JAYPEE INSTITUTE OF INFORMATION AND TECHNOLOGY

INTEGRATED M. TECH BIOTECHNOLOGY

5th Semester

Course Code	15B11BT511	**Semester:** Odd	**Semester: V Session 2023-2024** Month from **July to December**
Course Name	Cell Culture Technology		
Credits	4	**Contact Hours**	4
Faculty (Names)	**Coordinator(s)**	Prof Rachana	
	Teacher(s) (Alphabetically)	Dr Rachana, Dr Pooja Choudhary	

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO310.1	Demonstrate knowledge on principles of plant and animal tissue culture.	Understand Level, C2
CO310.2	Identify the requirements to construct cell culture laboratories	Analyze level, C3
CO310.3	Apply knowledge and techniques to maintain different types of cell cultures.	Understand Level, C4
CO310.4	Examine cell culture techniques for applications in different fields of biotechnology.	Analyze Level, C4

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Plant Cell Culture: An Introduction	Definitions, history of plant cell and tissue culture	2
2.	Organization of tissue culture laboratory & basic principles	Equipments, media preparation and precautions, **c**ellular totipotency and cell differentiation, factors affecting differentiation	4
3.	Suspension cultures	Isolation of single plant cells, suspension cultures and types, measurement of growth, assessment of viability of cultured cells, bioreactors.	3
4.	Type of cultures and their applications	Direct and indirect methods of culture; seed culture, embryo culture, organ culture, callus culture, haploid and triploid production, protoplast isolation and fusion, production of virus free plants, somaclonal variation	6

5.	Somatic embryogenesis & micropropagation	Technique, applications and advances in acclimatization of tissue cultured plants.	4
6.	Industrial applications	Secondary metabolite production and bioconversions through plant cell cultures	2
7.	Introduction to animal cell culture	Advantages and limitations, Laboratory design and layout, aseptic techniques; safety and biohazards, contaminations and eradication	4
8.	Environmental factors and cell culture methods	Culture media, use of serum and serum free media, primary culture, subculture and cell lines, feeder layers; animal cell lines (suspension versus adhered cell culture), Cryopreservation	7
9.	Biology of cultured cells	Cell adhesion molécules, extra-cellular matrix, cell proliferation	2
10.	Characterization of cultured cells	Authentication, Cell morphology, karyotyping, staining, isoenzyme analysis; DNA fingerprinting and DNA profiling	3
11.	Cell separation technology	Physical properties (Density gradient centrifugation), Biological properties (Panning), FACS	3
12.	Scaling up-techniques	suspension and monolayer cultures	2
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
Total	**100**

PBL: Students will identify relevant topics which use cell culture for laboratory and industrial applications. They will search, select and discuss/present such titles among the class students so that they can gain knowledge about their application in the research institutes and industries.

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.	S. S. Bhojwani and M. K. Razadan, Plant tissue culture: theory and Practice, Elsevier, 1996
2.	H. S. Chawla, Introduction to Plant Biotechnology, 3rd Edition, Science Publishers, 2009
3.	S. Narayanaswamy, Plant cell and tissue culture, Tata Mcgraw Hill, 1992
4.	M. K. Razdan, Introduction To Plant Tissue Culture, India Book House Limited, 2003
5.	R. Ian Freshney, Culture of animal cells : a manual of basic techniques, Wiley-Liss, 2005, Reviewed in Germany on 19 April 2020
6.	John R. W. Masters, Animal cell culture, 3rd Edition, Oxford University Press, 2000
7.	A. Mukhopadhyay, Animal Cell Technology, I.K. International, 2009

Course Code	**15B17BT571**	**Semester: Odd**	**Semester :** V **Session 2023-2024** Month from July to December
Course Name	**Cell Culture Lab**		
Credits	4	**Contact Hours**	**2**
Faculty (Names)	**Coordinator(s)**	Prof. Rachana	
	Teacher(s) (Alphabetically)	Dr. Ashwini Mathur Prof. Rachana Prof. Shalini Mani	

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO370.1	Understand requirements for *in vitro* culturing of animal cells	Understand Level, C2
CO370.2	Apply the fundamental knowledge of cell culture techniques to maintain animal cell lines	Apply level, C3
CO370.3	Compare, techniques to identify and differentiate cells in primary and continuous cell lines	Analyze Level, C4
CO370.4	Analyse cell culture for biotechnology procedures investigations	Analyze Level, C4

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Basic preparations and conduction for Animal Tissue Culture Lab	General Introduction and familiarization to animal tissue culture lab: Design and Equipments, learn media preparation (complete and incomplete), sterilization and associated precaution	1 and 2
2.	Identification and maintenance of cell cultures	Learn primary cell culture (cheek cells) isolation, staining and their identification, Detection of various cell culture contaminations (bacterial, fungal) through microscopic examination and Staining, qualitative analysis and differentiation between suspension and adherent cell lines using inverted microscope.	2

3.	Propagation and sub culturing of Cell Culture	Sub culturing of (Splitting and Trypsinization) suspension and adherent cell-lines, Cryo-preservation and resuscitation of Frozen Cell Lines. Differentiation of WTC parental cell line to cardiac cell line	2 and 3
4.	Counting, Estimation and Cell based assays	To learn serial dilution techniques and to calculate cell concentration in order to set up various types of assay's, using haemocytometer and calculation of cell viability in the isolated cells using Trypan blue assay, preparation of growth curve and calculation of doubling time for cell line, determination of cytotoxicity and oxidative stress of the given compound using MTT/NRU, LDH/NO etc. assay.	3 and 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 (Learning laboratory Skills and handling Laboratory Equipments, attendance)	45
Laboratory record	15
Total	**100**

PBL: Experiments for this laboratory have been designed in such a way that students can learn from scratch from designing the laboratory till the actual application of animal tissue culture technique in research and industry. The students learn methodology and its application in a systemic stepwise manner.

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.	Readings in Mammalian cell culture. R. Pollack., Cold Spring Harbour Laboratory (1981).
2.	Animal Cell Culture. R. Pollack and S. Pfeiffer, Cold Spring Harbour Laboratory (1971).
3.	Experiments with Normal and Transformed cells. R.Crowe., H. Ozer and Dr. Rifkin. Cold Spring Harbour Laboratory (1978).
4	Culture of Animal Cells. R. Ian Freshney and R. Alan., Liss. Inc. (1987).

Course Code	16B1NPH534	**Semester: ODD**	**Semester: V Session** 2023-2024 **Month from:** July to December
Course Name	Bio-Materials Science		
Credits	4	**Contact Hours**	4
Faculty (Names)	**Coordinator(s)**	Prof. R.K. Dwivedi	
	Teacher(s) (Alphabetically)	Prof. R.K. Dwivedi	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-13.1	Recall basic fundamental of material structure such as crystal defects, phases etc.	Remembering (C1)
C301-13.2	Demonstrate properties of materials such as mechanical, chemical, surface, optical, magnetic etc.	Understanding (C2)
C301-13.3	Selection of materials based on their properties such as ceramic, metal, polymer, composites etc.	Applying (C3)
C301-13.4	Analyzing the applicability of different biomaterials and listing them according to the applied fields like artificial organs.	Analyzing (C4)

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

1.	**Introduction to Biomaterials and their uses in medical industry**	Classification of biomaterials, Discussion about the need of biomaterials in industry, introduction of bionic man, cyborg. Types of biomaterials applied for the replacement of body parts: pacemakers, mammary prosthesis, heart valves, intracellular lenses, orthopedic implants, fixation, spinal replacement. Implant, Transplant , Prosthesis, their need availability and limitations. Basic ideas of crystal structure and bonding of materials used as biomaterials, elementary ideas of crystal defects and phase changes in biomaterials. Classification: metals, ceramics, polymers, advanced materials, nanomaterials. Length scale of material structures and their uses.	**8**

2.	Mechanical , chemical and optical Properties of Biomaterials	Modulus of elasticity, stress elongation and transfer, wear resistance, Stress-strain relationship, confined and unconfined compression, dynamic shear, pulse wave velocity, electrical and electromagnetic stimulation, stress generated potential (SGP), pulsed electromagnetic field (PEMF), Failure characteristics of materials (Yielding, plastic deformation, creep, fatigue, corrosion wear, impact fracture etc.). Degradation , whiteness and clarity of materials, role of these properties in specific materials for artificial organs Biocompatibility of materials used in artificial organs.	6
3.	Surface properties of Biomaterials	Interface, cohesion, adhesion, Surface energy, contact angles, critical surface tension, thermal treatment of materials, surface improvement (anodization), surface properties influencing cell adhesion, Young's equation, annealing, quenched materials, Surface reconstruction.	5
4.	Magneti c Material s	Concept of magnetic materials used for implantation. Classification – dia-, para-, ferro-, antiferro- and ferri magnetic materials, their properties and applications; Super Paramagnetism. Magnetic Storage, biocompatible magnetic materials, basic idea of super conductivity, uses of super conducting diamagnets with focus on MRI.	5
5.	Polymers and Ceramics	Various types of Polymers and their applications (with specific examples of biopolymers); Optical/ Mechanical behavior and Processing of Polymers; Structure, Types, Properties and Applications of Ceramics; Mechanical behavior and Processing of Ceramics. Hydrolysis and its uses. Application of polymers and ceramics in organ replacement.	8

6.	Optical Materials and optical fibers, lasers	Optical materials and their properties for biomedical engineering. Concept of optical fiber and principle of total internal reflection in optical fiber. Single, multistep & graded index fiber. Numerical aperture and Attenuation coefficient. Transmission losses in optical fiber. Uses of optical fibers in medical industry: Endoscopy, Laparoscopy, capsule endoscopy, their benefits and limitations. Optical materials and optical fibers in dentistry. Propagation characteristics of different fibers; Applications of Laser and optical fibers in Biotechnology, laser as medical cutting tool.	8
		Total number of Lectures	**40**

Evaluation Criteria
Components Maximum Marks
T1 20
T2 20
End Semester Examination 35
TA 25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total 100

Project based Learning (PBL): Students will make some individual projects on selected biomaterial (polymer, ceramics, metals, alloys, semiconductor, composites etc) depending on its applicability for specific Medical Activity. Example: some specific polymers are used to make intraocular lenses, ceramics are used as bone cement for heap joints. Each project work will describe the material properties (physical and chemical), characteristics, whole working principles, advantages and disadvantages of that specific biomaterial to be used for specific purpose. Students will take the help of some experimental data also. Students will take help from available internet sources, current research papers, medical journals and real laboratory experiments for preparing the project. Throughout the preparation of the whole project and by presenting the project work students will gather deep learning about the biomaterials. The overall knowledge will help them to prepare themself as an efficient biotechnologist according to the requirements of current Medical Industry

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.	Elements of Material Science and Engineering, L.H.Van Vlack, Addison-Wesley 1998
2.	Materials Science and Engineering - An Introduction, W. D. Callister, (Wiley)
3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.
4.	Biomaterials, Sujata V. Bhat, Narosa, New Delhi, 2007

Course Code	16B17BT571	**Semester Odd**	**Semester** V **Session 2023-2024** Month from July -Dec
Course Name	IT Practice Lab		
Credits	1	**Contact Hours**	LTP 0 0 2
Faculty (Names)	**Coordinator(s)**	Dr. Chakresh Kumar Jain	
	Teacher(s) (Alphabetically)	Dr. Chakresh Kumar Jain Dr. Nidhi	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C373.1	Explain features of programming environment for Python and Perl	Understand Level (C2)
C373.2	Apply Perl based script for bioinformatics problem	Apply Level (C3)
C373.3	Utilize python programming for pattern finding in biological sequences and explore the app designing	Apply Level (C3)
C373.4	Perform the Sequence analysis	Analyze Level (C4)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Computer basics and Environment	To understand different operating systems and compare them.	C373.1C2
2.	PERL	To understand scalars, arrays and hashes in perl and study its applications.	C373.1 C2
3.	PERL	To understand the use of conditional statements, loops in perl	C373.1 C2
4.	PERL	To understand subroutine in perl and study its applications.	C373.2 C3
5.	PERL	To understand different operators in perl	CO2
6.	PERL	To understand file handling in Perl and study its applications.	C373.2 C3

7.	PERL	To make use of regular expressions of Perl in biological problems.	C373.2 C3
8.	PYTHON	To explore the basics of Python and Installation.	C373.1 C2
9.	PYTHON	To explore the data types, Functions and loops in python.	C373.1 C2
10.	PYTHON	To understand file handling in Python and study its applications.	C373.3 C3
11.	PYTHON	To identify the biological pattern using regular expressions and modules of python	C373.3 C3
12.	PYTHON	To perform the sequence analysis using packages	C373.4 C4
13	App designing	Exploration and basic of App Designing	C373.3 C3

Evaluation Criteria

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

PBL: Students learn and explore the basic knowledge of perl and python and various functions , data structure, modules with understanding the problems such as pattern serach, promoter search, regex operatios and seqeunce file handling. Students are also explained about the sequence analysis and basic use of app desiging with discussion about use in industry and research.

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.	M. Model, Bioinformatics programming using Python. Sebastopol, Calif.: O'Reilly Media, 2010**.**
2.	J Tisdall, Mastering Perl for Bioinformatics, O'Reilly Media, 2003

Course Code	**15B19BT591**	**Semester Odd**	**Semester** V **Session 2023-2024** Month from July -Dec
Course Name	Minor project-I		
Credits	1	**Contact Hours**	LTP 0 0 2
Faculty (Names)	**Coordinator(s)**	Prof Rachana	

COURSE OUTCOMES		**COGNITIVE LEVELS**
Sl. No.	**DESCRIPTION**	
C350.1	Recognize a biotechnological problem of interest	Understanding level (C2)
C350.2	Identify the literature related to chosen research problem.	Applying level (C3)
C350.3	Make use of the data analysis ability to discuss and conclude the selected literature.	Applying level (C3)
C350.4	Analyze and organize the data, develop scientific report writing skills and present.	Analyze level (C4)

Course Code	15B11BT413	**Semester ODD**	**Semester** V **Session 2023-2024** Month from **January- June**
Course Name	Bioprocess Engineering		
Credits	3	**Contact Hours**	3
Faculty (Names)	**Coordinator(s)**	Prof Sudha Srivastava	
	Teacher(s) (Alphabetically)	Dr. Ashwani Mathur	
		Prof 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 equation for maximum biomass production	5
	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	6

			media, Design of sterilization equipment (deterministic *vs* probabilistic approach), techniques of air sterilization, air sterilization by fibrous material.	
		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**

Project based Learning: The course explains the students the design and operation of bioreactors and the physical and chemical processes that are pivotal in commercial scale operation of bioreactor. Student also learn the association between upstream and downstream processes. Student learn different modes of operating bioreactors, used in Industries and their kinetics. The scalable sterilization instruments used in bio-manufacturing industries are also explained to students. Students also learn the processes involved in bio manufacturing of commercially important metabolites using process engineering principles.

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.

Subject Code	**15B11BT412**	**Semester : ODD**	**Semester : V Session : 2023-2024** **Month from : July - Dec**
Subject Name	**Molecular Biology& Genetic Engineering**		
Credits	**3**	**Contact Hours**	**3**
Faculty (Names)	**Coordinator(s)**	1. Dr. Vibha Gupta	
	Teacher(s) (Alphabetically)	1. Dr.Vibha Gupta 2. Prof. Vibha Rani	

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO214.1	Explain the structure of nucleic acids and chromosomal organization	Understand Level (C2)
CO214.2	Summarize the fundamental concepts of central dogma of life in prokaryotes and eukaryotes.	Understand Level (C2)
CO214.3	Develop critical thinking skills from understanding of classical experiments in Molecular Biology	Apply Level (C3)
CO214.4	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)
CO214.5	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, Nuclesome organization, Chromatin Remodeling,	2
2.	**Nucleic Acid Structure and Functional Elements in DNA**	DNA and RNA, Classical Models, ProkaryoticGenes, Eukaryotic Genes (Introns and Exons) Organization of Genes on EukaryoticChromosomes	3
3.	**DNA Replication, Repair and Recombination**	Replication in Prokaryotes &Eukaryotes, BreakageandReunion:Holiday; Meselson-RaddingEnzymes ,Gene Conversion,DirectRepair, Excision Repair, Post-ReplicationRecombination-Mediated Repair, SOSRepair. Mobile genetic elements	6

4.	**Prokaryotic RNA Trascription**	Process: Initiation, Elongation, Termination, gene regulation	5
5.	**Eukaryotic Trascription,mRNA, Processing:**	Basic Features, Methodologies, RNA PolymeraseI, RNA Polymerase IIIE. RNA Polymerase II, BasicFeatures 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 thePromoter:Enhancers: Sequence Elements not in Promoter Regulation 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 (Class Test-1, Assignment-1&2, Case studies 1, 2& 3)
Total	**100**

PBL: With the increasing number of biotech firms and interest, the future scope of the proposed course is very bright. Students were made aware of the concepts of Molecular biology, recombinant technology

and synthetic Biology by groups discussions, quizzes and problem-solving exercises. To develop ethical concepts, students were asked to make a mini proposal to apply concepts of molecular Biology and genetic engineering in the betterment of society	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Papers, Reports, Websites etc. in the IEEE format)	
1.	Molecular Biology of the Gene, fifth edition: Menlo Park, CA: Benjamin/Cummings Watson, J. D., 2008.
2.	Gene Cloning and DNA Analysis: an Introduction. Seventh edition: Oxford: Blackwell Pub, Brown, T. A. 2015.
3.	Molecular Biotechnology: Principles and Applications of Recombinant DNA, fourth edition: Washington, D.C.: ASM Press Glick, B. R., & Pasternak, J. J. 2010
4.	Recent research articles and reviews related to each module.

Detailed Syllabus

Subject Code	**16B1NHS435**	**Semester : ODD**	**Semester: V Session: 2023-2024** **Month: August to Dec**
Subject Name	**SOCIOLOGY OF MEDIA**		
Credits	**3**	**Contact Hours**	**(3-0-0)**

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

CO Code	**COURSE OUTCOMES**	**COGNITIVE LEVELS**
C303-2.1	Demonstrate a basic understanding of different concepts used in the systematic study of Sociology of Media	Understanding(C 2)
C303-2.2	Examine various sociological theoretical orientations towards media and society.	Analyzing(C 4)
C303-2.3	Analyze the key issues related to the processes of Production of Media, Popular Culture and consumer culture.	Analyzing(C 4)
C303-2.4	Critically evaluate the Cultural Consumption, Social Class & the process of construction of subjectivities and audience reception in new Media	Evaluating(C 5)
C303-2.5	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 Orientation	● Functionalist Approach to the Sociology of Media and Popular Culture ● Critical Approach to the Sociology of Media and Popular Culture ● Symbolic Interactionist Approach to the Sociology of Media and Popular Culture ● Different theories of Media	8
3.	Concept of Popular Culture and its critical analysis	● 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	8
4.	New media	● Difference between tradition media and new media ● New media as technology ● New Information Technology (brief history in case of India)	5
5.	Media & State	● Mediatization of Society ● Free-speech Media	5
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	9
7.		● Rise of Network Society- Manuel Castells ● Global Media: impact of market & state ● Global Perspectives: The world on our doorstep	7

	Media in Global Age	• Marketing and aesthetics in everyday life	
		Total number of Lectures	**42**

Evaluation Criteria

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

Project Based Learning- Each student will review research papers applying assumptions of different media theories studies in the course and submit a project.

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).

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**16B1NHS434**	**Semester :ODD**	**Semester V** **Session 2023-2024** **Month: August - December**
Subject Name	**Introduction to Contemporary Form of Literature**		
Credits	**3**	**Contact Hours**	**3 (3-0-0)**

Faculty (Names)	**Coordinator(s)**	Dr Monali Bhattacharya (Sector 62)
	Teacher(s) (Alphabetically)	Dr Monali Bhattacharya

Course Outcomes:

	Course Outcome	**COGNITIVE LEVELS**
C303-6.1	Interpret & relate with the genres, periods, and conventional as well as experimental forms of literature as current ethical, technological and cultural reflections of society.	CL-2 Understand
C303-6.2	Apply literary and linguistic theories on the texts to identify them as cultural constructs inculcating human values in the society.	CL-3 Apply
C303-6.3	Analyze select representative texts of different cultures thematically and stylistically.	CL-4 Analyse

C303-6.4	Determine the reciprocal relationship between the individual and culture individually and/or through a research-based paper/poster presentation.	CL-5 Evaluate
C303-6.5	Create literary, non-literary write-up with proper applied grammar usage, individually and in a team	CL-6 Create

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Hours for the module**
1.	**Introducing Literary Theories**	● From Formalism to Reader Response Theory: Major Terms & Concepts ● Narrative Art & Narratology ● Language & Style: An Introduction	12
2.	**Introducing New Forms & Sub Genres Today: Features & Portions**	● New Fiction: Graphic Novels, Cyberpunk ● Non Fiction: Memoirs & Autobiographies, Biographies	4
3.	**Modern Retellings/ Childeren's Literature**	*Cinderella* (Poem) - Roald Dahl	3
4.	**European Lit./Travel/ Memoir/ Spiritual Literature**	*Eat, Pray & Love (Travelogue& cinematic adaptation)*	4
5.	**Written Communication Through Non-Fiction**	*Personal Narratives (Diary, Blog, Memoirs, Travelogue)*	4
6.	**Commonwealth / Indian Literature**	*Hayavadana(Short Play)*- Girish Karnad	4

7.	**Afro-American Lit/ Post Colonial Literature**	*Sweetness (Short Story)* – Toni Morrison	3
8	**Sci-fi (Cyberpunk)**	*Neuromancer (Science Fiction) – William Gibson*	4
9	**Canadian Literature/ Speculative Fiction**	*The Penelopiad- Margaret Atwood*	4
		Total number of Hours	**42**

Project Based Learning: Students will be required form groups of 4-5 and write a research article on a chosen text (novel, short story, drama, poetry, prose or film) and analyze it through one/or more of the following theoretical perspectives including Reader response theory, Structuralism and Post-structuralism, Narratology etc. The objective of this project would be to help students understand the textual, socio-political and cultural dimensions of literature and its imitation of life. It would also enhance the thinking and analytical skills of the students.

Evaluation Criteria

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

Recommended Reading material: 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.	M.H. Abrams, 'A Glossary of Literary Terms'.7th Edition, Hienle&Hienle: Thomson Learning, USA, 2021
2.	Mark William Roche, 'Why Literature matters in the 21st Century', 1st Edition, Yale University Press, 2004.
3	https://allpoetry.com/poem/8503199-Cinderella-by-Roald-Dahl

	Online video version: https://www.youtube.com/watch?v=dLmNG5EbHvc. An interview with Dahl: https://www.youtube.com/watch?v=pA7kUPStmPE
4	Elizabeth Gilbert, 'Eat, Pray & Love. 1st Edition, Penguin,US, 2006. For online version: http://mrs-sullivan.com/wp-content/uploads/Eat-Pray-Love-Book-on-pdf.pdf An interview with Elizabeth : https://www.youtube.com/watch?v=m9B9zFo4RFw
5	William Zinsser, 'On Writing Well: The Classic Guide to Writing Nonfiction', Harper Perennial; 30th Anniversary ed. Edition, 2016 For Online version: http://richardcolby.net/writ2000/wp-content/uploads/2017/09/On-Writing-Well-30th-Anniversa-Zinsser-William.pdf
6	Girish Karnad, 'Hayavadana', 1st Edition, Oxford University Press, Delhi, 1975 (30th Impression, 2012). For online version: https://pdfcoffee.com/hayavadana-girish-karnadpdf-pdf-free.html An interview with Karnad: https://www.youtube.com/watch?v=laL7oWWuLGI
7	https://www.newyorker.com/magazine/2015/02/09/sweetness-2 Audio version: https://www.youtube.com/watch?v=ltKXTZTBmPs. An interview with Morrison: https://www.youtube.com/watch?v=DQ0mMjII22I&list=RDDQ0mMjII22I&start_radio=1&rv=DQ0mMjII22I&t=107
8	William Gibson, 'Neuromancer', 1st Edition, The Berkley Publishing Group, New York, 1984. For online version http://index-of.es/Varios-2/Neuromancer.pdf
9	Margaret Atwood, 'The Penelopiad', 1st Edition, Canongate Series, Knopf, Canada, 2005. For online version: https://www.langhamtheatre.ca/wp- content/uploads/2010/09/The-Penelopiad.pdf An interview with Atwood: https://www.youtube.com/watch?v=D5Wj_JQ6NhY

Course Code	**16B1NHS532**	**Semester: ODD**	**Semester:** 5th **Session: 2023-2024** **From:** Aug to Dec
Course Name	**Planning and Economic Development**		
Credits	03	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Amba Agarwal and Dr. Amandeep Kaur	
	Teacher(s) (Alphabetically)	**1.** Dr. Amba Agarwal **2.** Dr. Amandeep Kaur	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-4.1	Understand the issues and approaches to economic development.	C2
C303-4.2	Evaluate National income accounting, human development index and sustainable development.	C5
C303-4.3	Apply an analytical framework to understand the structural characteristics of development.	C3
C303-4.4	Analyze the role of Macroeconomic stability & policies and Inflation in the development process.	C4
C303-4.5	Evaluate the importance of federal development and decentralization.	C5

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

1.	Economic Development and its Determinants	Economic growth and development. Indicators of development. Approaches to economic development. Rostows Stages of Growth.	5

2.	National Income Accounting	National Income Accounting, Green GNP and Sustainable development	5
3.	Indicators of development	PQLI, Human Development Index (HDI) and gender development indices.	4
4.	Demographic Features, Poverty and Inequality	Demographic features of Indian population; Rural-urban migration; Growth of Primary, Secondary and Tertiary Sector.	5
5.	Inflation and Business Cycles	Inflation. Business cycle. Multiplier and Accelerator Interaction.	6
6.	Macro-Economic Stability & Policies	Monetary Policy. Fiscal Policy. Role of Central Bank & Commercial banks in the development of the country. Balance of payments; currency convertibility and Issues in export-import policy.	6
7.	Federal Development	The Federal Set-up - The Financial Issues in a Federal Set-up, Principles for Efficient Division of Financial Resources between Governments. Financial Federalism under Constitution. Finance Commissions in India, Terms of References and its Recommendations	6
8.	Planning and Development	Need for planning, Decentralisation, Rural and Urban local bodies.	5
Total number of Lectures			**42**

Evaluation Criteria
Components Maximum Marks T1 20
T2 20
End Semester Examination
35 TA 25 (Assignment + Quiz)
Total 100

Project-based Learning: Each student in a group of 4-5 will opt a topic and submit a report related to India's Development Indicators based on following parameters; National Income, State Income, Human Development Index (HDI), Gender Development Indices (GDI), Demographic Profile, Migration, Sectoral contributions of income and employment, Poverty, Income Inequality & literacy, Federal Structure, Budgetary estimates, Tax and Monetary Policy, Distribution of financial resources from central to state to local bodies. Understanding fundamental development indicators will upgrade student's knowledge on various Economic Development front and improve mechanism to formula suitable policy design, which further strengthen their employability into public and private decision-making body.

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.	**Todaro, M.P**., **Stephen C. Smith,** Economic Development, Pearson Education, 2017
2.	**Thirwal, A.P**., Economics of Development, Palgrave, 2011
3.	**Ahuja, H. L.**, Development Economics, S Chand publishing, 2016
4.	**Ray, Debraj,** Development Economics, Oxford University Press, 2016
5.	**Meier, G.M.,** Leading Issues in Economic Development, Oxford University Press, New Delhi, 2008
6.	**Ahuja, H. L.,** Development Economics, S Chand publishing, 2016
7.	**Benavot, Aaron.** "Education, gender, and economic development: A cross-national study." Sociology of education (1989): 14-32.
8.	**Falk, Armin, and Johannes Hermle.** "Relationship of gender differences in preferences to economic development and gender equality." Science 362, no. 6412 (2018).

Subject Code	**19B12HS311**	**Semester: ODD**	**Semester V Session: 2023-2024** **Month:** July to December
Subject Name	**ENTREPRENEURIAL DEVELOPMENT**		
Credits	**3**	**Contact Hours**	**3-0-0**
Faculty (Names)	**Coordinator(s)**	Dr. Deepak Verma	
	Teacher(s) (Alphabetically)	Dr. Deepak Verma	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-8.1	Understand basic aspects of establishing a business in a competitive environment	Understand Level (C2)
C303-8.2	Apply the basic understanding to examine the existing business ventures	Apply Level (C3)
C303-8.3	Examine various business considerations such as marketing, financial and teaming	Analyze Level (C4)
C303-8.4	Assessing strategies for planning a business venture	Evaluate Level (C5)

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

1.	Entrepreneurial perspective	Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur Types of Entrepreneurs	8

2.	Beginning Considerations	Creativity and developing business ideas; Legal issues; Creating and starting the venture; Building a competitive advantage	14
3.	Developing Marketing Plans	Developing a powerful Marketing Plan, E commerce, Integrated Marketing Communications	6
4.	Developing Financial Plans	Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan Developing a business plan	11
5.	Leading Considerations	Developing Team, Leading the growing company, Resources for growth	3
Total number of Lectures			**42**

Evaluation Criteria
Components Maximum Marks
T1 20
T2 20
End Semester Examination 35
TA 25 (Assignment, Project, Class Participation, Attendance)
Total 100

Project based learning: Each student in a group of 4-5 will work on developing business plan around a new idea. They will include the major business consideration in the plan. The students will present the business plans. Discussions on these practical issues will enhance students' understanding of entrepreneurship. The students will learn from other groups as well through other groups' presentations.

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.	Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship" 10th Edition, McGraw Hill Education, 2018
2.	Norman M. Scarborough and Jeffery R. Cornwell, "Essentials of entrepreneurship and small business management" 8th Edition, Pearson, 2016
3.	Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011
4.	Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016
5.	John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up" 5th Edition, Pearson Education, 2017

Detailed Syllabus

Course Code	**20B13HS311**	**Semester: Odd**	**Semester: V Session: 2023-2024** **Month: August-December**
Course Name	**Indian Constitution and Traditional Knowledge**		
Credits	*3*	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	● Dr. Chandrima Chaudhuri ● Dr. Namreeta Kumari ● Ms, Shikha Kumari

CO Code	**COURSE OUTCOMES**	**COGNITIVE LEVELS**
C305.1	Demonstrate an understanding about the early Indian traditional political thought and the constitutional design by knowing about the structure of government in place	Understand(C2)
C305.2	Demonstrate an understanding of the role of Indian President, Prime Minister, Governor, other members of the legislature in their mutual interaction and local governments as representatives of the common masses	Understand (C2)
C305.3	Analyze the working of Indian federalism with reference to centre-state relations	Analyze(C4)
C305.4	Analyze the impact of the contemporary challenges such as caste and gender to the working of Indian democracy	Analyze(C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	The Indian Constitution	● Historical Background to the Indian Constitution. ● Salient features of the Indian Constitution. ● Fundamental Rights (Part III of the Indian Constitution) ● Fundamental Duties (Part IVA of the Indian Constitution).	8

		● Directive Principles of the State Policy (Part IV of the Indian Constitution). ● Amendments to the constitution	
2.	Organs of the Government	● The Executive: President, Prime Minister and Governor- appointment, powers and functions ● The Legislature: Parliament and its components- Lok Sabha and Rajya Sabha (composition and functions) ● The Judiciary: Supreme Court-composition, functions, appointment and jurisdiction	8
3.	Nature of Federalism in India	● Centre-State Legislative Relations ● Centre-State Administrative Relations ● Centre-State Financial Relations ● Special Provisions of some state and the 5^{th} and 6^{th} schedule ● Emergency provisions	8
4.	Local Governance in India	● Urban local governance: Municipality- Structure & Functions. ● Rural Local governance: Panchayat- Organization and Powers. ● Civil Society: the participation of the people in local governance	8
5.	Traditional knowledge	● Kautilya- Theory of state. ● Mandala theory. ● Saptanga theory	6
6.	Challenges to Indian Democracy	● Caste as a critical factor in the Indian Constitution. ● Gender as critical to the process of Continentalization	4
		Total number of Lectures	**42**

Evaluation Criteria

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

Project: Projects based on important Supreme Court judgments have to be submitted by the students as a part of the project-based learning method. This would help the students to know about the interpretation

of the various rights done by Supreme Court which would help them in their workplace as well as in general life.

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.	A.A. George, *Important Judgements that transformed India*, New Delhi: McGraw Hill, 2020
2.	B. Chakraborty, *Indian Constitution: Text, Context and Interpretation*, New Delhi: Sage Publications, 2017
3.	B.K.Sharma, *Introduction to the Constitution of India*, New Delhi: Prentice Hall of India, 2002
4.	M.Laxmikanth, *Indian Polity*, 6th edition, Noida: McGraw Hill, 2019
5.	M.P.Singh and R. Saxena, R, *Indian Politsics: Contemporary Issues and Concerns*, New Delhi: PHI Learning, 2008
6.	R. Kangle, *Arthashashtra of Kautilya*, New Delhi: Motilal Publishers, 1997
7.	Videos- Samvidhan series produced by Rajya Sabha Television .https://www.youtube.com/watch?v=0U9KDQnIsNk

Course Code	**16B1NMA531**	**Semester Odd**	**Semester V Session 2023-2024** **Month from Aug- Dec**
Course Name	**Discrete Mathematics**		
Credits	**3**	**Contact Hours**	**3-0-0**
Faculty (Names)	**Coordinator(s)**	Dr. Anuj Bhardwaj	
	Teacher(s) (Alphabetically)	Dr. Anuj Bhardwaj	

COURSE OUTCOMES: After the successful completion of this course, the student will be able to		**COGNITIVE LEVELS**
C301-1.1	explain partial order relations, Hasse diagram, lattices and recursive functions.	Understanding Level (C2)
C301-1.2	solve the difference equations using generating function and Z transform.	Applying Level (C3)
C301-1.3	explain the propositional and predicate calculus to check the validity of arguments.	Understanding Level (C2)
C301-1.4	demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory.	Applying Level (C3)
C301-1.5	illustrate various algebraic structures and their properties.	Understanding Level (C2)
C301-1.6	explain the theory of formal languages and solve the related problems of automata	Applying Level (C3)

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

1.	Relations and Lattices	Relations and their composition. Pictorial representation, matrix and graphical representations. Equivalence relations and partitions. Partial ordered relations and Hasse diagram. Lattices.	5
2.	Functions	Functions and Recursively defined functions, generating functions, solution of recurrence relations by generating function. Z transforms, solution of difference equations by Z transform.	8
3.	Propositiona l Calculus	Propositions- simple and compound. Basic logical operators. Implication. Truth tables. Tautologies and contradictions. Valid arguments and fallacy. Propositional functions and quantifiers.	4
4.	Graphs	Graphs and related definitions, subgraphs, isomorphism, paths and connectivity. Eulerian graph and Konigsberg problem. Hamiltonian graph. Labelled and weighted graphs. Tree Graphs Minimum spanning Tree (Prim's algorithm). Graph colorings. Four color problem.	7
5.	Directed Graphs	Trees, Digraphs and related definitions. Rooted trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Path matrix. Shortest path. Linked representation of directed graphs. Binary trees.	5
6.	Algebraic Structures	Groups- definitions and examples, order of elements, subgroup, condition for subgroups. Quotient groups, Lagrange theorem and applications, Rings, integral domains and Fields- definition and examples.	7
7.	Languages and Grammars	Strings (words) and languages, grammars, types of grammars, Finite state machines, finite state automata, regular languages and regular expressions.	6
		Total number of Lectures	**42**

Evaluation Components	**Criteria Maximum**
Marks T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials, PBL)
Total	**100**

Project based learning: A group of 4 to 5 students will be formed. Each group will have a group leader to develop coordination among the group members. Each group will be assigned a problem related to the diversified applications of graph theory and theory of automata. The group leader of each group will submit a report of 6-7 pages and then finally each member of the group will be evaluated through a viva voce.

Recommended Reading material:

1.	Lipschutz, S. and Lipson, M., Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 1997.
2.	Rosen, K. H., Discrete Mathematics and its Application, 7th Edition, Tata McGraw-Hill, 2011.
3.	Liu, C. L., Elements of Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 1998.
4.	Kolman, B., Busby, R. C. and Ross, S., Discrete Mathematical Structures, 6th Edition, Prentice Hall, 2018.
5.	Deo, N., Graph Theory, Prentice Hall, 2004.
6.	Grimaldi, R.P., Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2011.

Detailed syllabus

Lecture-wise Breakup

Subject Code	**16B1NHS432**	**Semester: ODD**	**Semester V Session 2023-2024 Months: July to December**
Subject Name	**POSITIVE PSYCHOLOGY**		
Credits	**3**	**Contact Hours**	**(3-0-0)**
Faculty (Names)	**Coordinator(s)**	**Dr. Badri Bajaj (JIIT-62) & Dr. Shweta Verma (JIIT-128)**	
	Teacher(s) (Alphabetically)	**Dr. Badri Bajaj, Dr. Shweta Verma**	

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Demonstrate an understanding of the various perspectives of positive psychology and apply them in day to day life	Apply Level (C3)
CO2	Examine various theories and models of happiness, well-being and mental health	Analyze Level (C4)
CO3	Recommend possible solutions for enhancing happiness, well-being and mental health	Evaluating Level (C5)
CO4	Evaluate interventions/strategies for overall positive functioning	Evaluating 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:	**6**

		Human Strengths and Positive Outcomes.	
2.	Prosocial Behavior	Empathy and Egotism; Altruism, Gratitude, and Forgiveness.	**6**
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	**6**
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.	**6**
5.	Mental Health	Mental Health and Behavior; Prevent the Bad and Enhance the Good.	**6**
6.	Positive Environments	Positive Schooling, Good at Work, Balance Between ME and WE.	**6**
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.	**6**
Total number of Hours			**42**

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

Project based learning: Students will identify possible solutions for enhancing happiness and well-being. They will work in groups and identify easy to implement solutions having minimal financial bearing on them using these strategies. Existing resources at the home, institution, work organization, and community can be used. While identifying the strategies it is essential to refer to various research papers, books, and online resources, etc. to support the logic behind the identified strategies. Each student will implement the identified strategies for minimum three weeks and share their experiences before and after implementation. Each group will submit a project report after completion of the project. It will be important to add appropriate references (in-text citations and bibliography) for identifies strategies in the report.

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. *Positive Psychology: The Scientific and Practical Explorations of Human Strengths*, 4th Ed., Sage Publications, 2018.
2	Steve, B., & Marie, C. *Positive psychology*, 1st Ed., Pearson Education India, 2014.
3.	Boniwell, I., & Tunariu, A. D., *Positive Psychology: Theory, Research and Applications*, 2nd Ed., McGraw-Hill Education, 2019.
4.	Zelenski, J., *Positive Psychology: The Science of Well-being*, 1st Ed., Sage Publications, 2019.
5.	Snyder, C. R., Lopez, S. J., Edwards, L. M., & Marques, S. C. (Eds.), *The Oxford handbook of positive psychology*. 1st Ed., Oxford university press, 2020.

Detailed Syllabus

Lecture-wise Breakup

Course Code	21B12HS312	Semester: Odd	Semester: 5th Session: 2023 -2024 Month from: July-December
Course Name	**Management Accounting**		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Purwa Srivastava
	Teacher(s) (Alphabetically)	Dr Purwa Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C303-10.1	Understand various aspects of the management accounting system including ethical conduct for accountants	Understand (C2)
C303-10.2	Understand cost behaviour and apply cost-volume-profit analysis in decision making	Apply (C3)
C303-10.3	Understand basic accounting concepts and analyze financial statements of a business organization	Analyze (C4)
C303-10.4	Analyze various costing systems for cost allocation and pricing decisions	Analyze (C4)
C303-10.5	Evaluate the master budget and carry out variance analysis for planning and management control decisions	Evaluate (C5)

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

1.	Basic Accounting concepts and financial statements	Accounting Concepts, principles, accounting equation, analysis of Balance sheet, Income statement, statement of changes in stockholders' equity, statement of cash flows. Common size statement, trend analysis and ratio analysis	7
2.	Management accounting system	Meaning of Management Accounting, Influences on accounting systems, Ethical conduct for accountants	7
3.	Cost Concepts and cost behaviour	Identifying resources, Activities, Costs and Cost drivers; Variable and Fixed cost behaviour; Cost-Volume-Profit Analysis	7
4.	Cost Management Systems	Direct, Indirect cost; Cost allocation; Traditional and Activity Based costing systems, special orders, pricing decision, cost-plus pricing, target costing, make or buy decision	7
5.	Budgetary Control	Introduction to budgets; Functional budgets, Master budgets, Fixed and flexible budgets, Budgets as financial planning models, Variance analysis	8
6.	Management control system	Organizational goal and performance measures, designing a management control system	6
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (assignments, class test, project)
Total	**100**

Project-based learning- The students will be given a group project to identify a simple business, one with at least two products, two services or one product & one service. They will estimate the fixed and variable costs related to the business and carry outa Cost-Volume-Profit analysis to determine the Break-even sales of the business. Also, they will determine the

cost of products/services using Activity-based Costing. Lastly, the students will prepare a projected master budget for the next three years which includes the sales budget, operating expenses budget, cash budget, purchase budget, projected balance sheet, profit and loss account and so on.

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.	Charles T. Horngren, Gary L. Sundem, Jeff O. Schatzberg, Dave Burgstahler, Introduction to Management Accounting, 16th Edition, Pearson Publication, 2014.
2.	Anthony A. Atkinson, Robert S. Kaplan, Ella Mae Matsumura, S. Mark Young, G. Arun Kumar, Management Accounting, 5th Edition, Pearson Publication, 2009.
3.	Arora, M.N. Cost and Management Accounting, Himalaya Publishing, 4th Edition, 2018.
4.	Hingorani, Ramanathan and Grewal, Management Accounting, S. Chand Publications, 2003.
5.	Ghosh, T. P., Financial Accounting for Managers, 4th Edition, Taxmann Publications, 2009.
6.	Maheshwari, S.N., Maheshwari, S.K., Financial Accounting, 10th ed, Vikas Publishing House.
7.	Pandey, I.M., Financial management, 11th ed, Vikas Publishing House Pvt Ltd, 2015
8.	Chandra, P., Financial Management Theory and Practice, 7th ed., Tata McGraw Hill, 2007.
9.	Chawla, M, Chawla, C and Gupta, A. "India: Anti-corruption Compliance in India" Mondaq, January, 2021. Accessed on: 30th October 2021. Link: https://www.mondaq.com/india/white-collar-crime-anti-corruption-fraud/1022326/anti-corruption-compliance-in-india
10.	Tangdall, S. "The CEO of Starbucks and the Practice of Ethical Leadership", Santa Clara University, 29th August 2018. Accessed on: 30th October 2021. Link: https://www.scu.edu/leadership-ethics/resources/the-ceo-of-starbucks-and-the-practice-of-ethical-leadership/

Economics of Agriculture: Issues & Development

Course Code	**23B12HS312**	**Semester:** ODD	**Semester** V **Session** 2023 - 2024 **Month from:** July 2023-Dec2023
Course Name	**Economics of Agriculture: Issues & Development**		
Faculty (Names **Credits**	03	**Contact Hours**	2-1-0

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
CO1	Skill Development Understand the significance of agricultural sector in economic development	Understanding Level (C2)
CO2		Applying Level (C3)

	Skill Development Examine the working of marketing institutions and the players in marketing of agricultural commodities and the major sources of agricultural finance	
CO3	Skill Development Link the agricultural policies and its effect on sustainable agricultural development	Analyzing Level (C4)
CO4	Skill Development Assess the impact of globalization on agricultural development.	Evaluating Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
Module-I	**ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT**	Nature and scope of Agricultural Economics; Role of agriculture in economic/rural development - Inter-sector Linkages of Agriculture- Barriers to Agricultural Growth- Schultz Theory of Transformation of Traditional Agriculture; Mellor's theory of Agricultural development - Boserup's Theory of Agricultural Development - The Chayanov Farm Household model - Barnum–Squire Farm Household Model - Hayami-Ruttan Induced Innovation Hypothesis	8

			Skill Development	

Module-II	**AGRICULTURAL MARKETING AND PRICE ANALYSIS**	Market intermediaries and their role-Problems in Agricultural Marketing from Demand and Supply and Institutions sides - Need for regulation in the present context, Role of Information Technology and telecommunication in marketing of agricultural commodities - Market research-Market information service - electronic auctions (e-bay), e-Chaupals Skill Development	8

Module-III	**AGRICULTURAL PRODUCTION ECONOMICS**	Skill Development Various Types of Factor-Product, Factor-Factor, and Product Product Relations; Role of Farm Size and Structure in Equilibrium, Determination of optimal levels of production and factor application - Optimal factor combination and least cost combination of production - Theory of product choice; selection of optimal product combination.	9
Module-IV	**AGRICULTURAL FINANCE**	Skill Development Agricultural lending – Direct and Indirect Financing - Financing through Co-operatives, NABARD and Commercial Banks and RRBs. Role and Importance of Agricultural Finance. Financial Institutions and credit flow to rural/priority sector	8

Module-V	**AGRICULTURAL DEVELOPMENT AND POLICIES**	Development issues, poverty, inequality, unemployment and environmental degradation – Models of Agricultural Development - policy options for sustainable agricultural development, Globalization and the relevance of development policy analysis Skill Development	9
			Total number of Lectures -42

Evaluation Criteria

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

Project-based Learning: Each student in a group of 4-5 will choose a topic and submit a report focused on India's Agricultural Issues and Development, based on the following parameters: Agricultural Productivity, Crop Diversification, Technology Adoption, Agricultural Finance, Agricultural Marketing and Supply Chains, Government Policies and Initiatives, Rural-Urban Linkages, and Sustainable Agriculture. Exploring these fundamental agricultural indicators will enhance students' understanding of the diverse challenges and opportunities in the agricultural sector, equipping them with knowledge to contribute effectively to public and private decision-making bodies in the pursuit of agricultural development and sustainability.

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.	Agricultural Economics: Principles and Policy" by David L. Debertin,2012
2.	Principles of agricultural economics markets and prices in less developed countriesby David Colman And Trevor Young, Cambridge University Press
3.	Agricultural Development: An International Perspective" by Alain de Janvry and Elisabeth Sadoulet
4.	Agricultural Economics" by H. Evan Drummond and John W. Goodwin,2013
5.	Lekhi R.K. & Singh Joginder, Agricultural Economics, Kalyani Publishers, New Delhi.
6.	Priniples of Agricultural Economics by Andrew Barkley and Paul W. Barkley, Routledge Taylor and Francis Publications, 2013

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17BT472	**Semester** ODD **(specify Odd/Even)**	**Semester** V **Session** 2023 -2024 Month from AUG–DEC
Course Name	GENETIC ENGINEERING LAB		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Dr. Shalini Mani
	Teacher(s) (Alphabetically)	Dr. Sonam Chawla Dr. Shalini Mani Dr.Vibha Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO274.1	Demonstrate good lab practices, equipment handling and biosafety related to Genetic Engineering	**Understand [C2]**
CO274.2	Execute the procedures for nucleic acid isolation and purification	**Apply [C3]**
CO274.3	Develop an ability to conduct basic gene cloning experiments	**Apply [C3]**
CO274.4	Analyze and troubleshoot the experimental outcomes	**Analyze [C4]**

Module No.	**Title of the Module**	**List of Experiments**	**No. of labs in the module**	**CO**
1.	Good lab practices & equipment handling	Preparation of culture media and stock buffers	1	CO1
2.	Nucleic acid isolation	Genomic DNA isolation from Bacterial cells – *E. coli* (DH5α strain)	2	CO2
3.		Isolation of plasmid DNA (mini-prep method) by alkaline lysis		CO2
4.	Separation, purification and analysis of DNA	Agarose gel electrophoresis of isolated genomic DNA	4	CO2
5		DNA extraction and purification of plasmid DNA		CO2
6		Analysis of plasmid DNA on agarose gel		CO4
7.		Quantitative analysis of isolated plasmid DNA by UV spectrophotometer		CO4
8.	Gene cloning	Preparation of chemically competent *E. coli* (DH5α) cells by $CaCl_2$ method	5	CO3

9.		Transformation of competent cells with plasmid DNA		CO3
10.		Restriction Enzyme digestion of recombinant plasmid		CO3
11.		Ligation of plasmid vector and DNA insert		CO3
12.		Screening of recombinants		
13.	Application & Analysis	Practice Exercises	2	CO4
		Total number of labs	**14**	

Evaluation Criteria

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

PBL: This is a practical based course where the students are exposed to methodology of gene cloning. Hands-on-learning experiments are designed so as to familiarize students with the reagents, protocols and troubleshooting associated with this cutting-edge technique in biotechnology research and industry. The lab provides opportunity to students to practice the concepts acquired during the theory course and develop skills and confidence for future employability.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Papers, 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

Course Code **NBA Code**	18B15BT311 **C372**	**Semester:** Even	**Semester:** IV **Session:** 2024-25 Month from: July to December
Course Name	Industrial Biotechnology Lab-I		
Credits	0-0-1	**Contact Hours**	2

Course Outcomes:

At the completion of the course, students will be able to,

COURSE OUTCOMES At the completion of the course, students will be able to:		**COGNITIVE LEVELS**
C372.1	Demonstrate design, principle and operation of bioreactors	C2 (Understand Level)
C372.2	Identify the effect of culture conditions on cell growth/death kinetics	C3 (Apply Level)
C372.3	Apply knowledge of heat transfer and fluid dynamics in bioprocess operation	C3 (Apply Level)
C372.4	Analyze different purification strategies for soluble and insoluble bioproducts	C4 (Analyze level)

S NO.	**EXPERIMENT LIST**	**CO**
1.	Study different parts of bioreactor and their function & Sterilization of Bioreactor: Principle and approach	CO1
2	Explore the effect of different stirring speed on growth of microorganism	CO1
3	Comparison of heat transfer in co-current and counter-current heat exchangers	CO3
4	Thermal death time and point estimation	CO2
5	Principle and working of Ostwald's viscometer to determine relative viscosity of liquid	CO3
6	Study of different physical methods of cell lysis	CO4
7	Comparison of different chemical methods of cell lysis on total protein / biomolecules yield	CO4
8	Demonstration of High-Performance Liquid Chromatography	CO4
9	Precipitation of bioproducts using salting out methods	CO4
10	Desalting of product using dialysis method	CO4
11	Packing of column for chromatography	CO4
12	To separate biomolecules using size exclusion/ion exchange chromatography	CO4

Project Based Learning: Students will apply the acquired knowledge in the lab course to understand processes involved in manufacturing process, product purification and development of a fermented bio-product at an industrial scale. Fermentation products may include: Food products: from milk (yogurt, kefir, fresh and ripened cheeses), fruits (wine, vinegar), vegetables (pickles, sauerkraut, soy sauce), meat (fermented sausages: salami); Industrial chemicals (solvents: acetone, butanol, ethanol; enzymes; amino acids); Specialty chemicals (vitamins, pharmaceuticals)