Jaypee Institute of Information Technology

B.Tech. Biotechnology

Semester IV

Course Descriptions

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11BT411	**Semester Even (specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month from** January to June
Course Name	Introduction to Bioinformatics		
Credits	4	**Contact Hours**	**LTP 3 1 0**

Faculty (Names)	**Coordinator(s)**	DrChakresh Kumar Jain
	Teacher(s) (Alphabetically)	DrChakresh Kumar Jain

COURSE OUTCOMES		**COGNITIVE LEVELS**
C213.1	Summarize biological databases, storage and retrieval methods, file formats	Remembering(C1)
C213.2	Explain Bioinformatics resources, computational tools and associated algorithms	Understand Level (C2)
C213.3	Apply the bioinformatics concepts in genomics, proteomics and Drug discovery.	Apply Level(C3)
C213.4	Analyze evolutionary tree to understand evolutionary genetics	Analyze Level(C4)
C213.5	Compare sequence alignment tools to predict structures & functions of gene, RNA and proteins	Evaluate Level(C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Biological data and Internet	Network terminologies, Introduction to Bioinformatics, Information flow, Scope of Bioinformatics, Growth of databases, genome sequencing, basics of internet, www, IP address, domain, Network-based services (Cloud & Grid	5

		Computing).	
2.	Biological sequence data bases	Basics of Database designing and modeling, Designing policies, File formats (FASTA, PIR, Genbank), data storage, retrieval, Genbank, Swissprot, PIR, PDB, Pfam, KEGG, Brenda	6
3.	Sequence analysis (Sequence, retrieval, methods, substitution matrices, submission and analysis)	String comparison (substring, subsequences) , Hamming and Levenshtein distance, Sequence alignment (pair wise, multiple) Dot plot method, Dynamic programming, Needleman–Wunsch *and* Smith–Waterman algorithm, BLAST algorithm ,FASTA algorithm comparison, PSI blast, gap penalty, e-value, statistical importance, PAM and BLOSUM matrices, log odd score, Sequence submission tools (Banklt, Sequin)	10
4.	Gene predictions, promoter analysis and genome analysis tools	Gene structure (prokaryotes and eukaryotes), Genscan, Grail, Genemark, promoter region identification, promoter signals, repeats and identification in genome and computational tools	6
5.	RNA and protein structure predictions	RNA sequence and structures (secondary), Non-coding RNAs Primary, Secondary and Tertiary structure prediction , protparam, Chou–Fasmanalgorithm, GOR method, Concepts of structural modeling and tools (Comparative homology modeling, Threading),	4
6.	Phylogenetic analysis	Phylogeny, Phyloegenetic reconstruction distance matrix, types of trees, Rooted un-rooted, distance based methods (UPGMA, FM, NJ Methods), Character based methods (Parsimony method, Maximum likelihood method), tree evaluation, (bootstrapping, Jackknifing), Substitution models (Juke-Cantor, Kimura-2 parameter), Issues in Phylogenic Reconstruction, Biological inferences.	5
7.	Tools for proteome studies	AAcompldent, SOPMA PHD, ANOLEA, Transmembrane protein prediction tools	2
8.	Pharmacogenomics and comparative , Functional Genomics	Introduction of pharmacogenomics, comparative and functional genomics, microarray analysis, NGS and systems biology	4
		Total number of Lectures	**42**
Evaluation Criteria **Components**		**Maximum Marks**	

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment 1, MCQ, Presentations, Viva)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Attwood T.K. & Smith Parry., "Introduction to Bioinformatics", Benjamin Cummings, 2001
2.	BaxevanisA., D & Ouellette "Bioinformatics A practical guide to analysis of genes and protein", Wiley-Interscience, 1998.
3.	David Mount "Bioinformatics: Sequence and Genome analysis", Cold Spring Harbor Laboratory Press, 2001.

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11BT413	**Semester** Even **(specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month** fromJanuary to June
Course Name	Bioprocess Engineering		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Sudha Srivastava
	Teacher(s) (Alphabetically)	Dr.GarimaMathur Dr.Sudha Srivastava

COURSE OUTCOMES		**COGNITIVE LEVELS**
C215.1	Explain design, principle and working of bioreactors	**Understand Level (C2)**
C215.2	Apply the principles of microbial growth kinetics in bioreactor	**Apply Level (C3)**
C215.3	Analyze mixing operations, mass and heat transfer in bioreactor	**Analyze Level (C4)**
C215.4	Compare culture and sterilization methods for industrial scale operations	**Evaluate Level (C5)**
C215.5	Evaluate the suitability of a given bioreactor for bioproduct development.	**Evaluate Level (C5)**

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Microbial Process Development	Cell growth kinetics, Monod's kinetics, substrate utilization kinetics, Introduction to Upstream & Downstream processes, Batch, fed-batch and continuous cultivation processes, Enzyme Kinetics	6
2.	Bioreactor Systems incuding Utilities	Types of bioreactors and their applications, Cardinal Rule of bioreactor Design, Utilities of bioreactors, design	5

		equation for maximum biomass production	
3.	Fluid Flow and Mixing	Mixing, power consumption and shear properties of rushton turbine, helical, anchor, bubble column, external loop, airlift etc. Axial and radial flow of liquid in bioreactor.	5
4.	Mass transfer	Oxygen uptake in cell culture, Oxygen transfer in Fermenters, Measurement of dissolved-oxygen concentrations, Estimation of oxygen solubility, Mass-transfer correlations, Measurement of k_l a & Oxygen transfer in large Vessels, scale up of bioprocesses. Heat transfer Kinetics	8
	Sterilization	Air and Media sterilization: Thermal death of micro-organisms, Batch and continuous sterilization of media, Design of sterilization equipment (deterministic *vs* probabilistic approach), techniques of air sterilization, air sterilization by fibrous material.	6
	Bioreactor analysis	Ideal reactors for kinetics measurements (batch, fed batch & CSTR), Ideal rectors, Non-ideal rectors (airlift), Immobilized enzyme and cell reactor, multiphase bioreactors	6
	Case studies related applications in various biotech and biopharma industries	Process technology for production of primary metabolites, such as baker's yeast, ethanol, citric acid, amino acids, polysaccharides and plastics. Microbial production of industrial enzymes- glucose isomerase, cellulase, amylase, protease etc.. Production of secondary metabolites-penicillins and cephalosporins, Production of therapeutic proteins: Monoclonal antibodies, viral vaccines	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Class Test)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Doran, P.M., "Bioprocess Engineering Principles"
2.	Biochemical Engineering Fundamentals, Bailey and Ollis McGraw-Hill Education
3.	Stanbury P. F., Whitaker A and Hall S. J. "Principles of Fermentation Technology "Butterworth-Heinemann; 2nd edition 1994.
4.	Aiba, S., Humphrey, A.E., and Millis, N.F. " Biochemical Engineering". University of Tokyo Press.
5.	Scragg, A.H., "Bioreactors in Biotechnology: A practical approach", Ellis Horwood Publications.

Detailed Syllabus

Lecture-wise Breakup

Course Code	**15B11BT414**	**Semester** Even	**Semester** IV **Session** 2018 -2019 **Month from** January to June
Course Name	Immunology		
Credits	4	**Contact Hours**	6

Faculty (Names)	**Coordinator(s)**	DrShalini Mani
	Teacher(s) (Alphabetically)	DrRachna, DrShalini Mani

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO216.1	Differentiate between innate & adaptive immunity and explain the role of cells as well organs of immune system.	Understand level (C2)
CO216.2	Compare different antigens, immunogens, antibodies as well as their interactions and regulations	Understand level(C2)
CO216.3	Identify the inappropriate immune response in autoimmunity, hypersensitivity, immunodeficiency and infectious disease.	Apply level (C3)
CO216.4	Analyze different techniques based on antigen-antibody interactions and their use in diagnostics and therapeutics.	Analyze level (C4)
CO216.5	Apply the concepts of immunology in vaccine designing and production of monoclonal antibodies	Apply level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Basic immunology	Historical perspectives, Cells and organs of the immune system	3
2.	Types of immunity	innate and acquired immunity	3

3.	Antigens	Immunogenicity, antigenicity, epitopes, haptens, mitogens	2
4.	Immunoglobins : structure and function	Basic structure and fine structure of Igs, immunoglobin classes, hybridoma technology, antibody engineering	4
5.	Antigen- antibody interactions	Theory, cross reactivity, precipitation reactions, agglutination reactions, RIA, ELISA, Western blotting, immunofluorescence	4
6.	B cell and T cell receptor	Organization and expression of immunoglobulin genes : Generation of antibody diversity, class switching, T cell receptor complex, TCR coupled signaling pathways, co-stimulatory signals	**5**
7.	Major histocpmatibility complex (MHC) and HLA	General organization and inheritance of MHC, structure of MHC class I and II molecules, peptide binding by MHC molecules, MHC and susceptibility to disease, Tissue and organ transplantation	**3**
8	Regulation of immune response and immunological tolerance	Cytosolic and endocytic pathway, Responses in humoral and cell mediated branch and immunological tolerance	2
9	Immune effector mechanisms	Complement system, Cytokines	3
10	Autoimmunity	Types of autoimmune diseases	2
11	Hypersensitivity reactions	Type I, II, II and IV, hypersensitivity reactions	2
12	Vaccines	Types, active and passive immunization	3
13	Immune response to infectious diseases and tumor immunity	Viral, bacterial, protozoan diseases, parasitic infections	4
14	Immunodeficiency diseases	Primary and secondary immunodeficiency diseases, Acquired immunodeficiency syndrome (AIDS)	2
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (assignment, class test, quiz, case study)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	***Immunology (3rd edition),*** *Janus Kuby, W.H. Freeman and company*
2.	**Essentials of Immunogy** Ivan- roit; 6th edition (1988); Blackwell Publ
3.	**Antibodies A laboratory Manual** Harlow and David Lane, Old spring Harbor Laboratory
4.	**Immunology – A Short Course**, Richard Coico, *et al*. 5th Ed., Wiley – Liss, 2003.
5.	**Immunology, 4th Ed** Richard Hyde. Lippincott Wilkins & Wilkins, 2000.
6.	**Microbiology & Immunology Online.** Richard Hunt. Univ South Carolina, School of Medicine, http://pathmicro.med.sc.edu/book/immunol-sta.htm

Detailed Syllabus

Lab-wise Breakup

Course Code	15B17BT471	**Semester Even (specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month from** July to December
Course Name	Bioinformatics Lab		
Credits	**1**	**Contact Hours**	**LTP 0 0 2**

Faculty (Names)	**Coordinator(s)**	DrChakresh Kumar Jain
	Teacher(s) (Alphabetically)	DrChakresh Kumar Jain

COURSE OUTCOMES		**COGNITIVE LEVELS**
C273.1	Outline various computers hardware, operating system databases, storage and retrievals, file formats.	Understand Level (C2)
C273.2	Apply the bioinformatics tools in homology search, genome annotation, repeat masking, gene prediction, promoter analysis.	Understand Level (C2)
C273.3	Test for evolutionary relationship using sequence analysis and Phylogenetic tree	Apply Level(C3)
C273.4	Predict structure and function of DNA, RNA and protein	Analyze Level(C4)
C273.5	Compare the existing tools to address the biological problems	Evaluate Level(C5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Bioinformatics Resources and databases	To explore NCBI and its resources	CO1
2.	Bioinformatics Resources and databases	To use literature mining tool such as PubMed, Google Scholar & Citation Manager	CO1
3.	Computer environment and	To explore and understand the operating system (LINUX)	CO1

	network		
4.	Computer environment and network	To retrieve the sequences from FTP Sites. Perform Web-based Repeat Masker.	CO2
5.	Genomics	To identify the “open reading frames (ORF’s)" and genes in the given genomic sequence using ORF finder and Genscan.	CO2
6.	Genomics	Study the repeats, invert sequences and sequence alignment using alignment tools (Dotplot).	CO3
7.	Genomics	Global and Local alignment of two sequences using Needle N and Smith Waterman algorithm.	CO3
8.	Genomics	To perform pairwise and multiple sequence alignment using CLUSTAL W and BLAST.	CO3
9.	Genomics	To study the physiochemical properties of the residual sequences using computational method/Tools Prot-Param, CATH, Pfam.	CO4
10.	Phylogenetic	To find the evolutionary relationship and analyze changes in an organisms using PHYLIP.	CO3
11.	Proteomics	To perform structure modelling using Swiss Model	CO4
12.	Proteomics	To perform advance proteomics based (Mass spectrometry) experiment using computational tools.	CO4
13.	Proteomics and structural biology	To perform macromolecular structural analysis using RASMOL/ SWISS PDB viewer	CO5

Evaluation Criteria

Components	**Maximum Marks**
Mid Viva (Written exam)	20
Final Viva (Written exam)	20
D2D (Report/Attendance/Experiment)	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Baxevanis, Andreas D., and BF Francis Ouellette. *Bioinformatics: a practical guide to the analysis of genes and proteins*. Vol. 43. John Wiley & Sons, 2004.
2.	J. Dudley and A. Butte, "A Quick Guide for Developing Effective Bioinformatics Programming Skills", *PLoS Computational Biology*, vol. 5, no. 12, p. e1000589, 2009.

Detailed Syllabus

Lab-wise Breakup

Course Code	15B17BT472	**Semester** Even **(specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month from** January to June
Course Name	Genetic Engineering Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Vibha Gupta
	Teacher(s) (Alphabetically)	Ms. Ekta Bhatt Prof. Krishna Sundari Prof.NeerajWadhwa Dr.Shalini Mani Dr. Sujata Mohanty Dr.Susinjan Bhattacharya Dr.Vibha Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
C274.1	Demonstrate good lab practices, equipment handling and biosafety related to Genetic Engineering.	Understand Level (C2)
C274.2	Explain and perform nucleic acid isolation and purification.	Understand Level (C2)
C274.3	Develop an ability to conduct basic gene cloning experiments.	Apply Level (C3)
C274.4	Analyze and troubleshoot the experimental outcomes.	Analyze Level (C4)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Laboratory safety guidelines	General rules for safe handling of instruments and hazardous chemicals, Preparation of culture media and stock buffers	1
2.	DNA isolation	Genomic DNA isolation from Bacterial cells – *E.*	2 & 4

		coli(DH5α strain); Isolation of plasmid DNA (mini-prep method) by alkaline lysis	
3.	Purification and analysis of DNA	Paper chromatography for estimation of nucleotide content of prepared genomic DNA ; Agarose gel electrophoresis of isolated genomic DNA; DNA extraction and purification from agarose gels ; Quantitative analysis of isolated plasmid DNA by UV spectrophotometer	2 & 4
4.	Cloning a gene in suitable vector	Preparation of chemically competent *E. coli* (DH5α) cells by $CaCl_2$ method; Transformation of competent cells with plasmid DNA; Restriction Enzyme digestion of insert and vector DNA; Ligation of insert and vector DNA; Screening of recombinants	3 & 4
		Total number of labs = 12	

Evaluation Criteria

Components	**Maximum Marks**
Mid-Semester lab-viva/ test	20
End-Semester lab-viva/ test	20
Day to Day performance	45
(Learning laboratory Skills and handling Laboratory Equipments, attendance)	
Laboratory record	15
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Sambrook J. and Russell D, *Molecular cloning: A laboratory manual*, 3rd edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York, 2001.
2.	Sambrook J., Fritsch E.F., and Maniatis T, *Molecular cloning: A laboratory manual*, 2nd edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York. 1989.
3.	Frederick M. Ausubel et al. *Current protocols in molecular biology* Publisher: John Wiley & Sons, New York, 1994.

4.	Stefan Surzycki. *Basic techniques in molecular biology,* Publisher: Berlin Springer, 2000.
5.	David D. Moore et al..*Short Protocols in Molecular Biology: A Compendium of Methods from Current Protocols in Molecular Biology,* Publisher: John Wiley & Sons, New York, 2002.

Detailed Syllabus

Lab-wise Breakup

Course Code	15B17BT473	**Semester** Even **(specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month from** January to June
Course Name	BIOPROCESS ENGINEERING LAB		
Credits	3	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Dr. Susinjan Bhattacharya
	Teacher(s) (Alphabetically)	Dr.AshwaniMathur Dr.GarimaMathur Dr.Sudha Srivastava Dr.Vibha Rani

COURSE OUTCOMES		**COGNITIVE LEVELS**
C275.1	Demonstrate design, principle and operation of bioreactors	Understand Level (C2)
C275.2	Identify the effect of culture conditions on cell growth / death kinetics	Apply Level(C3)
C275.3	Apply knowledge of heat transfer and fluid dynamics in bioprocess operation	Apply Level(C3)
C275.4	Distinguish between different modes of operating bioreactors and demonstrate variation in substrate and product yield	Analyze Level(C4)

Module No.	**Title of the Module**	**List of Experiments**	**CO**

1.	Bioreactor	To study parts of Bioreactor	CO1
2.	Bioreactor	To study sterilization of Bioreactors	CO1
3.	Microbial Growth Kinetics	To study the effect of process parameters on bacterial growth kinetics	CO2
4.	Microbial Growth Kinetics	To estimate residual reducing sugar in broth using DNS Assay Method	CO2
5.	Death Kinetics	To estimate Thermal Death Point of a bacterial culture	CO2
6.	Death Kinetics	To estimate Thermal Death Time of a bacterial culture	CO2
7.	Heat Transfer	Efficiency of co-current and counter current Heat Exchanger	CO3
8.	Heat Transfer	Effect of flow rate on Heat Exchanger efficiency	CO3
9.	Fluid Dynamics	To estimate relative viscosity of liquid using Oswald's Viscometer	CO3
10.	Preparation of immobilized enzyme system	Immobilization of enzyme on activated charcoal by adsorption	CO4
11.	Mode of Operating Bioreactor	To study efficiency of immobilized enzyme in batch mode	CO4
12.	Mode of Operating Bioreactor	To study efficiency of immobilized enzyme in fed-batch mode	CO4
13.	Mode of Operating Bioreactor	To study efficiency of immobilized enzyme in continuous mode	CO4

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Viva	20
End Term Viva	20
Day to Day	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Doran, P.M., "Bioprocess Engineering Principles"
2.	Biochemical Engineering Fundamentals, Bailey and Ollis McGraw-Hill Education
3.	Stanbury P. F., Whitaker A and Hall S. J. "Principles of Fermentation Technology "Butterworth-Heinemann; 2nd edition 1994.

Detailed Syllabus

Lab-wise Breakup

Course Code	15B17BT474	**Semester** Even	**Semester** 5 **Session** 2018 -2019 **Month from**January to June
Course Name	Immunology Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	DrRachana
	Teacher(s) (Alphabetically)	Ms. Manisha Singh, Dr.Priyradarshini, Dr ReemaGabrani, Dr Smriti Gaur

COURSE OUTCOMES		**COGNITIVE LEVELS**
C474.1	Understand and learn skills for purification of antibody for experimental procedures.	C2
C474.2	Demonstrate relationship between different antigens using basic immunological techniques.	C2
C474.3	Apply immunological techniques for quantifying antigen/ antibody in the given sample.	C3
C474.4	Apply basic knowledge and skills of immunological principles and techniques for diagnostic assays.	C3

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Purification of antibody	Ammonium sulphate precipitation of crude immunoglobulins from serum.	C276.1
2.	Purification of antibody	Desalting of crude precipitated immunoglobulin by dialysis.	C276.1
3.	Purification of antibody	Chromatographic separation of immunoglobulin using DEAE-cellulose columns.	C276.1
4.	Purification of	Quantification of amount of immunoglobulin at different	C276.1

	antibody	steps of its purification.	
5.	Quantification of antigen/ antibody concentration	Quantification of antibody concentration using Precipitin assay.	C276.3
6.	Quantification of antigen/ antibody concentration	Quantification of antibody concentration using Single Radial Immuno Assay (SRID)/Mancini's test.	C276.3
7.	Demonstrate relationship between different antigens	Demonstrating relationship among the antigens using Ouchterlony Double Diffusion Assay (ODD).	C276.2
8.	Demonstrate relationship between different antigens	Analysing antigens from their complex mixture (serum) using Immunoelectrophoresis.	C276.2
9.	Principles of diagnostic assays	Demonstrate the presence of antigen in the given sample by using latex agglutination assay.	C276.4
10.	Principles of diagnostic assays	Detecting presence of antigen using DOT-BLOT ELISA, the basic principle behind pregnancy and other diagnostic kits.	C276.4
11.	Principles of diagnostic assays	Demonstrating the principle and functioning of pregnancy kit.	C276.4
12.	Principles of diagnostic assays	Determining the presence and concentration of antibody/antigen in the sample using ELISA, the basic technique behind various diagnostic tests.	C276.4

Evaluation Criteria

Components	**Maximum Marks**
Lab Record	15
Performance based test	15
Mid term viva voce	20
End term viva voce	20
Day to day evaluation	20
Attendance	10
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	J.A Owen, J.Punt, S. A. Stanford, P. P Jones, Janus Kuby Immunology (7^{th} edition), W.H. Freeman and company, 2009
2.	Harlow and D.Lane, Edward A. Greenfield Ed, Antibodies: A laboratory Manual, 2^{nd} edition Old spring Harbor Laboratory, 2014

Detailed Syllabus

Lecture-wise Breakup

Course Code	**15B11BT412**	**Semester** Even **(specify Odd/Even)**	**Semester** IV **Session** 2018 -2019 **Month from** January to June
Course Name	**Molecular Biology& Genetic Engineering**		
Credits	3	**Contact Hours**	3
Faculty (Names)	**Coordinator(s)**	1.Dr. Vibha Rani	
	Teacher(s) (Alphabetically)	1. Dr. Vibha Rani 2. Dr. Vibha Gupta	

COURSE DESCRIPTION

Central dogma of Life: Central Dogma, Chromatin, Nucleosome organization, Chromatin Remodeling, Nucleic Acid Structure and Functional Elements in DNA , DNA Replication, Repair and Recombination, Prokaryotic RNA Transcription ,Eukaryotic Transcription, mRNA Processing, Genetic Code and Protein Synthesis: Prokaryotic and Eukaryotic System , Gene manipulation: Introduction, DNA manipulative enzymes , Vector Biology , Gene Cloning strategies , Genetic Manipulation of Plants and Animals , PCR, RT-PCR, Blotting techniques, Sequencing methods.

COURSE OUTCOMES		**COGNITIVE LEVELS**
C214.1	Explain the structure of nucleic acids and chromosomal organization	**Understand Level (C2)**
C214.2	Summarize the fundamental concepts of central dogma of life in prokaryotes and eukaryotes.	**Understand Level (C2)**
C214.3	Develop critical thinking skills from understanding of classical experiments in Molecular Biology	**Apply Level(C3)**
C214.4	Distinguish the basic tools and techniques employed in genetic engineering and integrate the acquired knowledge for designing basic experiments, analyzing observations and predicting results	**Analyze Level(C4)**

C214.5	Recognize importance as well as ethical and biosafety issues related to generating transgenic plants, animals and microbes	**Evaluate level(C5)**

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Central Dogma of Molecular Biology	Central Dogma, Chromatin, Nucleosome organization, Chromatin Remodeling,	2
2.	Nucleic Acid Structure and Functional Elements in DNA	DNA and RNA, Classical Models, Prokaryotic Genes, Eukaryotic Genes (Introns and Exons) Organization of Genes on Eukaryotic Chromosomes	3
3.	DNA Replication, Repair and Recombination	Replication in Prokaryotes &Eukaryotes, Breakage and Reunion: Holiday; Meselson-RaddingEnzymes ,Gene Conversion, Direct Repair, Excision Repair, Post-Replication Recombination-Mediated Repair, SOS Repair. Mobile gentic elements	6
4.	Prokaryotic RNA Transcription	Process: Initiation, Elongation, Termination, gene regulation	5
5.	Eukaryotic Transcription, mRNA Processing:	Basic Features, Methodologies, RNA Polymerase I, RNA Polymerase IIIE. RNA Polymerase II, Basic Features of RNA Processing, RNA splicing, Eukaryotic mRNA Splicing:tRNA Processing: 5'- and 3'- Ends, and Intron SplicingE. rRNA Processing: Group I Introns -Ribozymes, and gene regulation Upstream Elements within the Promoter:Enhancers: Sequence Elements not in PromoterRegulation of Tissue-Specific Gene, transcription Transcription Control by Small Molecules: Lipid-Soluble Hormones	8

6.	Genetic Code and Protein Synthesis: Prokaryotic and Eukaryotic System	The role of triplet codon in the translation process, Basics of Translation, Components in the Translation Process, tRNA, Ribosomes	5
7.	Gene manipulation: Introduction, DNA manipulative enzymes	Restriction enzymes and other DNA modifying enzymes; Basic techniques of gene manipulation - Gel electrophoresis, Blotting and DNA transformation techniques, Polymerase Chain Reaction; Sequencing & Mutagenesis; Gene silencing	4
8.	Vector Biology	Cloning vectors – plasmid and phage vectors, cosmids, phagemids and other advanced vectors, Ti plasmid; Specialized vectors - shuttle vectors and expression vectors	3
9.	Gene Cloning strategies	Cloning of PCR products, Cloning genomic DNA (Construction of Genomic library, cDNA library, Screening Libraries with Gene Probes, Screening Expression Libraries, Positional Gene Cloning, Subtractive cloning, Functional cloning	5
10	Genetic Manipulation of Plants and Animals	Production of Industrially Important, Metabolites, Genetically Engineered Strains of Animals and Plants, applications in Agriculture and animal husbandry; Scope and application; Ethical and Biosafety Issues	3
		Total number of Lectures	**44**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment-1&2, Quiz, Case study)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Genes VIII: Benjamin Lewin, 2003
2.	Molecular Biology of the Gene, Fifth Edition: James D. Watson, Tania A. Baker, Stephen P.

	Bell, Alexander Gann, Michael Levine, Richard Losick, 2004
3.	Molecular Cell Biology, Fifth Edition: Matthew P Scott Paul Matsudaira Harvey Lodish James Darnell Lawrence Zipursky Chris A Kaiser Arnold Berk Monty Krieger, 2003
4.	Molecular Cell Biology, Fourth Edition: Harvey Lodish, Arnold Berk, Lawrence Zipursky, Paul Matsudaira ,David Baltimore & James Darnell, 2000
5.	Cell and Molecular Biology: G.Karp, John Wiley, 2002

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS431	**Semester** Even	**Semester IV Session 2018-19** Month from **Jan 2019 – June 2019**
Course Name	HUMAN RESOURCE MANAGEMENT		
Credits	3	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	DrKanupriyaMirsaBakhru
	Teacher(s) (Alphabetically)	DrKanupriyaMirsaBakhru, Dr Praveen Sharma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C207-1.1	Demonstrate a basic understanding of different functions of human resource management: Employer Selection, Training and Learning, Performance Appraisal and Remuneration, Human Relations and Industrial Relations.	Understand Level (C2)
C207-1.2	Apply various tools and techniques in making sound human resource decisions.	Apply level (C3)
C207-1.3	Analyze the key issues related to administering the human resource management activities such as recruitment, selection, training, development, performance appraisal, compensation and industrial relation.	Analyze Level (C4)
C207-1.4	Critically assess and evaluate different human resource & industrial relation practises and techniques and recommend solutions to be followed by the organization	Evaluate Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction to Human Resource Management and its definition, HRM functions and its relation to other managerial functions, Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization. Human Resource Planning	3
2.	Employer Selection	Recruitment Process; Selection Process - Job and Worker Analyses, Matching Job with the Person; Selection Methods - Application Blank, Biographical Inventories, References and Recommendation Letters, Interviews	8
3.	Training and Learning	Need Identification; Psychological Factors in Learning; Training Methods in the Workplace; Effective Training	6

		Programme	
4.	Performance Appraisal and Remuneration	Different methods of Performance Appraisal, Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives	6
5.	Human Relations and Industrial Relations, Trends in Human Resource Management	Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management. Trends in Human Resource Management: Analytics, Artificial Intelligence	5
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Project, Quiz)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	VSP Rao, Human Resource Management: Text and Cases, 2nd Edition , Excel Books, 2002
2.	K. Aswathappa, Human Resource Management: Text and Cases, 8th Edition, Published by Mc Graw-Hill
3.	Dessler, Gary and Varkkey, Biju., Human Resource Management, 14th Edition published by Pearson Education Ltd., 2017

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NHS432	**Semester: EVEN**	**Semester** IV **Session** 2018-19 **Month** from January to June
Subject Name	POSITIVE PSYCHOLOGY		
Credits	3	**Contact Hours**	2-1-0
Faculty (Names)	**Coordinator(s)**	Dr. Badri Bajaj	
	Teacher(s) (Alphabetically)	Dr. Badri Bajaj	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C207-2.1	Demonstrate an understanding of the various perspectives of positive psychology and apply them in day to day life	Apply Level (C3)
C207-2.2	Examine various theories and models of happiness, well-being and mental health	Analyze Level (C4)
C207-2.3	Recommend possible solutions for enhancing happiness, well-being and mental health	Evaluate Level (C5)
C207-2.4	Evaluate interventions/strategies for overall positive functioning	Evaluate Level (C5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Introduction to Positive Psychology	Overview, Perspectives, Classification and Measures: Human Strengths and Positive Outcomes.	4
2.	Prosocial Behavior	Empathy and Egotism; Altruism, Gratitude, and Forgiveness.	4

3.	Positive Emotions and Wellbeing	Emotional and Cognitive States; Focus on Application: Finding the positive in the Negative; Positive Emotions & Well-Being; Positive Emotions & Flourishing; Flow Experiences	4
4.	Happiness	Happiness and its Traditions; Determinants- Subjective Well-Being Hedonic Basis of Happiness; Life Satisfaction; Self –Realization: The Eudaimonic Basis of Happiness Happiness and Emotional Experiences; Other Facts of Life- Work & Unemployment; Intelligence; Education; and Religion.	4
5.	Mental Health	Mental Health and Behavior; Prevent the Bad and Enhance the Good.	4
6.	Positive Environments	Positive Schooling, Good at Work, Balance Between ME and WE.	4
7.	Living Well	Mindfulness; Contours of a Positive Life: Meaning & Means; Cultural Context, Every Stage of Life, Resilience, Positive Youth Development, Life Tasks of Adulthood, Successful Aging.	4
Total number of Lectures			**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Quiz , Oral Questions)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Snyder, C.R., Lopez, S. J., &Pedrotti, J.T. (2011). Positive Psychology: The Scientific

	and Practical Explorations of Human Strengths. 2nd Ed., Sage Publications
2.	Wesley J. Chun (2014). Positive Psychology, 1st Ed., Pearson
3.	Dewe, P. & Cooper, C. (2012). Well-Being & Work: Towards a Balanced Agenda. Palgrave Macmillian:NY
4.	Vijay Parkash, Updesh Kumar, Archana. (2015). Positive Psychology: Applications in Work, Health and Well – Being. 1st Ed., Pearson

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS434	**Semester** : Even	**Semester** IV **Session** 2018 -2019 **Monthfrom** January to June
Course Name	Introduction to Contemporary Form of Literature		
Credits	3	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Monali Bhattacharya (Sector 62) Dr. Ekta Srivastava (Sector 128)
	Teacher(s) (Alphabetically)	Dr. Ekta Srivastava , Dr. Monali Bhattacharya

COURSE OUTCOMES		**COGNITIVE LEVELS**
C207-4.1	Interpret & relate with the genres, periods, and conventional as well as experimental forms of literature as current ethical, technological and cultural reflections of society.	Understand Level (C2)
C207-4.2	Apply literary and linguistic theories on the texts to identify them as cultural constructs inculcating human values in the society.	Apply Level (C3)
C207-4.3	Analyze social, cultural, moral and linguistic changes in contemporary world through cloze study of select representative texts of different cultures thematically and stylistically.	Analyse Level (C4)
C207-4.4	Determine the reciprocal relationship between the individual and culture individually and/or through a research based paper/poster presentation with an aim to analyze social, cultural and moral fibre of youth in multidisciplinary environment, giving holistic solutions for sustainable development of society.	Evaluate Level (C5)
C207-4.5	Create literary, non-literary write-up with proper applied grammar usage, having moral and cultural significance for today's world individually and in a team.	Create Level (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**

1.	Introducing Literary Theories	• From Formalism to Reader Response Theory: Major Terms & Concepts • Narrative Art & Narratology • Cultural Studies: An Introduction	6
2.	Introducing New Forms & Sub Genres Today: Features & Portions	• New Fiction: Graphic Novels, Cyberpunk • Non Fiction: Memoirs & Autobiographies, Biographies & Personal Narrative	5
3.	Spiritual Literature	*Siddhartha*- Hermen Hesse (novella)	3
4.	Travel Literature	*Eat, Pray & Love (Book & cinematic adaptation)*	3
5.	Afro American Literature	*Things Fall Apart(Novella)*– Chinua Achebe	3
6.	Commonwealth / Post Colonial Literature	*Hayavadana(Short Play)*- Girish Karnad	3
7.	European Literature:	*The Bloody Chamber & Other Short Stories*-Angela Carter (Short Stories)	2
8	Canadian Literature	*The Penelopiad- Margaret Atwood*	3
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Presentation , Oral Questions)
Total	**100**

Recommended Reading material:

1.	**Margaret Atwood**, 'The Penelopiad', 1st Edition, Canongate Series, Knopf, Canada, 2005.
2.	**M.H. Abrams**, 'A Glossary of Literary Terms'.7th Edition, Hienle&Hienle: Thomson Learning, USA, 1999.

3.	**Mark William Roche**, 'Why Literature matters in the 21st Century', 1st Edition, Yale University Press, 2004.
4.	**Chinua Achebe**, Things Fall Apart. Reprint . New York: Anchor Books, 1994.
5.	**Angela Carter**, 'The Bloody Chamber & Other Short Stories', 1st Edition, Gollancz, UK, 1979. https://dudley.harvard.edu/files/dudley/files/the_bloody_chamber.pdf
6.	**Hermen Hesse**, 'Siddhartha', 1st Edition. New Directions, US, 1951. For online version: https://www.gutenberg.org
7.	**Elizabeth Gilbert**, 'Eat, Pray & Love. 1st Edition, Penguin,US, 2006.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS411	**Semester : Even**	**Semester IV Session** 2018 -2019 **Month from** January to June
Course Name	Market Research & Consumer Behaviour		
Credits	3	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Monica Chaudhary
	Teacher(s) (Alphabetically)	Dr. Monica Chaudhary

COURSE OUTCOMES		**COGNITIVE LEVELS**
C207-6.1	Explain the fundamentals concepts used in the study of consumer behaviour.	Remember Level (C1)
C207-6.2	Develop better marketing programs and strategies to influence consumer behaviour.	Apply Level (C3)
C207-6.3	Able to understand the key elements needed for Market Research.	Understand Level (C2)
C207-6.4	Design an effective market research framework.	Apply Level (C3)
C207-6.5	Design a research plan that demonstrates the understanding of Market Research.	Create Level (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Consumer Behaviour and Research	Topic 1: Introduction to Consumer Behaviour Topic 2: Consumer Research Topic 3: Consumer Behaviour and Marketing Strategy	3

2.	Market Research Fundamentals	Topic 1: Market research objective and design Topic 2: Primary data and secondary data Topic 3: Market Research Methods Topic 4: Qualtative& Quantitative Research Design	5
3.	Market Research Data Collection & Analysis	Topic 1: Sampling procedure & Methods Topic 2: Data Analysis	4
4.	Internal Influences on Consumer Behaviour	Topic 1: Motivation and Involvement Topic 2: Personality, Self-Image, and Life Style Topic 3: Consumer Perception & Learning Topic 4: Communication and Consumer Behaviour	6
5.	External Influences on Consumer Behaviour	Topic 1: The Influences of Culture on Consumer Behaviour Topic 2: Subcultures and Consumer Behaviour Topic 3: Social Class and Consumer Behaviour Topic 4: Reference Groups and Family Topic 5: Consumer Influence & the Diffusion of Innovations	3
6.	Consumer Decision Making	Topic 1: Consumer Decision Making-Process Topic 2: Consumer Decision Making-Outcomes Topic 1: Desiging market research Topic 2: Report Writing	4
7.	Market Research Project & Report Writing	Topic 1: Designing market research Topic 2: Report Writing	3

Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment 1,Assignment 2 and Project)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Schiffman, Consumer Behavior, Global Edition, 10th Edition, Pearson, USA,2014
2.	M.R. Solomon, Consumer Behavior, 7th Edition, Prentice Hall International, 2006.
3.	J. F. Engel, R.D. Blackwell, P.W. Miniard, Consumer Behavior, 8th Edition, The Dryden Press, , 1995
4.	P. Kotler, Marketing Management Analysis: Planning and Control, 9th Edition, Prentice Hall, , 1997

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**16B1NHS435**	**Semester : EVEN**	**Semester: IV Session: 2018-19** **Month from: Januaryto June**
Subject Name	**SOCIOLOGY OF MEDIA**		
Credits	**3**	**Contact Hours**	**(2-1-0)**

Faculty (Names)	**Coordinator(s)**	**Prof. Alka Sharma**
	Teacher(s) (Alphabetically)	**Prof Alka Sharma** **MsShikha**

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C207-5.1	Demonstrate a basic understanding of different methods and concepts used in the systematic study of Sociology of Media	Understanding(C 2)
C207-5.2	Examine various tools and techniques used and gain theoretical orientation towards media and society.	Analyzing(C 4)
C207-5.3	Analyze the key issues related to the processes of Production of Media, Popular Culture and consumer culture.	Analyzing(C 4)
C207-5.4	Critically evaluate the major methods of Cultural Consumption ,Social Class & the process of construction of subjectivities and audience reception in new Media	Evaluating(C 5)
C207-5.5	Create positive and critical attitude towards the use of new media and understanding of threats of Digital Age	Creating(C 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to the Course	1
2.	Theoretical	• Functionalist Approach to the Sociology of Media	4

	Orientation	and Popular Culture • Critical Approach to the Sociology of Media and Popular Culture • Symbolic Interactionist Approach to the Sociology of Media and Popular Culture	
3.	Popular Culture	• What is popular culture? • Difference between 'pop' culture and 'high' culture • What distinguishes popular culture from other kinds of culture (art, folk culture)? Is there a distinction at all anymore? • Visualizing Society through 'pop' culture/ media • Risks and rituals that come with Popular Culture	5
4.	New media	• Difference between tradition media and new media • New media as technology • New Information Technology (brief history in case of India)	3
5.	Media & State	• Mediatization of Society • Free-speech Media	3
6.	Consumption of Media and Media reception	• Social Actors as Audience/ Audience as market– Theory • Media effects: Media and representations (gender, ethnic)- the under-representation and misrepresentation of subordinate groups. • Media and the construction of reality: media logic and cultivation analysis theory • Information Society vs Informed Society • Cultural Consumption and Social Class	7
7.	Media in Global Age	• Rise of Network Society- Manuel Castells • Global Media: impact of market & state • Global Perspectives: The world on our doorstep • Marketing and aesthetics in everyday life	5
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Presentation and attendance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	JosephTurow, *Media Today: An Introduction to Mass Communication*,3rd Ed., Taylor & Francis. UK. (2008).
2.	JA Fisher 'High Art v/s Low Art, in Berys Nigel Gaut& Dominic Lopes (eds.), *The Routledge Companion to Aesthetics*. Routledge2001
3.	G.Ritzer, 'McDonaldization of Society,. *The Journal of American Culture*. Volume 6, Issue 1. (2001 [1983])Pp. 100-107.
4.	Manuel. Castells,'Introduction', in *Rise of Network Society: The Information Age: Economy, Society and Culture*, 2nd Ed (1996).