DR. H. S. GOUR VISHWAVIDYALAYA, SAGAR
(A CENTRAL UNIVERSITY)

M.Sc. Biotechnology: IV Semester Course
Curriculum: 2016 onwards

The two years Masters' program in Biotechnology will comprise of 4 semesters and the following components--

1. Core course
2. Elective course
3. Dissertation work

Minimum 80 credits are required for completion of the course.

Core course: Semester I, II & III will have four core courses which includes theory and practical. Each core course will carry 3 theory credits and practical will carry 1 credit. A student requires at least 60 credits from core course

Elective course: A student requires at least 20 credits from elective courses and should at least take one elective (Open elective) from outside the department.

Dissertation: The last semester IV will be a semester long dissertation course comprising of 15 credits.

Credits:

I Semester	II Semester	III Semester	Elective	IV Semester	Total
16	16	16	20	12	80

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Course Curriculum

Semester	Paper Code	Title of the Paper	Credit			
			L	T	P	C
	BIT C 121	Cell Biology	3	0	1	4
	BIT C 122	Biomolecules	3	0	1	4
	BIT C 123	Microbial Physiology and Genetics	3	0	1	4
	BIT C 124	Macromolecules & Basic Enzymology	3	0	1	4
	BIT E 125	Biofuel Technology	5	0	0	5
	BIT E 126	Scientific writing and presentation	4	0	1	5
	BIT E 127	Instrumentation	4	0	1	5
II	BIT C 221	Molecular biology	3	0	1	4
	BIT C 222	Computer Applications and Biostatistics	3	0	1	4
	BIT C 223	Biology of the Immune System	3	0	1	4
	BIT C 224	Biophysical chemistry	3	0	1	4
	BIT E 225	Lab based Project work	0	0	6	6
III	BIT C 321	Animal Biotechnology	3	0	1	4
	BITC 322	Genetic Engineering	3	0	1	4
	BIT C 323	Bioprocess Engineering and technology	3	0	1	4
	BIT C 324	Plant Biotechnology	3	0	1	4
	BIT E 325	Genomics and Functional Genomics	4	0	1	5
	BIT E 326	Plant Tissue Culture	4	0	1	5
	BIT E 327	Basic Virology	5	0	0	5
	BIT E 328	Bioinformatics	4	0	1	5
IV	BIT C 421	Semester long dissertation/Project work/Practical training/Field work and technical writing.	12 Credits			

BIT – Biotechnology
C - Core course
E - Elective
L - Lecture
T - Tutorial
P - Practical
C - Credits

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Semester - I

COURSE: BIT C 121 Cell Biology

L	T	P	C
3	0	1	4

UNIT I **Diversity of cell size and shape.** Cell theory. Structure of Prokaryotic and Eukaryotic cell. Structure and function: plasma membrane, Excitable properties of the plasma membrane. Transport across plasma membrane, cell wall, cellular organelles: nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles and chloroplast. Cell motility- cilia and flagella.

UNIT II **Techniques in cell biology:** Sub-cellular fractionation, microscopic techniques (light microscopy, electron microscopy, fluorescence and confocal microscopy, flow cytometry), cytochemical methods.

UNIT III **Cellular energy transactions:** Glycolysis, Krebs's cycle and respiration (role of mitochondria and chloroplast). Protein localization: synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast and peroxisomes.

UNIT IV **Cell signaling:** mechanisms of signal transduction, types of signal and response, cell surface and intracellular receptors, classes of cell surface receptors. Signal transduction via GPCRs. Receptor mediated endocytosis.

UNIT V **Cell division:** mitosis and meiosis, homologous recombination. Cell cycle- steps and control of cell cycle. Cancer and cell cycle. Development in drosophila: spatial and temporary regulation of gene expression.

Practicals

1. Observation of cells by light microscopy.
2. Staining of mitochondria
3. Staining of DNA and RNA
4. Cytochemical techniques
5. Observation of mitosis and meiosis.
6. Sub cellular fractionation.
7. Light, Electron, Fluorescence and Confocal microscopy.
8. Development of drosophila

Books

1. Molecular Biology of Cell, Alberts, B. *et.al.*
2. Molecular Cell Biology, Lodish *et.al.*
3. Cell and Molecular biology, E.D.P De Robertis
4. Developmental Biology, SF Gilbert, Sinauer Associates Inc.
5. Cell biology, Gerald karp.

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COURSE: BIT C 122 Biomolecules

L	T	P	C
3	0	1	4

UNIT I Acid, bases and buffers, pH, and pKa. Role of water. Covalent and non covalent bonds. Disulphide bridges. Types of biological molecules. Principles of thermodynamics, forms of energy in biological systems.

UNIT II Carbohydrates- classification and reactions. Lipids- classification, structure and functions. Glycolipids and phospholipids. Glyocproteins.

UNIT III Amino acids and peptides- classification, chemical reactions and physical properties. Proteins- classification and separation, protein primary, secondary, Tertiary and quaternary structure. Basic concept of protein folding. Folding-unfolding equilibrium and denaturation of proteins.

UNIT IV Concept of Photosynthesis, Calvin cycle and pentose phosphate pathway, Glycogen metabolism: synthesis and degradation, concept of Fatty acid metabolism

UNIT V Biosynthesis & metabolism of amino acids, nucleotides, membrane lipids and steroids

Practicals

1. Reactions of amino acids, sugars and lipids, including diagnostic tests.
2. Isolation, purity determination and quantization of Protein, DNA and RNA.
3. Quantization of proteins and sugars by spectrophotometric method.
4. Analysis of oils- iodine number, saponification value and acid number.

Books

1. Biochemical Calculations, Irwinn H. Segel, John Wiley and Sons Inc.
2. Biochemistry, D. Voet and J. G. Voet, J. Wiley & Sons.
3. General Chemistry, Linus Pauling, W.H. Freeman & Company.
4. Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work.
5. A Biologist's Guide to Principles and Techniques of Practical Biochemistry, K. Wilson & K. H. Goulding. ELBS Edition, 1986.
6. Tools of biochemistry by T. G. Cooper.

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COURSE: BIT C 123 Microbial Physiology and Genetics

L	T	P	C
3	0	1	4

UNIT I — The history and development of Microbiology, contribution of Leeuwenhoek, Pasture, Jenner, Koch. Microbial nutrition, Microbial growth: Culture media (Synthetic and complex), batch and continuous culture, Factors affecting microbial growth. Growth curve. Physical and chemical control of microorganisms.

UNIT II — Microbial metabolism and its importance: Anaerobic respiration, fermentation, chemolithotrophy, phototrophy, CO_2 fixation

UNIT III — Gene structure, mutation and mutagenesis: UV and chemical mutagens; types of mutations, methods of genetic analysis. Bacterial Genetic System: transposable elements, plasmids, transformation, conjugation, transduction, bacterial genetic map with reference to E. Coli.

UNIT IV — Etiology, prevention and cure of Microbial diseases: Tuberculosis, AIDS and Malaria. Antimicrobial agents, Antibiotics, Sulfa drugs, Antifungal drugs.

UNIT V — Applied microbiology: Microbiology of fermented food, probiotics, microorganisms used in industrial microbiology, major products of industrial microbiology

Practicals

1. Preparation of liquid and solid media for growth of microorganisms.
2. Isolation of pure culture from soil by serial dilution method.
3. Maintenance of organisms by plating, streaking, slants and stab cultures.
4. Preparation of glycerol stocks.
5. Growth, growth curve; measurement of bacterial population by turbidometry.
6. Microscopic examination of bacteria, yeast and molds.
7. Study of organisms by gram stain acid fast stain and staining for spores.
8. Assay of antibiotics and demonstration of antibiotic resistance.

Books

1. General Microbiology, Stainer, R. Y., Ingraham, J. L., Wheelis, M. L., and Painter, P. R. The McMillan Press Ltd.
2. Prescott's Microbiogy, Joanne M. Willey, Linda M. Sherwood. Christopher J. Woolverton. Eighth edition.
3. Microbiology, Pelczar, M. J., Jr. Chan, F. C. S., and Kreig, N. R., Tata- McGraw- Hill.
4. Microbial Genetics, Maloy, S. R., Cronan, J. E. Jr., and Friefelder, D. Jones and Bartlett Publishers.
5. Microbiological Applications (A Laboratory Manual in General Microbiology), Benson, H. J., W. C. B., Wm. C. Brown Publishers.

30.11.2016 30/4/16

COURSE: BIT C 124 Macromolecules & Basic Enzymology

L	T	P	C
3	0	1	4

UNIT I Nucleotides, DNA: Structure, types and functions. RNA: Structure, types and functions. Formation of complex macromolecular structures and Chromosome organization. Ribosome structure.

UNIT II Structure of molecular motors, ATP binding and hydrolysis. Actin and myosin assembly, Microtubules, flagellar movement.

UNIT III Enzymes: Structure and classification. Enzymes as biological catalysts. Isozymes, Vitamins and cofactors: structure, sources and biological properties. Ribozymes: structure and function.

UNIT IV Enzyme catalysis in solution, kinetics and thermodynamic analysis. Enzyme inhibition: competitive, non-competitive, allosteric inhibition. Catalytic strategies: making reactions easier, faster and specific.

UNIT V Enzymes regulation: feedback regulation, isozymes, covalent modification and proteolytic cleavage,

Practicals

1. Actin filaments visualization using confocal microscopy.
2. Electrophoresis of proteins-native and under-denaturing conditions.
3. Enzyme purification and kinetic analysis.
4. Methods for immobilization of enzymes.
5. Enzyme isolation from various tissues, precipitation methods for purification of enzyme proteins.

Books

1. The nature of Enzymology by R.L. Foster.
2. Enzymes by Dixon and Webb.
3. Fundamentals of Enzymology by Price and Stevens.
4. Enzyme catalysis and Regulaton by Hammes.
5. Enzyme Reaction Mechanisms by Walsch.
6. The enzymes vol I and II by Boyer.
7. Enzyme Structure and Mechanism by Alan Fersht.
8. Enzyme Assays: A Practical Approach by Eisenthal and Danson.

30.4.16

COURSE: BIT E 125 Biofuel Technology

L	T	P	C
5	0	0	5

UNIT I Introduction and history of Biofuels, energy units, terminologies. Energy security, renewable energy sources, types of biomass and available bioresources. Concept of first and second generation bioenergy. International regulations and recommendations.

UNIT II Overview of Biorefinery and Biomass Process. Biochemical Conversion Process, bioethanol production from 1st and 2nd generation biomass feedstocks. Biohydrogen and biomethane energy.

UNIT III Lignocellulosic bioethanol: current status and future perspectives. Techno-economic analysis of lignocellulosic ethanol Pretreatment technologies for lignocellulose-to-bioethanol conversion. Production of bioethanol from agroindustrial residues as feedstocks.

UNIT IV Production of biodiesel from vegetable oils: Biotechnological methods to produce biodiesel, Biodiesel production in supercritical fluids,

UNIT V Production of biofuels from algae. Production of biodiesel from algal biomass: current perspectives and future. Cultivation of algae in photobioreactors for biodiesel production.

Books

1. Biorenewable Resources: Engineering New Products from Agriculture by Robert C. Brown, Wiley-Blackwell.
2. Biomass for Renewable Energy, Fuels, and Chemicals by Donald Klass, Academic Press Publications.
3. Gasoline, Diesel and Ethanol Biofuels from Grasses and Plants by Ram B. Gupta and AyhanDemirbas, Cambridge University Press.
4. Biofuels Engineering Process Technology by Cave Drapcho, John Nghiem, and Terry Walker, McGraw Hill Publications.
5. Monica EK; GoranGellerstedt; Gunnar Henriksson 2007 Wood Chemistry and Wood Biotechnology (Publisher: Stockholm: KTH)

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COURSE: BIT E 126 Scientific writing and presentation

L	T	P	C
4	0	1	5

UNIT I Searching and reviewing scientific articles. Publishing in scientific journals.

UNIT II Art of scientific presentations. Powerpoint presentations, animations. Do's and Don'ts of presentations. Efficient speech.

UNIT III Making Posters. Presenting a poster in record time. Do's and Don'ts of posters.

UNIT IV Dissertation writing. Thesis writing. Article writing. Fellowship/scholarship application writing.

UNIT V Reading - understand scientific texts in science.

Practicals

1. Prepare a Power Point.
2. Deliver a scientific seminar.
3. Write a given assignment.

Books

1. Recent articles in science magazines.
2. Scientific Papers and Presentations: Navigating Scientific Communication in Today's World-Martha Davis, Kaaron Joann Davis, Marion Dunagan-2012.
3. Preparing and Delivering Scientific Presentations: A Complete Guide for International Medical Scientists-John Giba, Ramón Ribes-2011.

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COURSE: BIT E 127 Instrumentation

L	T	P	C
4	0	1	5

UNIT I Good lab practice and laboratory safety procedure. Preparation of solutions. General lab setup and waste disposal.

UNIT II Lab instruments: handling and principle of Autoclave, pH meter, CO_2 incubator, Biosafety cabinets, milliQ water purifier.

UNIT III Imaging science: Compound Microscope, Electron Microscope, Fluorescence Microscope and Confocal Microscope, scanning ion conductance microscope.

UNIT IV Analysis of biomolecules: UV transilluminator, PCR and RT-PCR DNA sequencer, FRET.

UNIT V Specialized instruments: Flow Cytometer, Fermentor, Patch-clamp.

Practicals

1. Study of various types of Microscope.
2. Sterilization by autoclave.
3. Cell fractionation by Centrifuge.
4. Separation of proteins by SDS-PAGE.
5. Study of DNA bands by Transilluminator.
6. Quantification of DNA by UV spectrophotometer.
7. DNA sequencing.
8. Demonstration of fermentation.

Books

1. Instrumental method of analysis, Wilard, Merritt, dean, Settle, Wadsworth publishing Company, USA.
2. Biochemical Engineering: Lee, J.M. Prentice Hall Inc.
3. Chemical Engineering problems in Biotechnology, Shuler, M.L. (Ed), AICHE.
4. Introduction to Biomedical Equipment Technology (5th ed), Joseph J. Carr and John M. Brown, Addison Wesley Longman (Singapore).
5. Principals of Fermentation Technology, Stanbury, P.F. and Whitaker, A., Pergamon press Oxford.

30.4.2016

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Semester – II

COURSE: BIT C 221 Molecular biology

L	T	P	C
3	0	1	4

UNIT I Introduction to Molecular Biology and Genetics. Flow of genetic information. Anatomy of gene, gene structure of prokaryotes and eukaryotes. Genome organization.

UNIT II DNA Replication: Prokaryotic and Eukaryotic DNA replication, enzymes and accessory proteins involved in DNA replication. DNA repair and recombination.

UNIT III Transcription: Prokaryotic and Eukaryotic transcription, RNA polymerase. Transcription factors, regulatory elements and mechanisms of transcriptional regulation. Alternative splicing. Modification in RNA: 5'-Cap formation, transcription termination, 3-end processing and polyadenylation, splicing, editing, nuclear export of mRNA, mRNA stability.

UNIT IV Translation: Prokaryotic and Eukaryotic translation, translation machinery, mechanisms of initiation, elongation and termination, regulation of translation. Co-and post-translation modification in proteins.

UNIT V Control of gene expression in Prokaryotes: DNA binding proteins, posttranscriptional control of gene expression. Control of gene expression in Eukaryotes: enhancers, chromatin remodeling, posttranscriptional control of gene expression. Antisense RNA.

Practicals

1. Isolation of genomic DNA.
2. Visualization of DNA using EtBr.
3. Restriction digestion of genomic DNA.
4. Plasmid DNA isolation.
5. Electrophoresis of DNA- linear, circular and super coiled plasmid.
6. Plasmid restriction map.
7. RFLP and RAPD
8. In vitro transcription.
9. Western blotting.

Books

1. Gene IX, Benjamin Lewin, Oxford University press Inc. New York.
2. Cell and Molecular Biology: Concepts and Experiments, 4th Edition, Gerald Karp, John Wiley & sons Inc. San Francisco, CA.
3. Molecular cell Biology: Lodish, Berk, Matsudaira, Kaiser, Krieger, Scott, Zipursky, and Darnell, W.H. Freeman & Co.

COURSE: BIT C 222 Computer Applications and Biostatistics

L	T	P	C
3	0	1	4

UNIT I Introduction to biostatistics. Types of data. Types of variables. Tabulation of data and its graphical representation. Measures of central tendency and dispersion: Mean, median, mode, range, standard deviation, and variance.

UNIT II Two types of errors and level of significance, tests of significance (F and t test, chi- square tests). Simple linear regression and correlation. Use of linear regression in biological experiments.

UNIT III Introduction of digital computers: organizations; low-level and high- level and languages. Binary number system. Binary to decimal and decimal to binary conversion. Introduction to internet and various search engines and their applications.

UNIT IV Introduction to data structures and database concepts. Introduction to MS- office software, covering word processing, spreadsheets and presentation software.

UNIT V pDRAW32 DNA analysis software and Graphpad Prism statistical software. Computer- oriented statistical techniques: Frequency table of single discrete variable. Bubble sort through excel, computation of mean, variance and standard deviation; t-test, correlation coefficient, Anova analysis.

Practicals

1. Tabulate and present graphs in excel.
2. Using excel to do simple maths on data tables.
3. Calculate descriptive statistics through excel.
4. Calculate regression and correlation through excel.
5. MS word, powerpoint and excel operation.
6. Statistical tests through excel (t-test)
7. pDraw32 DNA analysis software operation.
8. How to download and install softwares from internet.
9. Sorting lowest to highest and highest to lowest in excel (bubble sort).

Books

1. Introduction to biostatistics. S.chand publishers
2. Statistical methods- G.W. Snedeear & W.G. Cochran Affiliated East – West press & Iowa state University press.
3. Statistical methods in biology, T.N. Bailley, English Language Book society & The English University press ltd.
4. Statistics: Theory and practical problems, D.N. Elhance and P.N. Elhance, Vol. I&II, Kitab Mahal, Allahabad.
5. Computer Fundamentals, P.K. Sinha. BPB publications.

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COURSE: BIT C 223 Biology of the Immune System

L	T	P	C
3	0	1	4

UNIT I Introduction. Cells and organs of the immune system. Innate immunity: anatomical barriers, soluble molecules and membrane associated receptors, cell types of innate immunity, Antigen, Immunogen, Hapten.

UNIT II Structure of antibody, antibody mediated effector functions, classes of antibodies, antigenic determinants. Monoclonal antibodies: production and applications. Generation of antibody diversity. Antibody engineering.

UNIT III Antigen-Antibody interactions: principles and applications. Complement activation and its biological consequences. Major histocompatibility complex (MHC). MHC and disease susceptibility. Antigen-presenting cells.

UNIT IV T-cell receptor (TCR): experiments demonstrating self MHC restriction of TCR, TCR complex, T-cell accessory membrane molecules. T-cell maturation in thymus, T-cell activation and differentiation. B-cell maturation, activation and proliferation. Humoral response.

UNIT V Cytokines, Cytokines related diseases and therapies. Cell mediated cytotoxicity: Mechanism of T-cell and NK cell mediated cytotoxicity, antibody – dependent cell mediated cytotoxicity. Tolerance and autoimmunity: organ-specific and systemic autoimmune diseases. Immune response to infectious diseases. Immunodeficiencies.

Practicals

1. Blood film preparation and identification of cells.
2. Isolation of WBCs using density gradient centrifugation
3. ELISA.
4. Lymphoid organs and their microscopic organization.
5. Radial immunodiffusion
6. immuno-electrophoresis.
7. Immunodiagnostics (demonstration using commercial kits).

Books

1. Kuby Immunology, 5e, Goldsby *et al* (Freeman).
2. Immunology: An Introduction, 4e, Ian R. Tizard, Saunders college Publishing, Texas (US).
3. Immunology- A short Course, 4e – Eli Benjamin, Richard Coico, Geoffery Synshine (Wiley-Liss).
4. Fundamentals of Immunology, William Paul.
5. Immunology, by Roitt and Others.

11.2016

COURSE: BIT C 224 Biophysical chemistry

L	T	P	C
3	0	1	4

UNIT I Concept of electrolytes, basic techniques of centrifugation, preparative and analytical centrifugation, Microscopy: Phase contrast, oonfocal, fluorescence, scanning & transmission electron microscopy.

UNIT II Spectroscopic techniques: Principle of spectroscopy (emission and absorbance), Visible, UV and X-ray crystallography, Spectroflourimetry, atomic absorption and fluorescence spectroscopy, NMR and ESR spectroscopy

UNIT III Chromatography, planar and column chromatography), paper chromatography, TLC, HPLC, LC-MS & MALDI-TOF

UNIT IV Electrophoresis: Polyacrylamide gel electrophoresis (PAGE), agarose gel electrophoresis, native PAGE, 2D electrophoresis, Isoelectric focusing (IEF).

UNIT V Blotting: Principles, types of blotting techniques, Southern, Northern, Western, Immunoblotting, Basic concept of nucleic acid sequencing & PCR method. Probe preparation.

Practicals

1. Separation by Chromatography.
2. Analysis of DNA and protein by electrophoresis.
3. Quantitative analysis of nucleic acid by spectrophotometer.
4. Measurement of bacterial population by turbidometry and photometry.
5. Agarose gel electrophoresis based experiments.
6. PCR and gel documentation techniques.

Books

1. Principles and techniques of biochemistry and molecular biology: Wilson and Walker.
2. Chemical Engineering problems in Biotechnology, Shuler, M.L. (Ed), AICHE.
3. Introduction to Biomedical Equipment Technology (5th ed), Joseph J. Carr and John M. Brown, Addison Wesley Longman (Singapore).
4. Instrumental method of analysis, Wilard, Merritt, dean, Settle, Wadsworth publishing Company, USA.
5. Principals of Fermentation Technology, Stanbury, P.F. and Whitaker, A., Pergamon press Oxford.

30.4.2016

30-04-2016

COURSE: BIT E 225 Lab based project work

L	T	P	C
0	0	6	6

The purpose of the course is to improve the student's ability to apply basic concepts and knowledge through laboratory based project work. The course will comprise of a mini project to solve or address a simple question or to improve/develop expertise of a particular technique through hands on experiments and generate data. The data will be interpreted and submitted as a project report and also be presented.

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Ph. D. COURSE SYLLABUS

DEPARTMENT OF BIOTECHNOL

2016 Onwards

SCHOOL OF BIOLOGICAL SCIENCES

DR. HARISINGH GOUR UNIVERSITY

SAGAR-470003 M. P.

30.4.2016

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30-04-2016

Ph. D. Course Work: Minimum of 24 credits should be completed as follows in one semester

Paper	Code	Title	Credits
Paper I	BIT C 501	Research Methodology	4
Paper II	Core Course BIT C 502	Instrumentation	4
Paper III	Elective Course One (1) BIT E 503 (2) BIT E 504	Biotechnology Techniques and Applications Cell and Molecular Biology	4
	BIT C 505	Review of Published Research	8
		Total	20

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Code BIT C 501 Title: Research Methodology

Total Credits: 6 credits

(Instructor: Dr. C.P. Upadhyay & Dr. Rajneesh Anupam)

Course content:

1) Good laboratory practices and safety regulations
2) Research ethics and conduct
3) Selecting and designing research topic
4) Essentials of experimental designing, preparation of protocols and their validation
5) Designing of robust assays and their significance
6) Data collection, analysis and interpretation
7) Data presentation and statistical analysis

Practical will be based on the theory content

Core Course Code BIT E 502 Title: Instrumentation

Total Credits: 6 credits

(Instructor: Dr. C. P. Upadhyaya)

Course content:

1) pH determination
2) Spectrometry
3) Chromatography
4) Electrophoresis
5) Centrifugation
6) Gene sequencing
7) Proteomics
8) Microscopic techniques
9) Blotting techniques
10) ELISA
11) Flow cytometry

Practical will be based on the theory content

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Elective Course Code BIT E 503 Title: Biotechnology Techniques & Applications

Total Credits: 6 credits

(Instructor: Dr. R. Anupam)

Course content:

1) Brief introduction and history of Biotechnology
2) Concept of recombinant DNA technology particularly in molecular cloning
3) Tissue culture techniques: plant and animal
4) Animal biotechnology: transgenic and knockout animals, animal disease models and animal model systems
5) Plant biotechnology: Development of transgenic plants and their application in various areas
6) Applications of biotechnology

Practical will be based on the theory content

Elective Course Code BIT E 504 Title: Cell and Molecular Biology

Total Credits: 6 credits

(Instructor: Dr. S. K. Jain)

Course Content

1) Introduction to genetic material, genes and gene products and functions
2) Investigating protein interactions
3) RNA structure-function studies
4) Cancer biology
5) siRNA technology
6) Southern, Northern and Western blotting
7) Current trends in molecular and cell biology

Practical will be based on the theory content

Code BIT C 505 Title: Review of Published Research

Total Credits: 6 credits (Instructor: Prof. S. K. Jain)

The student will prepare a draft of a review under the supervision of a teacher allotted.

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