, estimation of variance components, model adequacy checking. Two factor factorial design, basic definitions and principles, main effect and interaction, response surface and contour plots, general arrangement for a two-factor factorial design; Models - effects, means and regression, hypothesis testing.

**Unit III – Advanced instrumentations**

GC-MS - HPLC - NMR, Fluorescence, Atomic Absorption, CD, ORD, Mass, Raman Spectroscopy – PFGE – MALDI-ToF, TEM and SEM

**Unit IV- Molecular and in-silico techniques**

Denaturing Gradient Gel Electrophoresis (DGGE), Terminal Restriction Fragment Length Polymorphism (T-RFLP), Amplified Ribosomal DNA and Restriction Analysis (ARDRA). Microbial sequence analysis. Preparation of ordered cosmid libraries, bacterial artificial chromosomal libraries, shotgun libraries and sequencing, conventional sequencing (Sanger, Maxam and Gilbert Methods), next-generation sequencing methods - Sequence analysis: Computational methods, homology algorithms (BLAST) for proteins and nucleic acids, open reading frames, annotations of genes, conserved protein motifs related structure / function (PROSITE, PFAM, Profile Scan). DNA analyses for repeats (Direct and inverted), palindromes, folding programmes. Use of Internet, public domain databases for nucleic acid and protein sequences (EMBL, GeneBank), database for protein structure (PDB).

**Unit V – Biosafety and IPR**

Biosafety levels – IBC – Institutional ethical committees – Good Laboratory Practices and Good Manufacturing Practices – regulations on rDNA products - commercialization – copy right – trademark - designs – royalty - Intellectual Property Rights and patent law – patent laws in India - WTO – Trade related aspects of Intellectual Property Rights – Patents – conditions for patentability – composition of a patent – patenting of microorganisms – Ethics in science reporting - Reproduction of published material – Plagiarism - Citation and acknowledgement.

**Text Book:**

1. Gurumani, N. (2007). Research Methodology. MJP Publishers, Chennai – 600 005.

**Reference Books:**

1. Krishnamurthy, K.V (2007) Scientometrics. BDU Journal of Science & Technology Vol.I (2) 153 – 168.
2. John G Webster (2004).Bioinstrumentation .Student edition, John Wiley &sons, Ltd.
3. Keith Wilson& John Walker (2003) Practical Biochemistry Principles-tech.5th edition, Cambridge university press.
4. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley)
5. Manual of patent practice and procedure. IPR India, 2005. Ministry of commerce and industry, New Delhi, pp.163.
6. Biotechnology and safety assessment, John.A.Thomas, 2004. pp.333

**SEMESTER – I**  
**CORE COURSE II - ADVANCED MICROBIOLOGY**

**Course Code: 18MPMB1CC2**  
**Hours: 6**  
**Credit: 4**

**Total Marks: 100**  
**External Marks: 75**  
**Internal Marks: 25**

**Objectives**

- To learn the genomics and their applications
- To provide a detailed knowledge of drug designing and microbial nanotechnology
- To understand the basic concepts of in-silico methods

**Unit I - Microbial Technology**

Production of useful products through microbial & recombinant microbes – insulin, vaccines, antibiotics, SCP (Spirulina & Mushroom) and Biofertilizers (Cyanobacteria, Azospirillum & VAM). Biodegradation of organic wastes and xenobiotic compounds – heavy metals, pesticides, insecticides. Microbial leaching. Microbial Biofuels - hydrogen production. Biodiesel - biodegradation of oils and petroleum products.

**Unit II – Genomics and metagenomics**

**Genomics:** Historical prospective and strategies of genomics. Genome Structure: genome sizes – microbial and organelle genome – genome physical mapping and sequencing – tools in genome analysis; Structural and functional annotations of genes and genomes. Human, plant, animal and microbial genomes. Human Microbiome project. **Metagenomics** – definition – principles – methods - whole genome shotgun sequencing – pyrosequencing – metagenomic library production – high throughput screening - Environmental Gene Tags (EGTs).

**Unit III – Proteomics**

Proteome - Primary attributes for protein identification - protein species of origin - Protein N- and C-terminal sequence tags - cross species protein identification - Modifications that influence protein change on 2-D PAGE - Detection and analysis of co- and post-translational modification – Applications of proteomics

**Unit IV – Drug designing**

Sources of Drugs - History of drug design, microbial drugs, *E. coli* as a source of recombinant therapeutic proteins. Expression of recombinant proteins in yeasts, animal cell culture systems. Additional production systems: Fungal production systems, transgenic animals, transgenic plants and Insect cell-based systems. Drug development process - Impact of genomics and related technologies upon drug discovery: Gene chips, Proteomics, Structural genomics and Pharmacogenetics. Drug manufacturing process - Guides to good manufacturing practice, Production of final product - Cell banking systems, Upstream processing, Microbial cell fermentation and Downstream processing.

**Unit V - Microbial nanotechnology**

Microbial nanotechnology – History, microbial synthesis of Nanoparticles. Synthesis of nanodrugs – metal nanoparticles and drug delivery vehicles – Nanoshells – Tectodentrimers Nanoparticle drug systems – Diagnostic applications of nanotechnology. Preparation of nanobiomaterials – Polymeric scaffolds collagen, Elastins: Mucopolysaccharides, proteoglycans, cellulose and derivatives; Dextrans; Alginates; Pectins; Chitin. Nanoparticles – types, functions – Silver, Gold and Titanium. Physical and chemical properties of nanoparticles.

**Text Book:**

1. Doolittle RF. (1990). Molecular evolution. Computer Analysis of Protein and Nucleic acid Sequences Methods in Enzymology. Academic Press, New York.

**Reference Books:**

1. Glick BR, Pasternak JJ (1998) Molecular Biotechnology - Principles and Applications of Recombinant DNA, ASM Press, Washington DC
2. Baxevanis AD and BFF Ouellette, Wiley O. (ed) (2001) Bioinformatics – A practical guide to the analysis of genes and proteins. Interscience, New York,
3. Povl Krogsgaard-Larsen, Ulf Madsen and Kristian Stromgaard. Textbook of Drug Design and Discovery, Fourth Edition, CRC press, 2009.
4. Primrose, Principles of Genome analysis. Blackwell Sciences.2003.

**SEMESTER – I**  
**CORE COURSE III - TEACHING AND LEARNING SKILLS**

**Course Code: 18MPMB1CC3**  
**Hours: 6**  
**Credit: 4**

**Total Marks: 100**  
**External Marks: 75**  
**Internal Marks: 25**

**Objectives**

- Acquaint different parts of computer system and their functions
- Understand the operations and use of computers and common accessories
- Develop skills of ICT and apply them in teaching learning context and research
- Appreciate the role of ICT in teaching, learning and research
- Acquire the knowledge of communication skill with special reference to its elements, types, development and styles
- Understand the terms communication Technology and Computer mediated teaching and develop multimedia / e-content in their respective subject
- Understand the communication process through the web
- Acquire the knowledge of Instructional Technology and its Applications
- Develop different teaching skills for putting the content across to targeted audience

**Unit I – Computer Application Skills**

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

**Unit II – Communication Skills**

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

**Unit III – Communication Technology**

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

**Unit IV – Pedagogy**

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

**Unit V – Teaching Skills**

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

**Text Book:**

1. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana

**Reference Books:**

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weert, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi

**SEMESTER – I**  
**CORE COURSE IV – GUIDE PAPER**

**Course Code: 18MPMB1CC4**  
**Hours: 6**  
**Credit: 3**

**Total Marks : 100**  
**External Marks: 75**  
**Internal Marks: 25**

**Name of the Supervisor:**

**Name of the Scholar:**

**Title of the Course:**

**Register Number:**