

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12EC311	Semester Even (specify Odd/Even)	Semester 6th Session 2023 -2024 Month: Jan to June
Course Name	Advanced Radio Access Networks		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Samriti Kalia
	Teacher(s) (Alphabetically)	Dr. Samriti Kalia

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Recall the basic concepts of antenna and wave propagation, digital and wireless communication.	Remembering (Level I)
CO2	Understand the architecture and channel structure of LTE based on the 3GPP reference network model.	Understanding (Level II)
CO3	Apply the concept of KPI's in tuning and optimization of radio access networks.	Applying (Level III)
CO4	Analyze LTE power control, mobility, call flow and throughput in LTE wireless systems.	Analysing (Level IV)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Overview and evolution of mobile telephony, telecom team structure, Generic network architecture, RAN network components, RAN life cycle.	6
2.	RF Basics	Concepts related to baseband signal processing, Microwave theory fundamentals, concepts of radio propagation, antenna Concepts, fading in wireless communication.	6
3.	Radio Access Networks- Overview	Introduction to cellular concepts, link adaptation, Power control, generalized macro site overview, generalized call flow, introduction to KPI, protocol layers, standardization.	6
4.	Radio Access Network- LTE	Architecture of LTE, LTE bearer, LTE QoS, LTE radio interface, channel structure, scheduling in LTE, idle mode behavior, power control in LTE, LTE mobility, LTE call flow.	18
5.	Radio Access Network Optimization	Optimization basics, RAN tuning and RAN optimization, Introduction to KPIs and counters, pre-launch optimization, post-launch optimization.	6

Total number of Lectures		42
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Attendance, PBL/Assignment)	
Total	100	

Project based learning: Here, students will learn the process of radio network planning which is utmost important while implementing and deploying the radio networks. Radio network planning comprises of services relevant to network operators, regulatory organizations, and system suppliers, including: coverage analysis, frequency planning, network design, network implementation, network optimization in terms of coverage or capacity. By using propagation tools (like TEMS that is widely used by telecom operators) or some simulation tool like MATLAB, students will learn to measure, analyze, and optimize the mobile networks. In particular, they will learn the simulations for RF coverage predictions, field-strength measurements in wireless propagation.

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.	Advanced Radio Access Network, Student Book, Ericsson AB 2018.
2.	T. S. Rappaport, Wireless Communications: Principles and Practice. Piscataway, NJ, USA: IEEE Press, 1996.
3.	TEMS Investigation, User Guide, ARAN Program-2018, Ericsson.
4.	Online resource material from NPTEL, Research Papers.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	24B12EC311	Semester Even	Semester : 6th Session: 2023-2024 Month from Jan. to June
Subject Name	Artificial Intelligence		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr Juhi Gupta	
	Teacher(s) (Alphabetically)	Dr Juhi Gupta	

S. No.	Course Outcomes	Cognitive Levels
CO1	Clarify the basics of Artificial Intelligence (AI), history of AI developments and the latest applications.	Understanding (C2)
CO2	Demonstrate the concepts of Artificial Intelligence including problem solving, search strategies, knowledge representation, and game playing etc	Applying (C3)
CO3	Explain various machine learning methods and optimization techniques.	Analyzing Level (C4)
CO4	Appraise the Neural network and CNN architectures for the related applications	Evaluating (C5)

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Introduction to Artificial Intelligence	Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents	5
2.	Introduction to Search Solutions	Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms, Travelling Salesman Problem, Search problems for different games, Breadth First Search, Depth First Search, A* Algorithm, Iterative Deepening A* Algorithm	8
3.	Optimization Techniques	Introduction to Optimization, Gradient Descent and Ascent Method, Learning Rate, Types of Gradient descent methods, Performance Optimization, Steepest	10

		Descent, Stable Learning Rates and Widrow-Hoff Learning, Different Optimizers, Metaheuristic Optimization	
4.	Machine Learning	Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Reinforcement learning.	8
5.	Introduction to Neural Networks	Neuron Model and Network Architecture: Perceptron, Perceptron learning rule and proof of convergence. Backpropagation, Multilayer Perceptrons, Feed forward neural networks, CNN, Feature Maps and Pooling, LeNet	12
Total number of Lectures			42

Evaluation Criteria

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

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2.	Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3.	E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4.	Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,
5.	Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC613	Semester Even (specify Odd/Even)	Semester VI Session 2023-2024 Month from Jan-June 2024
Course Name	Control Systems		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr Abhishek Kashyap, Dr Ritu Raj
	Teacher(s) (Alphabetically)	Dr Abhishek Kashyap, Dr Ritu Raj

COURSE OUTCOMES: At the end of the course, students will be able to		COGNITIVE LEVELS
C332-3.1	Recall the concepts of Laplace transform. Define open-loop and closed-loop systems.	Remembering Level (C1)
C332-3.2	Relate physical systems to transfer function and state-variable models.	Understanding Level (C2)
C332-3.3	Solve for the time domain response of first-order and second-order systems.	Applying Level (C3)
C332-3.4	Analyze the stability of control systems in time and frequency domain.	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Introduction to Control System	Review of concepts related to control systems, Development of control systems, non-feedback and feedback systems, negative feedback a means of automatic regulation, basic classification of control systems	3
2.	Modeling and Mathematical Representation of Systems	Block diagram simplification of continuous-time systems, Classification of system models, input – output description of systems, signal flow graph representation	8
3.	Time Domain Analysis and Design	Time domain response, steady state error and error coefficients, design considerations for second order systems, time domain response considerations for higher order systems. PID controller	7
4.	Stability Analysis of continuous-time systems	Basic stability concept of linear systems, absolute stability criteria for continuous-time systems, relative stability concepts	5
5.	Root Locus method and design in Time Domain	Fundamentals of Root Locus, construction of root loci, root contour diagram	6
6	Frequency Response Analysis and Design	Bode plot and Nyquist plot, gain margin and phase margin, stability analysis	7

7	State Variable Approach to Time Domain Analysis	State variable representation of continuous-time systems; System Response and State Transition Matrix (STM); Applications of STM	6
Total Number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
Total		100	
Project Based Learning: Simulate time response of continuous time systems, pole-zero plot based stability analysis and root locus analysis using MATLAB			

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.	R.C. Dorf, R.H. Bishop, Modern Control Systems, 13 th Edition, Pearson, 2017.
2.	K. Ogata, Modern Control Engineering, 5 th Edition Prentice Hall, 2010.
3.	Norman S. Nise, Control Systems Engineering, 7 th Edition, John Wiley, 2014.
4.	M. Gopal, Control Systems: Principles and Design, 4 th Edition, McGraw Hills, 2012

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17B1NEC741	Semester EVEN	Session 2023-2024 Month January to June
Subject Name	Digital Hardware Design		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Shamim Akhter	
	Teacher(s) (Alphabetically)		
Course Outcomes		Cognitive Levels	
C332-1.1	Recall the concept of sequential circuits and state machines	Remembering Level (C1)	
C332-1.2	Discuss advanced adders and multiplier circuits	Understanding Level (C2)	
C332-1.3	Demonstrate the concept of VHDL and FSM in digital circuit design	Applying Level (C3)	
C332-1.4	Illustrate the concept of different ways of pulse or pattern generation.	Analyzing Level (C4)	
C332-1.5	Design asynchronous sequential digital circuits using flow table method.	Evaluating Level (C5)	
Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Finite State Machine (FSM)	FSM Design methodology, State Reduction, State Assignment, Implementation, and State Diagram partitioning, Mealy to Moore Conversion and vice-versa.	9
2.	Pulse Generation Technique	Sequence generation using Direct and Indirect Approach, Shift Register Based Approach, Clock Dividers (Integer/Non-Integer)	5
3.	Advanced Topics in Digital Circuits	Different Types of Adders, Parallel Prefix Adders, Multipliers,	9

4.	VHDL based Digital Circuit Design	Importance of HDL, Basic Language elements, VHDL syntax, entities, and architectures, concurrent and sequential constructs, hierarchical design and test benches, FSM modeling and simulation	10
5.	Asynchronous Finite State Machines	Asynchronous Analysis, Design of Asynchronous Machines, Flow table realization, reduction, state assignments and design, Cycle and race analysis. Hazards, Essential Hazards, and its removal	9
Total Number of Lectures			42

Evaluation Criteria

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

Project Based Learning: Student will design and synthesize combinational and sequential circuits using VHDL.

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	William Fletcher: An Engineering approach to digital design, PHI, 2012
2.	Z.Kohavi: Switching and Finite Automata Theory, 2nd Edition, Tata Mc-Graw Hill, 2001
3.	A. Anand Kumar : Fundamental of Digital Circuits, PHI, 4 th Edition 2016
4.	J. M. Rabaey, A. Chandrakasan, B. Nikolic: Digital Integrated Circuits: A Design Perspective, 2 nd Edition, Pearson Education Inc., 2016.
5.	Volnei A. Pedroni: Circuit Design with VHDL, 2 nd Edition, MIT Press 2020

Detailed Syllabus Lecture-wise Breakup

Subject Code	17B11EC731	Semester Even	Semester 6th Session 2024 Month from Jan to June 2024
Subject Name	Mobile Communication		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Pimmy Gandotra	
	Teacher(s) (Alphabetically)	Pimmy Gandotra	

COURSE OUTCOMES		COGNITIVE LEVELS
C331-2.1	To recall the basic concepts of mobile and cellular communication, with an overview to the evolution of generations of wireless communication networks	Remembering Level (C1)
C331-2.2	To infer the cellular concept, architectures for 2G, 3G, 4G, 5G and beyond and other related advancements in cellular technology	Understanding Level (C2)
C331-2.3	To identify the concept of mobile communication network in GSM, GPRS, UMTS, LTE, WiMax standards	Applying Level (C3)
C331-2.4	To estimate assignment of channels, access mechanisms, radio propagation models for coverage and capacity enhancement in cellular networks	Analyzing Level (C4)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Mobile communication system evolution	Evolution of mobile communication systems. 2G, 3G, and 4G systems. Block diagram of mobile communication system. Problems of mobile communication: spectrum, propagation. Near far problem.	3
2.	The cellular Concept – System Design Fundamentals	Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage & capacity in cellular system	8
3.	Mobile Radio Propagation	Free Space Propagation Model, Ground Reflection Model, Small scale Propagation, Impulse Response model of a multipath channel, Parameters of mobile multipath channels, Types of small scale fading, Rayleigh and Ricean distributions, Level crossing rates and Average fade duration.	12
4.	Multiple Access Techniques	FDMA, TDMA, CDMA and OFDMA techniques and their performance. Number of channels.	5
5.	Mobile communication network architectures	GSM: GSM standards and architecture, GSM Radio aspects, typical call flow sequences in GSM, security aspects. GPRS, UMTS.	8
6	Introduction to 4G systems	Long Term Evolution (LTE) and Worldwide	4

		Interoperability for Microwave Access (WiMax).	
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		s20	
T2		20	
End Semester Examination		35	
TA		25(Attendance, Performance. Assignment/Quiz)	
Total		100	
<p>Project based Learning Component: Here, students will learn frequency planning in mobile communication and designing the network in such a way so as to maximize the system capacity. System capacity is used to characterize the total number of users that can be supported by the system. As an alternate to measurements, different propagation models will be analyzed. Using some simulation tool (like MATLAB) performance of different propagation models (like Okumura, Hata, SUI, etc.) will be analyzed to find the best suited model for a particular wireless generation. Further to characterize the fading scenarios in wireless communication, simulations will be performed for different fading distributions like Rayleigh or Ricean. Summarizing, students will learn the simulations required to analyze the different aspects of wireless communication like system capacity, signal strength, and fading.</p>			

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.	T. S. Rappaport, Wireless Communications (principle and practice), PHI/Pearson, 2002.
2.	William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
3.	Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005
4.	V.K.Garg, Principles and Applications of GSM, Pearson Education, 1999
5.	V.K.Garg, IS-95 CDMA and CDMA 2000, Pearson Education, 2000

Detailed Syllabus
Lecture-wise Breakup

Course Code	16 B19EC691	Semester- Even (specify Odd/Even)	Semester -6	Session 2023-2024
Course Name	Renewable Energy			
Credits	2	Contact Hours	2	

Faculty (Names)	Coordinator(s)	K. Nisha
	Teacher(s) (Alphabetically)	K. Nisha

COURSE OUTCOMES		COGNITIVE LEVELS
C305-4.1	Recall the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid and Smart Grid.	Remembering Level (C1)
C305-4.2	Illustrate the different biomass energy resources and extraction of biomass energy.	Understanding Level (C2)
C305-4.3	Compute Solar photovoltaics power generation for modelling and balance of PV systems for energy generation.	Applying Level (C3)
C305-4.4	Estimate the maximum power extraction from wind energy resources and design of Wind Energy Generators.	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Overview of energy use and related issues, major energy options, issues of supply and demand, energy conversions, global climate change issues, effects on ecology and biodiversity, status of renewable energy in India.	4
2.	Solar Energy	Fundamentals of Solar radiation, Solar Resource Assessment, Solar Photovoltaics, Balance of PV Systems, and Solar Thermal.	10
3.	Wind Energy	Wind resource, Basics of aerodynamics, Maximum power extraction from wind resource fundamental power equations, Basic design concepts of Wind Energy Generators	8
4.	Biomass Energy	Biomass resource, extracting biomass energy, landfill gas, waste to energy, energy balances and economics.	6
5.	Electric Grid	Basic operations, performance related issues, new developments and challenges in the electric grid.	2
Total number of Lectures			30

Project Based Learning: Students will be asked to do the analysis and designing of the solar cell for high efficiency using industry standard simulation tools and the development of the complete system.

Evaluation Criteria

Components	Maximum Marks
Mid-Term	30
End Semester Examination	40
TA	30
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.	Solanki, C.S., <i>Solar Photovoltaics: Fundamental, technologies and applications</i> , 3rd ed., Delhi: Prentice Hall of India, 2015
2.	Momoh, J., <i>Smart Grid: Fundamentals of Design and Analysis</i> , Wiley-IEEE Press, 2012.
3.	Ahmed S., <i>Wind Energy: Theory and Practice</i> , 3rd ed., Delhi: Prentice Hall of India, 2016
4.	Earnest J., <i>Wind Power Technology</i> , 2nd ed., Delhi: Prentice Hall of India, 2015
5.	Kothari, D.P., Singal, K.C. and Ranjan, R., <i>Renewable Energy Sources and Emerging Technologies</i> , 2nd ed., Delhi: Prentice Hall of India, 2016.
6.	Rabindra, N. S. Ankush, G., Saad, M., Valendina, E.B., <i>Applications of AI and IOT in Renewable Energy</i> Elsevier, 2022

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NEC734	Semester EVEN	Semester VI Session 2023 -2024 Month from January to June
Course Name	RF and Microwave Engineering		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Abhay Kumar
	Teacher(s) (Alphabetically)	Dr. Abhay Kumar, Prof. Shweta Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C332-3.1	Describe the concepts of microwave frequency range, its origin and its applications	Understanding Level (C2)
C332-3.2	Use the concepts of microwave theory to solve the problems on transmission line, impedance matching circuit and scattering parameters	Applying Level (C3)
C332-3.3	Examine the performance of waveguide components, microwave sources and also relate their responses and applications	Analyzing Level (C4)
C332-3.4	Assess and measure the performance of RF filters and other microwave components	Evaluating Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to RF and Microwave Engineering	History of Microwaves, applications of Microwaves, Maxwell's Equations.	2
2.	Microwave Transmission Lines	Review of Transmission lines, Line Equations. Microwave Integrated Lines: Microstrip line, Strip line, CPW line.	3
3.	Impedance matching	$\lambda/4$ Transformer, Tapered Lines: Exponential	3
4.	Scattering Parameters	S-parameters: definition, properties, 2-port, 3-port and 4-port.	4
5.	Microwave Components	H-plane, E-plane and Magic Tee, Isolator, Circulator, Directional Coupler, Cavity Resonators, Q of Cavity Resonator, Rectangular waveguide cavities.	10
6.	Microwave Devices and Sources	Microwave semiconductor devices, Schottky diode, Gunn diode, Microwave Tubes.	7
7.	Microwave Measurements	Impedance and Power Measurement Vector Network Analyzer, Spectrum analyzer.	4

8.	RF Filters	Classification of filters, Filter Design by Insertion loss method	3
9.	Microwave Propagation and Applications	Industrial, Scientific and Medical applications of Microwave Energy, Biological effects of microwave energy.	4
Total number of Lectures			40

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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.	D.M. Pozar, Microwave Engineering (2 nd Ed.), John Wiley, 1998.
2.	S. Y. Liao, Microwave Devices and Circuits (3 rd Ed.), Pearson, 2003.
3.	Peter A. Rizzi, Microwave Engineering, Pearson, 1998.
4.	B. R. Vishvakarma , R. U. Khan and M.K. Meshram , Microwave Circuit Theory and Applications, Axioe Books, 2012.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	23B12EC311	Semester EVEN	Semester 6th Session 2023-24 Month from Jan 24 to June 24
Subject Name	Semiconductor Devices and Circuits		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Ms. Shivani	
	Teacher(s) (Alphabetically)	Ms. Shivani	

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Recall the basics of semiconductor physics and diodes	Remembering [C1]
CO2	Explain the basics of energy band diagram and optical absorption properties for various two terminal devices.	Understanding [C2]
CO3	Apply the concept of semiconductor physics to design the special purpose diodes, transistors and thyristors	Applying [C3]
CO4	Analyze the operation of different logic families such as Bipolar, Unipolar and Hybrid.	Analyzing (C4)

Module No.	Title of the Module	Topics in the module	No. of Lectures for the module
1.	Fundamentals of Semiconductors	Introduction to Semiconductor Physics: Semiconductor materials, E-K Diagram, Carrier Concentration, Density of States, Fermi Level, Carrier Dynamics. Energy band diagram of P-N diode, Tunneling mechanism, Types of Metal-Semiconductor contacts, Schottky Barrier, Ideal Nonrectifying Barriers, Tunneling Barrier, and Heterojunctions	13
2.	Introduction to Optoelectronic Devices	Optical Absorption: Generation and Recombination, Photoluminescence and Electroluminescence, Light Emitting Diode, Photodiode, Photodetector, Solar Cell	10
3.	Introduction to Special Semiconductor Diodes	Schottky Diode, Tunnel Diode, Varactor Diode, Gunn Diode, IMPATT diode	4
4.	Introduction to Semiconductor Power Devices	Power Bipolar Transistor, Power MOSFETS, Thyristors	5

5.	Digital Logics Families	The basic Classification of the Logic Families is as follows: A) Bipolar Family B) Unipolar Family C) Hybrid Family.	10
Total Number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignment = 10, Quiz = 5, Attendance = 10)	
Total		100	
Recommended Reading material:			
1.	D. Neamen, D. Biswas ,”Semiconductor Physics and Devices”, McGraw Hill Education; 4 edition, 2017		
2.	S.M Sze. "Physics of Semiconductor Devices," Wiley 3 edition reprint (2018)		
3.	Thomas L. Floyd, “Digital Fundamentals”, 10th edition, Pearson. (2013)		
4.	S Salivahanan, N S. Kumar “ <i>Electronic Devices and Circuits</i> ”, McGraw Hill Education PrivateLtd. 2018		

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17EC671	Semester: EVEN	Session: 2023-24 Months: January to June
Course Name	TELECOMMUNICATION NETWORKS LAB		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Pankaj Kumar Yadav, B Suresh
	Teacher(s) (Alphabetically)	Juhi Gupta, Kapil Dev Tyagi, Ruby Beniwal

COURSE OUTCOMES		COGNITIVE LEVELS
C375.1	Describe about network simulator, and building/installing NS2 for conducting network simulation and summarizing OSI, TCP & UDP	Understanding Level (C2)
C375.2	To apply and analyze the concept of TCP/IP to the wired and LAN networks using UDP/TCP agents with CBR/FTP traffic source respectively	Analyzing Level (C4)
C375.3	To label and evaluate data trace files (.tr) of Wired and LAN Networks and evaluating throughput in Wired networks (with and without errors).	Evaluating Level (C5)
C375.4	To create the mobile ad-hoc network, heterogeneous networks and their routing algorithms.	Creating Level (C6)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to NS2 and Linux	1. (a) To learn about network simulator, and use NS2 for conducting network simulation including LINUX Commands. (b) To learn installing NS2 in Fedora. © . Introduction to OSI, TCP & UDP.	CO1
2.	Set up a wired Network	1 To set up a network with two nodes; link them with duplex link, 10ms propagation delay, 1Mbps rate and DropTail procedure. Use Agent UDP with CBR Traffic source. 2. To set up a network with two nodes; link them with duplex link, 10ms propagation delay, 1Mbps rate and DropTail procedure. Use FTP over Agent TCP.	CO2
3.	Ethernet	4. To implement wired LAN connection in NS2	CO2
4.	Mobile Networks	5. To create a mobile ad-hoc network with 3 nodes in 500*400 topography with following initial positions and movements: Node 0 (5, 5) Node 1 (490,285) Node 2 (150,240) At t = 10, 0 moves towards (250,250) at 3m/sec. At t =15, 10 moves towards (45,285) at 5m/sec. At t =110, 100 moves towards (480,300) at 5m/sec.	CO3
5.	Wired-cum-Wireless Networks	6. To create a Heterogeneous Network (wired cum wireless network).	CO3

6.	Interpretation of Trace Files	7. To interpret data trace file (.tr) of Wired, Wireless and LAN Networks.	CO4
7.	Throughput Calculation and Error Analysis	8. Throughput calculation for TCP or UDP in Wired network. 9. To create a network with 4 nodes 0-2, 1-2, 2-3 with TCP from 0-3 and UDP from 1-3. Apply an error model on link 2-3 with error rate 0.2 and uniform distribution. Apply queue monitor on 2-3 link and interpret any five lines of qm.out file. 10. To create a network with 5 nodes, and apply uniform, exponential and constant error model with error rate 1% on 3 different links.	CO4

Project-Based Learning: NS2 provides an interactive and graphical platform for the simulation of wired-cum-wireless networks. The TCL programming to generate any telecommunication networks is taught to the students, allowing further to analyze the performance of the network in the presence and absence of any error due to the channel fading or interference.

Evaluation Criteria

Components	Maximum Marks
Mid-Sem Viva	20
Final 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.	The ns Manual (formerly ns Notes and Documentation), http://www.isi.edu/nsnam/ns/ns-documentation.html
2.	W. Stallings, Data & Computer Communication, PHI
3.	B. A Forouzan, DATA COMMUNICATIONS AND NETWORKING, 4 th Edition TMH
4.	A.S. Tanenbaum, Computer Networks, PHI

Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B11EC611	Even-Semester	Semester: 6th Session 2023-24 Month from Jan 2024 to June 2024
Subject Name	Telecommunication Networks		
Credits	3	Contact Hours	40
Faculty (Names)	Teacher(s) (Alphabetically)	1. Dr. Ankur Bhardwaj 2. Dr. Pankaj Kumar Yadav	

COURSE OUTCOMES		COGNITIVE LEVELS
C315.1	To understand the basic concepts of Telecommunication network model, Traffic engineering and switching technology. Also to understand various mechanisms involved in OSI model, TCP/IP and LAN access protocols, ATM and ISDN.	Understanding Level (C2)
C315.2	To apply the concepts of traffic engineering, switching technologies and various network protocols for solving network related problems.	Applying Level (C3)
C315.3	To analyze the link utilization and data packet generated after incorporation of data link error control and flow control mechanisms.	Analyzing Level (C4)
C315.4	To apply the concept of subnetting for evaluating address blocks in a network. Applying various routing algorithms to predict routing path for communication between two nodes.	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Telecommunication network model	Telecommunication network model, Different networks types	2
2.	Switching technologies	Switched Communication Networks, Circuit Switching networks, Time Division Switching-Time Division Space Switching, Time Division Time Switching, Time Multiplexed Time Switching and TSI, Packet Switching Principles-Datagram and Virtual Circuit Approach, Message switching. Traffic engineering.	12
3	Computer Networks	Seven layered OSI model, Functions of different layers, primitives and services. Physical layers.	2

4	Detailed working of data link	Data link Control, Flow Control, Stop and Wait flow Control, Sliding Window Flow Control, Error Control, Go-Back-N ARQ, Selective-Reject ARQ, Performance Analysis, HDLC.	6
5.	Network Layer and Internet Protocol (IP)	Basic Principles of Network layer, IPv4, IPv6, IP Addressing, Subnetting, Supernetting, Routing Schemes-Distance Vector routing, Link-State routing, Hierarchical routing.	6
6	Transport and TCP/UDP description	Basic Principles of Transport Layer and TCP/UDP description. Congestion control and Quality of Service (QoS)	6
7	Local area networks	LAN Protocols-ALOHA, CSMA, CSMA-CD, Implementation and performance issues.	4
8	ISDN, B-ISDN, ATM.	Introduction to ISDN, B-ISDN and ATM.	2
Total number of Lectures			40

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
a) Attendance and Performance = 10	
b) Class Test/Quiz = 5	
c) Assignment = 10	
Total	100

Project based learning: Here, students will learn the basic concepts of circuit switched Telephony and packet switched data networks (TCP/IP). These concepts are utmost importance for designing, implementing and testing of telecommunication networks. Students will be will doing assignments on different topics of switching systems and different TCP/IP layers.

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.	W. Stallings, Data & Computer Communication, PHI
2.	B. A Forouzan, DATA COMMUNICATIONS AND NETWORKING, 4 th Edition TMH
3.	A.S. Tanenbaum, Computer Networks, PHI
4.	John C. Bellamy, Digital Telephony, 3 rd Edition, Wiley.
5.	Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, PHI

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B11EC315	Semester (Even)	Semester: VI Session: 2023-24 Month from January to June
Subject Name	VLSI Design		
Credits	4	Contact Hours	3-1-0

Faculty (Names) **Coordinator(s)** Dr. Ajay Kumar, Dr. Garima Kapur
Teacher(s) (Alphabetically) Dr. Ajay Kumar, Dr. Garima Kapur, Dr. Hemant Kumar, Dr. Saurabh Chaturvedi

Course Objectives: This course aims to convey knowledge of basic concepts of circuit design using CMOS with emphasis on the design, optimization and layout. Special attention will be devoted to the most important challenges facing digital circuit designers today and in the coming decade, being the impact of scaling, deep submicron effects and timing.

S. No.	Course Outcomes	Cognitive Levels/ Blooms Taxonomy
CO1	Understand VLSI design flow, VLSI design styles, digital systems modeling using Verilog-HDL	Understanding Level (C2)
CO2	Apply MOSFET models for circuits simulation and its effect on scaling.	Applying Level (C3)
CO3	Analyze the concepts of static and dynamic characteristic of MOS inverters, combinational and sequential circuits.	Analyzing Level (C4)
CO4	Evaluate dynamic logic circuits, stick diagram, layout and different types of semiconductor memories.	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Introduction to VLSI	Overview of VLSI design methodologies, VLSI design flow, Design hierarchy, VLSI design styles.	3
2.	MOS Transistor Theory	MOS structure and operation, MOSFET I-V characteristics, Scaling and small-geometry effects, MOSFET capacitances, MOSFET models for circuit simulation	9
3.	MOS Inverters	Static and switching characteristics, Delay-time definitions, calculation of delay times, Inverter design with delay	9

		constraints, Static and switching power dissipation of CMOS inverter	
4.	MOS Logic Circuits	CMOS logic circuits, Complex logic circuits, Pass transistor logic, CMOS transmission gates, Sequential logic circuits, Dynamic logic circuits, Stick diagram, Layout, Layout design rules	13
5.	Semiconductor Memories	Working of Dynamic and Static Random Access Memory (DRAM, SRAM)	4
6.	System Design using HDL	Language fundamentals, Different modeling techniques using Verilog-HDL	4
Total number of Lectures			42

Evaluation Criteria

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

PBL Component: Knowledge of VLSI Design industry, Basic of CMOS technology, CMOS circuits, power and delay calculations, CMOS technology layout and design rules, designs of memory and HDL language, all these topics develop designing and analysis ability in students.

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	Sung-Mo Kang, ; Yusuf Leblebici ; Chulwoo Kim, “CMOS Digital Integrated Circuits: Analysis and Design”, 4 th Edition, McGraw-Hill Higher Education, Indian Edition,2019.
2.	J. M. Rabaey, A. Chandrakasan, B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, 2 nd Edition, Pearson Education Inc., 2016.
3.	Neil Weste and David Harris, “CMOS VLSI Design: A Circuits and Systems Perspective”, 4 th Edition, Pearson Education India, 2015.
4.	M.Morris Mano, Michael D.Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6 th Edition, Pearson, 2018.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC315	Semester-Even	Semester VI Session 2023-2024 Month from January to June
Course Name	VLSI Design Lab II		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Garima Kapoor, Hemant Kumar
	Teacher(s) (Alphabetically)	Ajay Kumar, Saurabh Chaturvedi, Shruti Kalra

COURSE OUTCOMES - At the end of the course, students will be able to		COGNITIVE LEVELS
C374.1	Relate the concepts of basic electronics circuits and recall the use/working of circuit simulation tools.	Remembering Level (C1)
C374.2	Understand and explain the current-voltage characteristics of NMOS and PMOS transistors and extraction of MOSFET parameters.	Understanding Level (C2)
C374.3	Apply the MOSFET theory in MOS-based circuits, e.g. MOS inverters, combinational, and sequential MOS logic circuits.	Applying Level (C3)
C374.4	Analyzing the static and switching characteristics of MOS inverters, examining delay times, and simulating the schematic and layout of CMOS combinational and sequential logic circuits to inspect their responses	Analyzing Level (C4)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to EDA tools (Cadence/Tanner)	Introduction to Cadence/Tanner tools: SPICE, Schematic Editor, Layout Editor. Transient analysis of RC circuit.	C374.1
2.	MOS transistors	To study the I-V characteristics of NMOS and PMOS transistors.	C374.2
3.	MOS transistors	To obtain the following NMOS transistor parameters: k_n , V_{to} , V_t , γ and λ	C374.2
4.	MOS inverters	To analyze the voltage transfer characteristics (VTC) of resistive-load NMOS inverter and calculate V_{OH} , V_{OL} , V_{IH} , V_{IL} and V_{th} .	C374.3
5.	MOS inverters	To analyze the voltage transfer characteristics (VTC) of CMOS inverter and calculate V_{OH} , V_{OL} , V_{IH} , V_{IL} and V_{th} .	C374.3
6.	MOS combinational and sequential logic circuits	To analyze the transient response of CMOS inverter and calculate the propagation delay, rise time and fall time.	C374.4
7.	MOS combinational and sequential logic circuits	To simulate the following logic gates and verify the truth tables: (a) Two-input NAND	

(b) Two-input NOR			
8.	MOS combinational and sequential logic circuits	SPICE simulation of a circuit with the given Boolean expression.	C374.4
9.	MOS combinational and sequential logic circuits	Layout design and simulation of NMOS and PMOS transistors.	C374.4
10.	MOS combinational and sequential logic circuits	Layout design and simulation of CMOS inverter.	C374.4
11.	MOS combinational and sequential logic circuits	Simulation of CMOS SR-Latch	C374.4
Virtual labs			
12.	MOS transistors	The aim of this experiment is to plot (i) the output characteristics and, (ii) the transfer characteristics of an n-channel and p-channel MOSFET. https://www.iitg.ac.in/cseweb/vlab/vlsi/MOSFET_theory.html	C374.2
13.	MOS inverters	The aim of this experiment is to design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter. https://www.iitg.ac.in/cseweb/vlab/vlsi/CMOS_theory.html	C374.3
Evaluation Criteria			
Components		Maximum Marks	
Mid-semester viva		20	
End-semester viva		20	
Day-to-day performance (Lab record, experiment performance, discipline etc.)		60	
Total		100	
Project Based Learning: Students will learn EDA/CAD tools, MOS/CMOS logic layout design, which is the utmost requirement to design a VLSI chip. Therefore, students with the knowledge of CMOS combinational logics, can design and analyze VLSI system/sub-system-based projects.			

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.-M. Kang, Y. Leblebici, and C. Kim, "CMOS Digital Integrated Circuits: Analysis and Design," 4 th edition, McGraw-Hill Higher Education, Indian Edition, 2019.
2.	J. M. Rabaey, A. Chandrakasan, and B. Nikolic, "Digital Integrated Circuits: A Design Perspective", 2 nd Edition, Pearson Education Inc., 2016.
3.	N. H. E. Weste and D. M. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective," 4 th Edition, Pearson Education India, 2015.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	24B12EC311	Semester Even (specify Odd/Even)	Semester : 6th Session:2023-2024 Month from Jan. to June
Subject Name	Artificial Intelligence		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr Juhi Gupta	
	Teacher(s) (Alphabetically)	Dr Juhi Gupta	

S. No.	Course Outcomes	Cognitive Levels
CO1	Clarify the basics of Artificial Intelligence (AI), history of AI developments and the latest applications.	Understanding Level (C2)
CO2	Demonstrate the concepts of Artificial Intelligence including problem solving, search strategies, knowledge representation, and game playing etc	Applying Level (C3)
CO3	Explain various machine learning methods and optimization techniques.	Analyzing Level (C4)
CO4	Appraise the Neural network and CNN architectures for the related applications	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Introduction to Artificial Intelligence	Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents	5
2.	Introduction to Search Solutions	Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms, Travelling Salesman Problem, Search problems for different games, Breadth First Search, Depth First Search, A* Algorithm, Iterative Deepening A* Algorithm	8
3.	Optimization Techniques	Introduction to Optimization, Gradient Descent and Ascent Method, Learning Rate, Types of Gradient descent methods, Performance Optimization, Steepest Descent, Stable Learning Rates and Widrow-Hoff Learning, Different Optimizers, Metaheuristic Optimization	10

4.	Machine Learning	Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Reinforcement learning.	8
5.	Introduction to Neural Networks	Neuron Model and Network Architecture: Perceptron, Perceptron learning rule and proof of convergence. Backpropagation, Multilayer Perceptrons, Feed forward neural networks, CNN, Feature Maps and Pooling, LeNet	12
Total number of Lectures			42

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Attendance & Quiz)
Total	100

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)

1.	Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2.	Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3.	E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4.	Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,
5.	Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013

Detailed Syllabus
Lecture-wise Breakup

Subject Code	24B12EC312 OE	Semester	EVEN	Semester 6th Session	2023-24
Subject Name	Introduction to Information Theory				
Credits	3	Contact Hours	3		

Faculty (Names)	Coordinator(s)	Dr. Alok Joshi
	Teacher(s) (Alphabetically)	Dr. Alok Joshi

COURSE OUTCOMES		COGNITIVE LEVELS
C333-2.1	Understand the concept of probability, its relation with information, entropy and their application in communication systems.	Understanding Level (C2)
C333-2.2	Applying source coding algorithms and identifying their importance in data communications.	Applying Level (C3)
C333-2.3	Analyzing B.W & channel capacity trade off and its implication on data communications. Examining channel coding and its importance in data communications	Analyzing Level (C4)
C333-2.4	Evaluating error correcting algorithms for error detection and correction.	Evaluating Level (C5)

Module No.	title of the Module	Topics in the module	No. of Lectures for the module
1.	Review of Basic Probability	Probability mass function, probability distribution function, Random variables. Mean, standard deviation, cumulative distribution function. Bayes theorem.	3
2.	Information Measure	Discrete memoryless source, continuous source, measuring Information. Entropy and information rate, joint and conditional entropies. Differential entropy, entropy of AWGN. Source extension.	5
3.	Data Compression	Uniquely decipherable and instantaneous codes. Kraft- McMillan inequality. Source coding theorem, encoder efficiency. Huffman codes, Shanon Fano, Arithmetic and Lempel Ziv coding methods for data compression.	4
4.	Data Transmission	Discrete memoryless channel. Channel diagram, channel matrix, various types of channels. Mutual information and channel capacity. Capacity of a bandlimited AWGN channel. Limits to communication – Shannon limit.	5
5.	Error Control Coding	Concept of error control coding. Error detection and correction codes. Hamming distance, Hamming weight, condition for error detection and detection codes and evaluating their capabilities. Hard Vs soft decision decoding. ML decoding.	3

6.	Linear Block Codes	Hamming bound, systematic and non-systematic codes, linear block codes, generator matrix and parity check matrix generation, error detection using linear block codes	8
7.	Cyclic Codes	Polynomial representation, Systematic encoding. Cyclic encoding, Syndrome decoding.	6
8.	Convolutional Codes	Generator Sequences. Structural properties. Convolutional encoders. Optimal decoding of convolutional codes- the Viterbi algorithm.	8
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance, Performance. Assignment/Quiz)
Total	100

Project Based Learning: Students will learn about the design and implementation of compression algorithms as well as error-correcting codes with the help of assignments. Additionally, students in group sizes of two-three required to prepare a review of any one application of information theory using one or more research publications.

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.	R. BOSE: Information theory, coding and cryptography, Mcgraw Hill 2016.
2.	R.W. YEUNG: Information Theory and Network Coding, Springer, 2010.
3.	S. LIN & D.J. COSTELLO: Error Control Coding, 2 nd Edn, Pearson, 2011.
4.	T.K. MOON: Error Correction Coding, Wiley, 2006.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B13EC314	Semester Even	Semester VI Session 2023 -2024 Month Jan to Jun 24
Course Name	Machine Learning for Signal Processing		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Bhawna Gupta
	Teacher(s) (Alphabetically)	Dr. Bhawna Gupta

COURSE OUTCOMES		COGNITIVE LEVELS
C331-3.1	Recall propability and linear algebra concepts for intelligent processing of data.	Remembering Level (C1)
C331-3.2	Demonstrate different techniques for feature extraction and feature selection.	Understanding Level (C2)
C331-3.3	Identify various classifier and regression models for typical machine learning applications.	Applying Level (C3)
C331-3.4	Analyze neural networks and convoluntional neural network applications in real life problems.	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction and Basic Concepts	Linear algebra, Probability distributions, Representing signals, Machine Learning basics.	6
2.	Feature Selection	Introduction, Types of Feature Selection: Mutual Information (MI) for Feature Selection, Goodman– Kruskal Measure, Laplacian Score, SVD, Ranking for Feature Selection, Feature Selection for Time Series Data.	6
3.	Linear Models for Regression	Regression: Linear Basis Function Models, The Bias-Variance Decomposition	4
4.	Linear Models for Classification	Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models, The Laplace Approximation	5
5.	Decision Tree Learning	Decision Tree Representation, Hypothesis space search, Inductive bias, Issues in decision tree learning	6

6.	Support Vector Machines	Linear maximum margin classifier for linearly separable data, Linear soft margin classifier, Kernel induced feature spaces, Nonlinear classifiers, Regression by SVM, SVM variants	6
7.	Introduction to Neural Networks and Deep Networks	Neural networks, Convolutional neural networks and applications.	7
Total number of Lectures			40
Evaluation Criteria			
Components		MaximumMarks	
T1		20	
T2		20	
EndSemesterExamination		35	
TA25 (Attendance, Performance, Assignments/Quiz, Project)			
Total		100	
<p>Project based learning: Students will apply machine learning frameworks for the classification problems with the help of programming assignments. Additionally, students in group sizes of two-three will prepare a review of the one CNN application using current research papers.</p>			

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.	Pattern Recognition and Machine Learning, C.M. Bishop, 2nd Edition, Springer, 2011.
2.	Deep Learning, I. Goodfellow, Y, Bengio, A. Courville, MIT Press, 2016.
3.	The Elements of Statistical Learning, T. Hastie, R. Tibshirani, J. Friedman., 2nd Edition, 2008.
4.	Machine Learning, T. Mitchell, McGraw Hill, 1997.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16BINHS 531	Semester :Even (specify Odd/Even)	Semester : VI Session: 2023 -2024 Month from: Jan to June
Course Name	Sociology of Youth		
Credits	3 (3-0-0)	Contact Hours	3

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

COURSE OUTCOMES		COGNITIVE LEVELS
C303-2.1	Understand Youth and youth culture in sociological perspectives	Understanding(C 2)
C303-2.2	Explain the ethical, cultural& social issues concerning Youth	Evaluating(C 5)
C303-2.3	understand youth culture and to interprets the same	Analyzing(C 4)
C303-2.4	Analyze societal problems related to youth in the evolving society.	Evaluating(C 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Youth	Meaning and characteristics of youth, demographic profile of youth in India, Challenges faced by Youth, Youth's roles and responsibilities in society	4
2.	Youth Culture	Concept of Youth Culture, role of Popular culture in shaping youth culture,	4
3.	Perspectives on Youth Culture	Functionalist, Conflict, Interactionist and Feminist Perspective on Youth Culture, Youth and Gender	5
4.	Youth and Identity	Social divisions: sexuality, urban and rural youth, social identities: subcultural, digital, Experiences of youth to negotiate identities in contemporary societies	8
5.	Socialization of Youth	Concept and process of socialization, Internalization of norms, types of socialization, conditions of learning, internalized objects, theories of socialization, stages of socialization, adult socialization, agents of socialization, role of culture in socialization, socialization and cultural differences, importance of socialization, Failure of the socialization process	9
6.	Problems of Youth	Role and Value conflicts, Generation Gap, Career decisions and Unemployment, Emotional adjustment, Coping with pressures of living, Unequal Gender norms, Crime (Social Strain theories)	8
7.	Changing perceptives of Youth and Youth Culture in 21st century	involvement of youth in major decision making institutions, Post-modernity and Youth, Youth Unrest	4
			...

Total number of Lectures		42
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Project, Presentation, Assignment and attendance)	
Total	100	

Collect data from your classmates through questionnaire and identify the variables shaping their identity and aspirations. In what ways do they do this? (Another way to think about this question: How do these social forces or institution provide you with the chance to pursue your goals? How do they limit your life chances?)

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.	Tyyskä, V. <i>Youth and Society: The long and winding road</i> , 2nd Ed., Canadian Scholars' Press, Inc. (2008).
2.	White, Rob, Johanna Wyn and Patrizia Albanese. <i>Youth & Society: Exploring the Social Dynamics of Youth Experience</i> . Don Mills, ON: Oxford University Press, 2011.
3.	Bansal, P. <i>Youth in contemporary India: Images of identity and social change</i> . Springer Science & Business Media, 2012.
4.	Furlong, Andy. <i>Youth studies: An introduction</i> . Routledge, 2012.
5.	Blossfeld, Hans-Peter, et al., eds. <i>Globalization, uncertainty and youth in society: The losers in a globalizing world</i> . Routledge, 2006.
6.	Ruhela, Satya Pal, ed. <i>Sociology of the teaching profession in India</i> . National Council of Educational Research and Training, 1970.
7.	Frith, S. "The sociology of youth. Themes and perspectives in sociology." Ormskirk, Lancashire: Causeway Books, 1984.

**Detailed Syllabus
Lecture-wise Breakup**

Course Code	16B1NHS631	Semester Even	Semester 6th Session 2023 -2024 Month from January to June
Course Name	PROJECT MANAGEMENT		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr. Deepak Verma
	Teacher(s) (Alphabetically)	Dr. Deepak Verma

COURSE OUTCOMES- Revised		COGNITIVE LEVELS
C304-5.1	Understand the basic concepts of project management such as features, objectives, life cycle, model and management.	Understanding Level (C2)
C304-5.2	Apply the understanding of various theoretical frameworks, non-numerical and numerical models to identify project related risks and make correct project selection decisions	Applying Level (C3)
C304-5.3	Analyze the project deliverables and use the planning and scheduling techniques for different stages of project.	Analyze Level (C4)
C304-5.4	Evaluate management approaches for budgeting, controlling and terminating projects in order to achieve overall project success	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Project Management: Introduction	Characteristics of project; Life Cycle of Project; Project Model; Project Management as discipline; Contemporary aspects of Project Management	4
2.	Project Selection	Theoretical Models; Non-numeric models; Numeric Models; Financial Models; Project Portfolio process, Significance and applicability of Monte Carlo simulation	6
3.	Project Organization, Manager and Planning	Pure Project organization; Functional Organizations; Mixed organizations; Matrix organizations; Role, Attitudes and Skills of Project Manager, Project Coordination, Systems Integration, Work Breakdown Structure, Linear Responsibility Charts.	4
4.	Risk Management	Theoretical Aspects of risk, Risk Management process, Numeric Techniques, Hillier model, Sensitivity Analysis, Certainty Equivalent approach and Risk adjusted discount rates, Game theory.	4
5.	Project Scheduling and Resource Allocation	Theoretical aspects-Importance, Focus Area-PERT/CPM, AOA and AON charts, Probability Analysis, Gantt Charts, Crashing of Projects- Time and Cost tradeoff, Basics-	6

		Resource Leveling and Loading.	
6.	Budgeting, Control and Project Termination	Estimating Project Budgets, Improving the process of cost estimation, Basics, Importance, Purpose of control, Types of Control, Desirable features of Control, Control Systems, Critical Ratio Method, Control of creative activities, Control of change and scope creep, Why Termination, Types of termination, typical termination activities.	4
Total number of Lectures			28

Project Based Learning: Students are supposed to form a group (Maximum 5 students in each group) and identify a real-life project. They are supposed to do the in-depth study of this project and assess it in terms of project objectives. They are supposed to do the detailed study of project planning and project organization. They must highlight the various tools and techniques of Project planning, which are used in their chosen project. The fundamentals of Project management are very important in today's corporate world and certainly this subject enhances student's employability in every sector.

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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)

Text Book

1.	Meredith, Mantel, Project Management-A Managerial Approach, 10 th Edition, Wiley Publications,2017
Reference Books:	
1.	Timmothy Kloppenborg, Contemporary Project Management, 5th ^t Edition, Cengage Learning, 2017
2.	Harold Kerzner,Project Management: A Systems Approach to Planning, Scheduling, and Controlling,12 th Edition,Wiley Publications, 2017
3.	Wysocki,R.K., Effective Project Management: Traditional, Agile, Extreme, Hybrid, 8th Edition, Wiley Publications, 2018
4.	Vohra, N. D., Quantitative Techniques in Management, 5 th Edition, Tata McGraw Hill Publishing Company, 2017

Detailed syllabus
Lecture-wise Breakup

Subject Code	16B1NHS632	Semester: EVEN	Semester 6th	Session 2023-24
Subject Name	COGNITIVE PSYCHOLOGY			
Credits	3	Contact Hours	2-1-0	
Faculty (Names)	Coordinator(s)	Dr Yogita Naruka		
	Teacher(s) (Alphabetically)	Dr Yogita Naruka		

COURSE OUTCOMES		COGNITIVE LEVELS
C304-4.1	Understand and apply the concepts of cognitive psychology in everyday life	Applying Level (C3)
C304-4.2	Analyze the different models of various cognitive processes	Analyzing Level (C4)
C304-4.3	Evaluate cognitive psychology issues and recommend possible solutions	Evaluating Level (C5)
C304-4.4	Evaluate interventions/solutions for self-development through cognitive processes	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Cognitive Psychology	Historical Background: Emergence of modern cognitive Psychology; Approaches: Information Processing and PDP Model; Research Methods	3
3.	Perceptual Processes	Perceptual learning and development; perception of shape, space, and movement.	4
3.	Attention	Selective Attention and Divided Attention: Meaning, Definition, and Theories.	4
4.	Memory	Short Term Memory	3
5.	Imagery	Properties of mental images; Representation of images and cognitive maps.	3
6.	Language	Structure of language and its acquisition, speech perception, factors affecting comprehension.	4
7.	Thinking and Problem Solving	Types of thinking; Classification of problems; Problems solving approaches, Problems space theory by Newell and Simon, Creativity	4
8.	Decision Making	Logical reasoning types and errors in reasoning processes. Concept formation and categorization;	3

		Judgment and decision making	
Total number of Hours			28
Evaluation Criteria			
Components	Maximum Marks		
T1	20		
T2	20		
End Semester Examination	35		
TA	25 (Project, Assignment, Oral Questions)		
Total	100		

Project based learning: Students in a group will choose a research topic from the syllabi of cognitive psychology. Students will cover the following points to prepare project reports: Understanding of concept, related theories and perspectives; Describe the relevance of the chosen concept for personal growth; Discuss the application of chosen topic for your professional life; Elaborate the relevance of the topic at group level and societal level. Discussions on these practical aspects will enhance students' understanding & application of concepts of cognitive psychology in everyday 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.	Ronald T. Kellogg, Fundamentals of Cognitive Psychology, 2 nd Ed., Sage Publishing, 2012
2.	Robert Solso, Otto Maclin, M. Kimberly Maclin, Cognitive Psychology, 8 th Ed., Pearson Education, 2013
3.	Kathleen M. Galotti, Cognitive Psychology, 5th Ed., Sage Publishing, 2014
4.	Michael W. Eysenck, Mark T. Keane, Cognitive Psychology: A Student's Handbook , 7th Ed, Psychology Press, 2015
5.	Robert Sternberg, Karin Sternberg, Cognitive Psychology, 6th Ed, Wadsworth/Cengage Learning, 2011
6.	Edward E. Smith, Stephen M. Kosslyn, Cognitive Psychology: Mind and Brain, 1st Ed, Pearson Education India; 2015

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS634	Semester Even (specify Odd/Even)	Semester Session 2023 -2024 Month from Jan 2024 to June 2024
Course Name	Theatre and performance (Value added)		
Credits	2(Value Added)	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr Nilu Choudhary & Dr Danish Siddiqui
	Teacher(s) (Alphabetically)	Dr Nilu Choudhary

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C304-14.1	Demonstrate problem solving ability and effective life skills through theatre performances.	Understanding level (C2)
C304-14.2	Develop awareness of the role of these arts in human life	Understanding level (C2)
C304-14.3	Apply skills of listening, articulation, awareness and collaboration through the creation of performance.	Applying level (C3)
C304-14.4	Design and present an original performance alone or in collaboration with other artists.	Creating level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction of Theatre	History of theatre: role of theatre in human culture with special reference to India	2
2.	Characterization	Tips for developing character, thinking about thoughts, Flash-back, Performance	2
3.	Script Writing	Turning a story into a play ,How to write a one Act , setting the scene ,character , stage direction , Dialogues	3
4.	School of Drama	Natya-Shastra, Stanislavsky and Brecht	3
5.	Text and its interpretation	Mother Courage ,Galileo ,AadheAdhure (any one)	3
6.	Back-stage work	Management, planning, execution	1
Total number of Lectures			14

Module No.	Title of the Module	List of Experiments/Activities	CO
1.	Moving in Space.	Students will be moving around the room, filling up the space, changing pace, changing direction, being aware of other people but not touching them. Find new ways of moving, with a different emphasis each time – smooth, jagged, slow, fast, heavy, light, high up, low down and so on. Every now and again Teacher will shout “Freeze! And	C304-14.1

		Students need to freeze every muscle in your body. Absolutely NO LAUGH, LOOKING AROUND, OR MOVING. You will be out.	
2.	Mirror Activity	A great way to get students aware of body movement and working together.	C304-14.1
3.	Characterization	Developing and analyzing characters to reveal the special qualities and personalities of the characters in a story, making character believable.	C304-14.2
4.	Script Writing	The more passionate you feel about your idea, the more attractive your play will be. Divide the idea into a beginning, middle and end.	C304-14.3
5.	Role Assignment	No acting or movement at this point – just sit together to speak and hear the script carefully. Discuss and clarify any confusing aspects of the script and any apparent challenges in bringing the script to the stage. Division of script into small “units” and rehearsed separately	C304-14.3
6.	Turning story into a play	Read thru each episode or unit separately “on its feet”.Actors moving around the stage space. Set blocking for each episode. Use ideas generated from Mini-Episodes, and Staging with Images. Make sure the gestures, movements, and stage pictures tell the story clearly.	C304-14.3
7.	Stage blocking	Practice the blocking and the lines so that everyone knows what happens when and what their performance responsibilities are. Memorize lines. Work on making characters, relationships, and dialogue clear. This is a good place in which to use the Creating the Character lessons. Pay attention to vocal projection and articulation. Generate ideas about any technical elements you want to incorporate using the Transformation of Objects.	C304-14.3
8.	Script to performance	Finalize and run the entire play from beginning to end without stopping to check any additional rehearsal required to get everything running smoothly or not. Finally Perform!!	C304-14.4
Evaluation Criteria			
Components		Maximum Marks	
Mid Term		30	
End Term		40	
TA		30 (Script writing, End term stage performance)	
Total		100	

Project Based Learning: Students will be given a project in a group of 5-6 to create own imagination in the form of story and in which students create character, emotions, Vocal projection and articulation, props, background. Developing and analyzing characters to reveal the special qualities and personalities of the characters in a story, making character believable. With the help of this subject students will understand and experience the importance of these (Human)qualities or arts in human 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.	Eric Bentley, ed., The Theory of the Modern Stage: An Introduction to Modern Theatre and Drama, Penguin Books, 1968
2.	Mark Fontier, Theory/ Theatre: An Introduction, New York: Routledge, 2002
3.	Michael Holt, Stage Design and Property, Oxford: Phaidon, 1986
4.	Michael Holt, Costume and Make-up, Oxford: Phaidon, 1988
5.	Natyashastra, tr. by AdyaRangacharya, New Delhi: MunshiramManoharlal, 2006,

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS635	Semester Even	Semester VI Session 2023 -2024 Month from Jan to June
Course Name	Organizational Behavior		
Credits	3	Contact Hours	2-1-0
Faculty (Names)	Coordinator(s)	Dr. Anshu Banwari	
	Teacher(s) (Alphabetically)	Dr. Anshu Banwari	

COURSE OUTCOMES		COGNITIVE LEVELS
C304-6.1	Understand the role of individual, groups and structure in achieving organizational goals	Level-2- (Understanding)
C304-6.2	Apply appropriate strategies for meeting the special challenges in the 21 st century competitive workplace	Level-3 (Apply)
C304-6.3	Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.	Level-4 (Analyze)
C304-6.4	Assess the potential effects of emerging trends and latest practices on organization's performance	Level-5 (Evaluate)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1	Introduction to OB: Challenges and Opportunities	Interdisciplinary Field, Concepts, Approaches, Responding to Globalization; Improving Quality & Productivity; Improving Customer Service; Improving People Skill; Empowering People; Stimulating Innovation & Change; Coping with Temporariness; Positive Organizational Behavior, Working in Networked Organizations; Balancing Work-Life Conflict	3
2	Managing Workforce Diversity	Major forms of Workplace Diversity, Valuing Diversity, Role of Disabilities, Discrimination, Diversity Initiatives, Diversity Awareness and Affirmative Action, Diversity Management and strategies to implement it Competitive Advantage of Diversity Management Generational Workforce	4
3.	Job Design and Flexible Job Environment	Job Design & its uses; Flexible Job Environment; Job Enrichment Model	2
4.	Leadership: Authentic Leadership	Inspirational Approach to Leadership: Authentic, Ethical & Servant Leadership Defining Authentic Leadership through Intrapersonal, Interpersonal and Developmental Aspects; Basic Model of Authentic Leadership; Practical Approach to Authentic Leadership through the research of Terry and Bill	6

		George; Authentic Leadership: Trust and Ethics, Dimensions of Trust, Counseling & Mentoring	
5.	Power & Politics	Concept of Power; Sources of Power Contingencies of Power; Power Tactics; Measuring Power Bases: Power Authority Obedience Organizational Politics: Types Factors contributing to Political Behavior; Consequences & Ethics of Politics	5
6.	Employee Engagement	Creating a Culture of Engagement, Models of engagement, Benefits of Employee Engagement, Gallup Study, Methods of engaging employees – from entry to exit, Managers Role in Driving Engagement	2
7.	Organizational Culture & Workplace Spirituality	Creating Organizational Culture Approaches to Organizational Culture; How employees learn culture; Measuring Organizational Culture; Spirituality & Organizational Culture	3
8.	Organizational Change & Development	Organizational Change: Meaning & Types; Technology & Change; Resistance to Change v/s Inviting Change; Approaches to Organizational Change; Planning & Implementing Change; Organizational Development; OD Interventions & Change	3
Total number of Lectures			28

Evaluation Criteria

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

Project based learning: To identify the behavioral strategies adopted by a specific corporate/ business leader for his organization to meet the challenges of the 21st century competitive workplace and achieve the tangible outcomes of productivity and employee wellness within his organization.

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. P. Robbins, T. A. Judge, N. Vohra , Organizational Behavior, 18th Edition, Pearson, India, 2022
2	P.Subba Rao , Organizational Behavior: Text Cases & Games, 2nd Edition, Himalaya Publishing House , 2015
3	John R. Schermerhorn, Richard N. Osborne, Mary Uhl-Bien; James G. Hunt , Organizational Behavior, 12th Edition, Wiley India Pvt. Ltd, 2012
4	Debra L.Nelson and James C. Quick , Organizational Behavior, Cengage Learning, India Edition, 2009
5	Steven L. McShane and Mary Ann Von Glinow, Organizational Behavior Essentials, Tata McGraw Hill Publishing Company Ltd, 2007
6	J. Marques, and S. Dhiman , Leadership Today: Practices for Personal and Professional Performance (Springer Texts in Business and Economics), 1st ed., 2017

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS636	Semester: Even	Semester VI Session 2023 -2024 Month: January 2024 to June 2024
Course Name	Literature & Adaption		
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 Harleen Kaur & Dr. Monali Bhattacharya.

COURSE OUTCOMES		COGNITIVE LEVELS
C304-3.1	Understand and outline the elements and theories of adaption and its various forms.	Understanding Level (C2)
C304-3.2	Utilize visual literacy to identify the language and style adopted in filmed texts through Readers' and Audience' values and perceptions.	Applying Level (C3)
C304-3.3	Analyze texts and their adaptations stylistically beyond the surface level of narrative and audience interpretation.	Analyzing Level (C4)
C304-3.4	Evaluate, interpret and document source texts and adaptations thematically as reflections of value systems, various cultures and times.	Evaluating Level (C5)
C304-3.5	Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaption of any literary/non literary piece in another form individually and in groups.	Creating Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction Literary Devices	Figures of speech, Character, Plotline, Conflict, Point of View	2
2.	Literature & Adaptation	Understanding Cultural Contexts Forms of Adaption Cinematography & Narratology	4
3.	Framework	Adaptation Theories; Reader Response & Audience Response Theories Case study of the Classic Fairy Tale The Sleeping and its contemporary adaptation Maleficent	7
4.	Play & adaptations	The Pygmalion: George Bernard Shaw Hamlet : William Shakespeare	6
5.	Novel & Adaptations	Pride & Prejudice: Jane Austen The Giver: Lois Lowry The Godfather: Mario Puzo	9

Total number of Lectures		28
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Project, Quiz and class participation)	
Total	100	

Project Based Learning: The Group Project will consist 2 parts: Part A: creation of a story based on the symbols assigned to different groups in their respective tutorials after T1. The groups will be formed by the teacher based on the marks of T1, with every group having students with lower and higher marks. The students are required to use various literary perspectives to use the symbols in their story and create a narrative with exposition, conflicts, rising and falling action as well as climax and resolution in their respective tutorial classes on the spot. Part B will be a report analyzing the archetypal theory and narrative technique employed.

Recommended Reading material:	
1.	Linda Hutcheon, <i>A Theory of Adaptation</i>, Routledge, 2006
2.	Mark William Roche, <i>Why Literature matters in the 21st Century</i>, 1st edition, Yale University Press 2004
3.	George Bernard Shaw, <i>Pygmalion</i>, Electronic Version, Bartleby.com, New York, 1999
4.	http://shakespeare.mit.edu/hamlet/full.html
5.	https://www.sparknotes.com/film/sleepingbeauty/
6.	Jane Austen, <i>Pride & Prejudice</i>, Reprint, Thomas Egerton, 2013
7.	Mario Puzo, <i>The Godfather</i>, 1st Edition, G. P. Putnam's Sons, USA, 1969
8.	Lois Lowry, <i>The Giver</i>, 1st Edition, Houghton Mifflin Harcourt Publishing Company, USA, 1993

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS611	Semester EVEN (specify Odd/Even)	Semester VI Session 2023 -2024 Month from: Jan – June
Course Name	Marketing Management		
Credits	3(2-1-0)	Contact Hours	42

Faculty (Names)	Coordinator(s)	Dr Aviral Mishra, Dr. Deepak Verma
	Teacher(s) (Alphabetically)	Dr. Deepak Verma

Revised-COURSE OUTCOMES		COGNITIVE LEVELS
C304-7.1	Understand the fundamentals of marketing, marketing environment and market research	Understanding Level (C2)
C304-7.2	Utilize market opportunities while considering stakeholders interests and business environment.	Applying Level (C3)
C304-7.3	Analyze the emerging marketing trends and social media marketing	Analyze Level (C4)
C-304-7.4	Determine marketing strategies for businesses to gain competitive advantage.	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Understanding New Age Marketing	Defining Marketing For 21 st Century The importance of marketing and marketing's role in business and society. Introduction to Digital Marketing. Online Communication Tools. The Social Media-Conversations, Community and Content. Affiliate Marketing and Mobile Engagement. The Digital Campaigns	5
2	Marketing Environment and Market Research and insights	Internal and external forces impacting marketers. Marketing and Customer Value. Gathering Information and Scanning the environment. Company's Micro and Macro Environment Responding to the Marketing Environment	3
3	Strategic Planning and the marketing Process	Explore the impact of social forces on marketing actions. Describe how technological change affects marketing. Designing the business Portfolio Discuss the Strategic Planning Process and Strategic Marketing Process.	5
4	Consumer and	Consumer Markets and consumer buyer behavior.	5

	Business Buyer Behavior	The buying decision process. Business Markets and business buyer behavior. Discuss the modern ethical standards.	
5	Branding	Brand Image, Identity and Association. Product brands and Branding decisions. Product line and mix decisions. Consumer Brand Knowledge. New Product Development and Product life cycle strategies.	4
6	Pricing products: Pricing considerations and strategies	Factors to consider when setting prices. New product pricing strategies. Product mix pricing strategies. Price adjustments and changes.	4
7	The New Age Social Marketing	Ethics and social responsibility in marketing. Ethical behavior in business. Ethical decision making. Social forces affecting marketing. Impact of culture on marketing. Discuss modern ethical standards. Importance of marketing in CSR and business sustainability.	2
Total number of Lectures			28

Project Based Learning: Students will be assessed on a Project report. The students will present a business plan for a prospective business idea focusing on its marketing strategies applying all the concepts taught in the course

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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.	Kotler, Philip and Gary Armstrong, Principles of Marketing, 10 th Edition, New Delhi, Pearson Education, 2004.
2.	Darymple, Douglas J ., and Leonard J. Parsons, Marketing Management: Text and Cases, 7 th Edition, John Wiley & Sons(Asia) Pte. Ltd., 2002.
3.	Kotler, Philip., and Kevin Lane Keller, Marketing Management, 12 th Edition, New Delhi, Pearson Education, 2006.
4.	Winer, Russell S ., Marketing Management, 2 nd Edition, Prentice Hall,2003.
5	Dalrymple, Douglas J ., and Leonard J. Parsons, 2 nd Edition, Wiley Publication, 2000.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS613	Semester: Even	Semester VI Session 2023-24 Month from: Jan 2024-June 2024
Course Name	International Trade and Finance		
Credits	03	Contact Hours	2-1-0
Faculty (Names)	Coordinator(s)	Dr. Amba Agarwal, Dr. Vandana Sehgal	
	Teacher(s) (Alphabetically)	Dr. Amba Agarwal, Dr. Vandana Sehgal	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C304-8.1	Understand the foundations of international trade and finance in the era of globalization.	Understanding Level (C2)
C304-8.2	Apply the major models and theories of international trade.	Applying Level (C3)
C304-8.3	Examine the effects of tariffs, quotas and technical progress on economic growth.	Analyzing Level (C4)
C304-8.4	Analyze the equilibrium in the Balance of Payments, exchange rate, monetary policy, foreign trade multiplier and trade policy.	Analyzing Level (C4)
C304-8.5	Evaluate the working of regional blocs and international organizations.	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	International trade and globalization.	2
2.	Theory of International Trade	The pure theory of international trade -Theories of absolute advantage, comparative advantage and opportunity costs, modern theory of international trade; Theorem of factor price equalization; Theory of absolute cost and comparative cost.	5
3.	Economic Growth and International Trade Policy	Terms of trade, Welfare implications (Tariffs, Quotas and non-tariff barriers); Technical progress, Growth and Trade.	4
4.	Balance of Payments	Meaning and components of balance of payments; balance of trade, equilibrium and disequilibrium in the balance of payments; Measuring Deficit or Surplus in BOP, Measures to correct it.	4
5.	Fixed and Flexible Exchange Rate	Fixed exchange rates and flexible exchange rates; Expenditure-reducing and expenditure-switching policies.	4
6.	International Economic Integration	Foreign Trade Multiplier, Devaluation, Theory of Custom Unions, Trade policy.	3

7.	The Theory of Regional Blocs & International organization	Rationale and economic progress of SAARC/SAPTA and ASEAN regions. Regionalism (EU, NAFTA); Functions of GATT/WTO (TRIPS, TRIMS), IMF and World Bank.	6
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Total number of Lectures	28
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Evaluation Criteria

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

Project Based Learning: The students in a group of 4-5 are required to prepare a project report (selecting two or more countries) to analyze the direction and trade composition between the countries. The students are also required to analyze the areas of potential expansion using different trade indices.

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.	Krugman, Paul., International Economics: Theory and Policy, 10 th edition, Pearson, 2017
2.	Kindleberger, C.P., International Economics, 6 th edition, R.D. Irwin, Homewood, 1978
3.	Salvatore, D., International Economics, 13 th edition , Prentice Hall, Upper Saddle River, N.J., New York, 2016
4.	Soderston, Bo, International Economics, 3 rd edition, The Macmillan Press Ltd., London, 1999
5.	Roy Malbika and Sinha, Saket, International Trade and Finance, 1 st edition, Springer, 2017

Detailed Syllabus

Course Code	20B12HS311	Semester Even (specify Odd/Even)	Semester Session 2023-24 Month from Jan– June2024
Course Name	Global Politics		
Credits	3(2-1-0)	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Gaurika Chugh
	Teacher(s) (Alphabetically)	

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C304-9.1	Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions	Understanding (C2)
C304-9.2	Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance	Analyze (C4)
C304-9.3	Analyze how the global politics shapes domestic politics	Analyze (C4)
C304-9.4	Demonstrate an understanding of the working of the global economy, its anchors and resistances offered by global social movements	Apply (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Globalization: Conceptions and Perspectives	Political Dimension of globalization Globalization and Culture Technological Dimensions Debates on territoriality and sovereignty	6
2.	Global Economy	Its Significance and Anchors of Global Political Economy:IMF- history and India's benefit from its membership of IMF WTO- History and India's experience with WTO and reform proposals World Bank- history and role of world Bank in India Rise of TNCs and role of TNCs in globalization Global resistances (Global Social Movement and NGOs)- their nature and characteristics, prominent movements and their impact	8
3.	Contemporary Global Issues-I	Ecological Issues: historical overview of international environmental agreements-UNSCD, Paris agreement, climate change- Copenhagen summit to post Copenhagen summit policies of India, climate change and global initiatives	8

Detailed Syllabus

CourseCode	21B12HS311	Semester:EVEN (specify Odd/Even)	Semester:VI Session:2023-24 Month from: Jan-June
CourseName	Development Issues and Rural Engineering		
Credits	03	ContactHours	2-1-0

Faculty(Names)	Coordinator(s)	Dr.Amandeep Kaur
	Teacher(s) (Alphabetically)	Dr. Amandeep Kaur

COURSE OUTCOMES		COGNITIVE LEVELS
C304-10.1	Understand the concept, philosophy and determinants of rural development	Understanding Level- (C2)
C304-10.2	Explain the role of local self-governance in planning and development of rural areas.	Understanding Level- (C2)
C304-10.3	Examine the role of public policies related to rural development	Analyze Level –(C4)
C304-10.4	Analyze the impact of recent policy changes and schemes on rural development.	Analyze Level –(C4)
C304-10.5	Evaluate the issue and challenges of through possible determinants of rural development.	Evaluation Level- (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Rural Development: An Introduction	Rural Development Philosophy, Concepts, Principles, Traditional and Modern Concept of Development, Trends and Pattern of micro as well as macro indicators of Rural Development.	4
2.	Public Policies and Rural Development	Policies related to Employment Generation, Poverty Reduction, Skill Development and, Infrastructure such as MGNREGA, DDUGKY, AtamNirbhar Bharat rojgaryojna and schemes related to MSMEs etc.	6
3.	Rural Development Administration and Panchayat Raj Institutions	Rural Development administration: Panchayat Raj System (73 rd Amendment Act), functions of Panchayat Raj System, Financial Distribution of Resources in Rural India through Panchayat Raj System, merits and demerits of Panchayat system, Ways to strengthen the existing system by overcoming the flaws.	6

4.	Rural Development Issues and Challenges	Issues and challenges of Rural development: Employment in line with sectoral distribution (GDP and Employment), Poverty and Migration Issue, Rural and Urban Consumption and Production Linkages.	7
5.	Recent Advancements and changes	Recent packages and schemes implemented in Rural India, Budget Allocation for Rural Development -2022-23 and 2023-24: For Employment Generation, poverty reduction, infrastructure and MSMEs.	5
Total number of Lectures			28

Evaluation Criteria

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

Project-based Learning: Students are required to collect the data related to different indicators of rural development (related to agriculture, health and education infrastructure, literacy levels, population density, poverty, employment etc.). They also need to check the compatibility of data (data mining and data refining process) and then analyse the contribution of these indicators in rural development of particular state/country as whole. Moreover, they are required to analyse the extent of progress and failure of programmes/schemes implemented in rural areas for poverty reduction, employment generation and MSMEs. Collecting information and analysing the data related to development indicators and policies will upgrade students' knowledge regarding the development issues and strengthen their skills to tackle multiple data handling and measuring issues.

Recommended Reading material:

1.	Singh, Katar. Rural Development: Principles, Policies and Management (3e).2009
2.	Coke, P., Marsden, T. and Mooney, P. Handbook of Rural Studies. Sage Publications, 2006
3.	Todaro, M.P., Stephen C. Smith, Economic Development, Pearson Education, 2017
3.	Ahuja, H. L., Development Economics, S Chand publishing, 2016
4.	Musgrave, R. A., Musgrave, P. B., Public Finance in Theory and Practice, McGraw Hill Education,2017

Detailed Syllabus
Lecture-wise Breakup

Course Code	23B18HS311	Semester Even (specify Odd/Even)	Semester Session 2023-24 Month from January to June
Course Name	Introduction to Workplace Communication (Value added)		
Credits	0	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr. Ekta Singh
	Teacher(s) (Alphabetically)	Dr. Ekta Singh

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
CO1	Describe different types of communication and how they are used in the workplace	Understanding level(C2)
CO2	Understand the impact that communication can have on how people are perceived by others	Applying level (C3)
CO3	Recognize the skills required for effective communication	Analyzing level(C4)
CO4	Identify how effective communication can overcome challenges in the workplace	Evaluating level(C5)
CO5	Reflect on current interpersonal communication skills and how these can be developed and used more successfully.	Creating (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Introduction to Work Place Communication	Concept and mechanism of communication, understanding of effective communication at work place, understanding corporate communication and its importance, Different levels of communication at workplace, Different kinds of communication employed in workplace	3

2.	Written Communication Skills	Effective and appropriate use of email, email etiquettes, report writing, memo writing, proposals and questionnaire, preparation of PowerPoint presentation slides, common grammatical errors, outlining before writing and document design	4
3.	Oral Communication Skills	Non-Verbal Communication and Cultural Competence, Public speaking vs. Small group communication, Interpersonal Communication, Interview etiquette	2
4.	Team Work	Contribution to Teams, Communication with peers, managers, clients and customers, Active participation in meetings, Professional conduct	2
5.	Visual and Electronic Communication Skills	Introduction to Visual and electronic communication, Producing Visual aids, writing effective text messages, Usage of Multimedia, Video calls etiquettes, various tools and software used	3
Total number of hours			14

Module No.	Title of the Module	List of Experiments/Activities	CO
1	Introduction to Work Place Communication	Introduction in an Interview Spread the Word Exercise	CO3 CO2
2	Written Communication Skills	Effective Email Writing Listen and Write	CO3 CO5
3	Oral Communication Skills	Mock Interview Customer – Service Provider Interaction	CO5 CO4
4	Team Work	Heard, Seen, Respected Conflict Resolution	CO1 CO4
5	Visual and Electronic Communication Skills	Online Briefing Session Online Meeting Etiquette	CO1 CO3

Evaluation Criteria	
Components	Maximum Marks
Midterm examination	30
End Semester Examination	40
TA	30 (Technical presentation, class participation, Project)
Total	100

Project Based Learning: Students form a group of 4-5 students. Each group is required to choose an

internal communication case study of corporate organizations which shows and describes the cost of poor communication. Students are required to:

- 1- Present the case and reflect on the related communication barriers
- 2- Submit a report on the same

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.	P. M. & R. A. Luecke, <i>Interpersonal Communication Skills in the Workplace</i> , United States of America: American Management Association, 2008.
2.	D. L. Lewis, <i>Effective Communication in the Workplace: A Practical Guide to Improve Interpersonal Communication in the Workplace for Better Environment, Client Relationships, and Employee Engagement</i> , Independently Published, 2019.
3.	D. L. Lewis, <i>Effective Communication in the Workplace: A Practical Guide to Improve Interpersonal Communication in the Workplace for Better Environment, Client Relationships, and Employee Engagement</i> , Independently Published, 2019.
4.	Barun K. Mitra, <i>Personality Development & Soft Skills</i> , Oxford University Press, New Delhi, 2012.
5.	L. M. & M. Valo, in <i>Workplace Communication</i> , vol. 1, New York, Routledge, 2019.
6.	M. S. & A. Aira, "Technology-Mediated Communication in the Workplace," in <i>Workplace Communication</i> , New York, Routledge, 2019. [5]
7.	J. Mizrahi, <i>Writing for the Workplace: Business Communication for Professionals</i> , Business Expert Press, 2015.
8.	Shiv Khera, <i>You Can Win</i> , Macmillan Books, New York, 2003.
9.	S. Kumar and PushpLata, <i>Communication Skills</i> , Oxford University Press, 1st, Ed. 2011
10.	Raman M. and S. Sharma, <i>Technical Communication: Principles & Practices</i> , 29 th Impression, Oxford University Press, New Delhi, 2009

Detailed Syllabus
Lecture-wise Breakup

Course Code	24B12HS311	Semester: Even (specify Odd/Even)	Semester: 6 th Session: 2023 -2024 Month from: January-June
Course Name	Investment management		
Credits	03	Contact Hours	2-1-0
Faculty (Names)	Coordinator(s)	Dr. Purwa Srivastava	
	Teacher(s) (Alphabetically)	Dr. Purwa Srivastava	

COURSE OUTCOMES		COGNITIVE LEVELS
C206-11.1	To Understand and getting acquainted with the securities market and its investment instruments.	Understand (C2)
C206-11.2	To Apply the concept of fundamental analysis of company and Investment Planning	Apply (C3)
C206-11.3	To Analyze the relationship between risk and return by applying various models	Analyze (C4)
C206-11.4	To Evaluate the value of financial assets, equities and bonds.	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Financial Investments	Concept and Definition of Investment – Investment Decision and Process – Types –Investment Vs Speculation- Role of Speculator – Source of Investment Information – Opening Demat account -Securities Market-Primary and Secondary Market –Stock Exchanges – Investment Planning and investment avenues	6
2.	Fundamental Analysis	Economic analysis -Factors in Domestic and International economy – Industry Analysis: Industry classification schemes –Classification by product and according to business cycle – Key characteristics in industry analysis – Industry life cycle – Sources of information for industry analysis. Company Analysis: Sources of information for company analysis (Internal, External) – Factors in company analysis – Operating analysis – Management	5

		analysis – Financial analysis – Earnings quality.	
3.	Basic Concepts and Methods	Capital Asset Pricing Model - Assumptions – Inputs Required for Applying CAPM, The Capital Market Line - Security Market Line, Pricing of Securities with CAPM. Arbitrage pricing theory (APT).	5
4.	Equity Valuation	Equity Valuation: Balance Sheet Techniques- Book value, Liquidation value, Replacement cost. Discounted Cash Flow Techniques: Dividend discount model, Free cash flow model. Relative Valuation Techniques: Price-earnings ratio, Price-book value ratio, Price-sales ratio.	5
5.	Bond Valuation	Overview of fixed-income securities – Risk factors in fixed-income securities (Systematic and unsystematic) – Bond analysis – Types of bonds – Major factors in bond rating process – Bond returns – Holding period return - Concept of yield – Current yield – Yield-to-Maturity – Price-yield relationship – Convexity - Term structure of interest rates and yield curve – Duration - Valuation of preference shares.	7

Total number of Lectures

28

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 student will be given a group project to do the fundamental analysis of one Industry. They will perform economic analysis, Industry analysis and company analysis. Basis this analysis they will shortlist top five companies fit for investing in that particular sector. They will prepare a rating chart for the companies for the top companies selected for investing.

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.	Luenberger, D. G. (2017), Investment Science,Oxford University Press.
2.	Bodie, Kane, and Marcus (2019), Investments,McGraw Hill.
3.	Damodaran, A.(2014), Applied Corporate Finance, Wiley India
4.	ZviBodie, Alex Kane, Alan J Marcus, Pitabas Mohanty (2014) Investments, (10th Edition), Tata McGraw Hill.
5.	Punithavathy Pandian, Security Analysis and Portfolio Management, Vikas Publishing House Pvt. Ltd.
6.	Jordan, R. J, and Fisher, D. E: (1995), Security Analysis and portfolio, (6th Edition), Pearson.

Detailed Syllabus
Lecture-wise Breakup

Course Code	24B12HS312	Semester Even	Semester: VI Session: 2023-2024 Month from Jan to June
Course Name	FILM STUDIES		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr Mohammed Danish Siddiqui
	Teacher(s) (Alphabetically)	Dr Mohammed Danish Siddiqui

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
CO1	Label with knowledge and reflect upon the articulation of a film's content, form and structure and genre	Remembering level(C1)
CO2	Demonstrate the formal and stylistic elements of film and extend an understanding of film language and terminology, and analyze the ways in which that this language constructs meaning and ideology	Understanding level(C2)
CO3	Applying Critical film theories to be able to identify significant movements and articulate key concepts.	Applying level (C3)
CO4	Discover the familiarity with diverse forms of the moving image, including, for example, the feature film, experimental and avant-garde cinema, video art and moving image installation, television, and digital media	Analyzing level(C4)
CO5	Evaluate film forms and its historical and cultural contexts. Explain how a film offers a set of social, political, and cultural ideas and questions through form and content	Evaluating Level (C5)
CO6	Develop a competency in discussing the ways in which film is influenced and shaped by individuals, movements, institutions, and technologies with local, national, transnational, and global dimensions	Creating level(C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction of Film and Film Theorists	History of Film: role of Film in human culture, elements of film, Film Theories and Theorist, Language of Film, Camera, and its Language.	5
2.	Components of Cinema	Color meaning in Cinema, Film Genre, Editing, Intertextuality, History of Cinema: German Expressionism, Aesthetics of Neo -Realism, French new wave, Concept of Third Cinema, Film Noir, Indian cinema, OTT Platforms: NETFLIX, Amazon Prime Video, Disney Hot Star, EROS	5

3.	Critical Film Theory	An Introduction to Critical Film Theories, Apparatus theory, Screen theory, Queer Theory, Cognition, Auteur theory, Mise En Scene, Male Gaze	5
4.	Reception of Film	Film and reception theory, Spectatorship as bridge,	2
5.	Film Reading	Bride and Prejudice, Gone with the Wind, Avatar: The way of Water	6
6	Essays on Film	Andrea Bazin: The Evolution of the Language of Cinema Gilbert Harman: Semiotics and the cinema Laura Mulvey: Visual Pleasure and the Narrative Cinema Bill Nicholas: The Voice of the Documentary	5
Total number of Lectures			28

PBL Component: The Project is to be done in a group of 3-4 Students. Students will be asked to write a Proposal with a well-researched technical report on the nature and critical appraisal of film by identifying the themes and purpose of film and its elements and its application in the real world.

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.	Vallejo, Amy, Film Studies: The Basics, Routledge London, and New York 2005.
2.	Joret Blandine: Studying Film with Andre Bazin, Amsterdam university Press
3.	Nelmes, Jill: An Introduction to Film Studies, Routledge London 1998.
4.	Doughty Ruth and Deborah Shaw: FILM ---The Essential Study Guide, Routledge London and New York 2009.

Evaluation Criteria	
Components	Maximum Marks
Test 1	20
Test 2	20
End Term	35
TA	25
Total	100

Detailed Syllabus
Lecture-wise Breakup

Course Code	24B16HS311	Semester: Even, VI	Semester: VI Session: 2023-24 Month: January- June 2024
Subject Name	Basics of Creative Writing (Value Added Course)		NBA Code: C305-16
Credits	2	Contact Hours	L-T-P (1-0-2)
Faculty (Names)	Coordinator(s)	Dr Harleen Kaur	
	Teacher(s) (Alphabetically)	Dr Harleen Kaur	

COURSE OUTCOMES: The students will be able to:		COGNITIVE LEVELS
C305-16.1	Explore the creative process through writing in different genres	Understand (C2)
C305-16.2	Develop an ability to critique constructively	Apply (C3)
C305-16.3	Synthesize the coherent and cohesive devices by using transition markers	Analyze (C4)
C305-16.4	Evaluate different forms of creative writing	Evaluate (C5)
C305-16.5	Employ to write clearly, effectively, and creatively by using appropriate style as per content and context	Create (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	General Principles of Writing	<ul style="list-style-type: none"> ● Introduction to writing ● Understanding creativity in writing ● Discovering the joy of writing ● Essentials of creative writing 	3
2.	Essentials of Language Usage	<ul style="list-style-type: none"> ● Language, Syntax and Figures of Speech ● Imagery, Motifs and Symbols ● Punctuation and Spellings 	3
3.	Developing Ideas into texts	<ul style="list-style-type: none"> ● Plot, Character and Dialogue ● From creative thoughts to expression ● Editing and Rewriting 	3
4.	Structure of Creative Writing	<ul style="list-style-type: none"> ● Coherence ● Cohesion ● Ways to attain unity 	3
5.	Modern forms of Creative Writing	<ul style="list-style-type: none"> ● Writing for mainline media ● Book Reviews ● Writing for the web 	2
Total number of Lectures			14

Module No.	Title of the Module	List of Experiments/Activities	No of Lab Sessions (in hours)	CO
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1.	Hands on process of Pre-writing	Students will be divided into groups. The students will be given a current topic after discussion with them and they will be assigned the following devices to write on the given topic: <ul style="list-style-type: none"> ● Freewriting ● Listing ● Cluster ● Mindmapping After completion of above-mentioned processes, the group will present their ideas in front of everyone.	6	CO1												
2.	Idea Generation/ Brainstorming	The teacher will ask students to bring a few excerpts of their favourite fiction /Non-Fiction and they will be asked to use the following devices in the chosen text to create a new plot: <p style="text-align: center;"> S – Substitute C – Combine A – Adapt M – Modify P – Put to another use E – Eliminate R – Reverse </p>	6	CO2												
3.	Structuring Ideas and Writing	The students will be asked to structure their ideas in a coherent way and reproduce the same in following forms: <ul style="list-style-type: none"> ● Twitterature ● Flash Fiction The twitterature will allure them reproduce the ideas in very precise form of 160 words whereas Flash fiction will allow them to write within 1000 words.	6	CO3												
4.	Developing a story	The students will be asked to write a story on the same topic by using the following different devices: <ul style="list-style-type: none"> ● Developing a story ● Inductive to Deductive ● Deductive to Inductive ● Spatial to Chronological ● Chronological to Spatial 	4	CO4												
5.	Experimental pieces	The students will be asked to write profiles, book review and blogs and travelogues to share their experience.	6	CO5												
Total number of Lab Hours				28												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: left;">Evaluation Criteria</th> </tr> <tr> <th style="text-align: left;">Components</th> <th style="text-align: left;">Maximum Marks</th> </tr> </thead> <tbody> <tr> <td>Mid Term</td> <td>30</td> </tr> <tr> <td>End Term</td> <td>40</td> </tr> <tr> <td>TA</td> <td>30 (PBL, Script writing, End term stage performance)</td> </tr> <tr> <td>Total</td> <td>100</td> </tr> </tbody> </table>					Evaluation Criteria		Components	Maximum Marks	Mid Term	30	End Term	40	TA	30 (PBL, Script writing, End term stage performance)	Total	100
Evaluation Criteria																
Components	Maximum Marks															
Mid Term	30															
End Term	40															
TA	30 (PBL, Script writing, End term stage performance)															
Total	100															

Project Based Learning:

Students, in groups of 4-5, are required to re-write a novella using the SCAMPER Technique.

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

Text Book(s):	
1 .	Steele, Alexander Ed.: Writing Fiction: the Practical Guide from New York's Acclaimed Creative Writing School, Gotham Writers' Workshop, 2003.
2 .	King, Stephen: On Writing: A Memoir of the Craft, Pocket Books, 2002.
Reference Book(s):	
3 .	Lamott, Anne: Bird by Bird: Some Instructions on Writing and Life, Goodreads Author, 1995
4 .	Goldberg, Natalie: Writing Down the Bones: Freeing the Writer Within, Shambala, 2006.
5 .	Browne, Rennie: Self-Editing for Fiction Writers: How to Edit Yourself Into Print, William Morrow Paperbacks, 2004.
6 .	Atwan, Robert and Forer, Bruce: Why we Write: a thematic reader, Harper and Row, 1986.
7 .	DiYanni, Robert: Twenty-five great essays, Longman, 2001.
8 .	Daniels, David I., Goldstein, Janet M., Hayes, Christopher G.: A Basic Reader for College Writers, 1989
9 .	McQuade, Donald, Atwan, Robert: Thinking in Writing: Structures for Composition, Knopf, 1998.

Detailed Syllabus

Course Code	16B19PH693	Semester: Even	Semester: 6 th Session: 2023-2024 From: January to June
Course Name	Mechatronics		
Credits	2	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dr. Alok P. S. Chauhan
	Teacher(s) (Alphabetically)	Dr. Alok Pratap Singh Chauhan

COURSE OUTCOMES After completion of the course, students will be able to:		COGNITIVE LEVELS
CO1	Define the basic fundamentals of materials and manufacturing as well as electronic and mechanical devices.	Remember Level (Level 1)
CO2	Illustrate the various principles involved in designing controllers and sensors.	Understand Level (Level 2)
CO3	Make use of mechatronics concept in drives, hydraulic and pneumatic systems.	Apply Level (Level 3)
CO4	Discover the problems in designing & fabrication in industrial robotics and mechanized machines.	Analyze Level (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Mechatronics and Mechatronics Elements	Definition of mechatronics. Mechatronics in manufacturing, products and design. Review of fundamentals of electronics. Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers.	6
2.	Processors /controllers	Microprocessors, microcontrollers, PID controllers and PLCs.	4
3.	Drives and mechanisms of an automated system	Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems.	6
4.	Hydraulic system	Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits.	4
5	Pneumatic system	Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems	4
6.	CNC technology and Robotics	CNC machines and part programming. Industrial Robotics. Use of micro-controllers (Arduino) and microprocessors (Raspberry Pi), etc. and integrate with MATLAB/OCTAVE, etc.	6
Total number of Lectures			30

Evaluation Criteria	
Components	Maximum Marks
Mid Term Examination	30
End Semester Examination	40
TA	30 [Attendance (10 M), Class Tests, Quizzes, Internal Assessments, etc (10 M), Internal Assessment and Assignments in PBL Mode (10 M)]
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.	Text 1: Bolton, W., Mechatronics: Electronic control systems in mechanical and electrical engineering, Pearson, 2019.
2.	Text 2: Ramchandran, K. P., Vijayaraghavan G.K, Balasundram, M.S., Mechatronics-Integrated Mechanical Electronic Systems, Wiley, 2019.
3.	Reference: De Silva, Clarence W., Mechatronic systems: devices, design, control, operation and monitoring , CRC Press, Taylor & Francis, 2008.
4.	Reference: Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, 1994.
5.	Reference: Boucher, T. O., Computer automation in manufacturing - an Introduction, Chapman and Hall, 1996.
6.	Reference: Alciatore, D. G., Hstand, M. B., Introduction to Mechatronics and Measurement Systems, Mc Graw Hill, 2016
7.	Reference: Mahalik, N. P., Mechatronics Principles, Concepts and Applications, Mc Graw Hill, 2017

Project Based learning: Different groups of students with 2-3 students in each group may be formed and these groups may be given to complete a task like collecting and classifying the mechatronic applications. The students can consider ideas that include building an autonomous robot, creating an automated control system, developing a smart home automation system, designing a quadcopter drone, developing an exoskeleton robot, and building an automated vehicle. The article advises choosing a project that aligns with one's interests and skills and encourages experimentation and innovation. They can use different commercially available software tools to do designing and prediction. Apart from this different coding languages be used as well along with integrating with Raspberry Pi, Arduino, etc. Within each of these problem domains, the students will learn to work in a team. It will improve their analytical skills and the students will learn to achieve their common goal through mutual discussion and sharing of knowledge, information & understanding.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH631	Semester: Even	Semester: VI Session 2023 -2024 Month from: Jan-June
Course Name	Computational Physics		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Vikas Malik
	Teacher(s) (Alphabetically)	Vikas Malik

COURSE OUTCOMES		COGNITIVE LEVELS
C302-12.1	Define key concepts used in Monte Carlo Simulation, Random walks, percolation and Numerical methods	Remember Level (C1)
C302-12.2	Explain basics of numerical analysis, statistical mechanics, Monte Carlo simulations, percolation, random walks.	Understand Level (C2)
C302-12.3	Model and simulate magnetic systems, polymers and networks; interpret simulation data	Apply Level (C3)
C302-12.4	Develop advanced Monte Carlo techniques to solve Optimization problems. Simulate percolation of complex networks.	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Numerical Methods	Locating Roots of Equations, Interpolation and Numerical Differentiation, Numerical Integration, Systems of Linear Equations, Ordinary Differential Equations, Fourier Transform Techniques.	10
2.	Simulation Techniques	Random Number Generation and Monte Carlo Methods, Equilibrium Statistical mechanics, Importance sampling, Metropolis algorithm.	10
3.	Applications of Computer Simulations in Physics	Ising Model Simulations of Magnetic Solids and Phase Transitions, Monte Carlo Intergration, Random Walk and its Applications to Polymers, Cluster Identification algorithms, Percolation and Fractal Phenomena, Chaos and Non-Linear Systems.	15
4.	Advanced Simulation Techniques	Cluster Algorithms, Variational Methods and Optimization Techniques.	05
Total number of Lectures			40

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 Attendance (5 M), Class Test/Quizzes (6 M), Internal assessment (04M)

Assignments in PBL mode (10 M)]

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.	S. S. Sastry, <i>Introductory Methods of Numerical Analysis</i> , Prentice Hall India, 2005.
2.	Kerson Huang, <i>Statistical Mechanics</i> , 2nd Edition, John Wiley, 2009.
3.	K. Binder & D. Heermann, <i>Monte Carlo Simulation in Statistical Physics</i> , 2nd Edition , Springer, 2013.
4.	Newman & Barkema, <i>Monte Carlo Methods in Statistical Physics</i> , Clarendon Press, 1999.
5.	Landau & Binder, <i>A guide to Monte Carlo Simulations in Statistical Physics</i> , Cambridge University Press, 2014.
6.	M. H. Kalos and P. A. Whitlock, <i>Monte Carlo Methods</i> , John Wiley and Sons, 2009.

The students will be given small projects (in groups) on various topics like Monte Carlo Simulation, random walks and cluster algorithms. The students will make programs to do simulations on various complex physical systems. This will make the student connect the concepts studied with real world problems.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH632	Semester EVEN	Semester 6th Session 2023-2024 Month from January to June
Course Name	SOLID STATE ELECTRONIC DEVICES		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr. Dinesh Tripathi	
	Teacher(s) (Alphabetically)	NA	
COURSE OUTCOMES			COGNITIVE LEVELS
CO1	Define terminology and concepts of semiconductors with solid state electronic devices.		Remembering (C1)
CO2	Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication.		Understanding (C2)
CO3	Solve numerical problems based on solid state electronic devices.		Applying(C3)
CO4	Examine the impact of various parameters on semiconductor devices and their performances.		Analyzing (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Energy band and charges carriers in conductors	Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields, Invariance of the Fermi level at equilibrium, optical absorption, Luminescence, Carrier lifetime and photoconductivity, diffusion of carriers	12
2.	Junctions	Fabrication of p-n junctions, equilibrium conditions, steady state conditions, reverse bias breakdown, recombination and generation in the transition region, metal semiconductor junctions, heterojunctions,	10
3.	Transistors	Field effect transistor (FET), Metal-insulator FET, Metal-insulator-semiconductor FET, MOS FET, Bipolar junction transistors	08
4.	Devices	Photodiodes, solar cell, light emitting diodes, semiconductor lasers, Negative conductance Microwave devices: Tunnel diode, IMPATT diode, Gunn diode	10
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 [PBL (10), Quizzes (3+3=6), Attn. (5), & Class performance (4)]	
Total		100	

Project based learning: To make a better understanding about the subject, groups of 4-5 students will be formed and a project on semiconductor devices viz. Gauss meter, Photodiode, Light Emitting Diode, Solar cell, Tunnel Diode, FET, MOSFET etc. will be allotted to each of the groups. The students will collect all the information's and understand about the basic principle, fabrication process and current research activities going on in the particular field. The students will also be encouraged to explore the field and create interactive simulations based on these devices.

Recommended Reading material:

1.	Donald A Neamen & Dhruves Biswas, Semiconductor Physics and Devices, McGraw Hill Education
2.	S. M. Sze, Physics of Semiconductor devices, Wiley-Interscience
3.	Streetman and Banerjee, Solid State Electronic devices, PHI
4.	Umesh Mishra and Jasprit Singh, Semiconductor Device Physics and Design,

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH633	Semester: Even	Semester: VI Session: 2023 -2024 Month: January to June
Course Name	Photovoltaic Techniques		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. B. C. Joshi -JIIT 62 Dr. Prashant Chauhan – JIIT 128
	Teacher(s)	Dr. B. C. Joshi Dr. Prashant Chauhan

COURSE OUTCOMES		COGNITIVE LEVELS
C302-8.1	Classify various type of renewable energy sources and explain working of photovoltaic device.	Understand Level (Level 2)
C302-8.2	Demonstrate the use of basic principles to model photovoltaic devices	Understand Level (Level 2)
C302-8.3	Identify challenges and apply strategies to optimize performance of various type of solar cells	Apply Level (Level 3)
C302-8.4	Analyze Solar PV module, mismatch parameter and rating of PV module	Analyze Level (Level 4)
C302-8.5	Evaluate the performance of various stand-alone PV systems with battery and AC and DC load	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Review	Energy issues, conventional energy sources, Renewable energy sources, Solar Energy	02
2.	Solar cell fundamentals	Fundamental of semiconductor, charge carriers and their motion in semiconductors, carriers generation and recombination, p-n junction diode, introduction to solar cell, p-n junction under illumination, Current-Voltage (I-V), open circuit voltage (V_{oc}), short circuit current (I_{sc}) Maximum power, current and voltage and Efficiency, Quantum Efficiency	10
3.	Design of solar cells	Upper limits of cell parameters, losses in solar cell, solar cell design, design for high I_{sc} , V_{oc} , FF, solar simulators	08
4.	Solar technologies cell	Production of Si, Si wafer based solar cell technology, thin film solar cell technologies (CIGS, microcrystalline and polycrystalline Si solar cells, amorphous Si thin film solar cells), multijunction solar cells, Emerging solar cell technologies: organics solar cells, Dye-sensitized solar cell (DSC), GaAs solar cell	12
5.	Photovoltaic system	PV system: Introduction, Stand-alone system, Grid connected system, Hybrid system, Designing of PV system, Balance of system- BOS (Inverters, Controllers, Wiring, Batteries) Photovoltaic Cells, Estimating PV system size and cost, Photovoltaic safety.	08

Total number of Lectures		40
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (2 Class Tests (6M), Attendance (5M), PBL (10 M), Class performance (4M))	
Total	100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)		
1.	Tom Markvart and Luis Castaner, "Solar Cells: Materials, Manufacture and Operations," Elsevier, 2006	
2.	Stuart R. Wenhem, Martin A. Green, M.E. Watt, "Applied Photovoltaics," Earthscan, 2007	
3.	Jenny Nelson, "The Physics of Solar Cells" Imperial college press," 003.Aatec publications, 1995.	
4.	C S Solanki, Solar Photovoltaics, PHI	

PBL: Students are given the task to design a PV system for the water pump and home appliances. This design can help students in understanding the basic knowledge of PV systems, wiring, load calculation, battery sizing, PV panels, etc. This can help students in getting jobs in the renewable energy sector.

Detailed Syllabus

Course Code	16B1NPH634	Semester: Even	Semester: VI Session: 2023-24 From: January 2024 to June 2024
Course Name	Applied Statistical Mechanics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Indrani Chakraborty
	Teacher(s) (Alphabetically)	Dr. Indrani Chakraborty

COURSE OUTCOMES		COGNITIVE LEVELS
After completion of the course, students will be able to:		
C302-9.1	Define the fundamental parameters of Thermodynamics and Statistical Mechanics.	Remember Level (Level 1)
C302-9.2	Explain the Thermodynamic potentials, Maxwell's equations and Heat equations.	Understand Level (Level 2)
C302-9.3	Apply the concepts of thermodynamics and statistical ensembles to understand the phase space and distribution functions.	Apply Level (Level 3)
C302-9.4	Determine the distribution functions in case of various types of physical and chemical ensembles.	Analyze Level (Level 4)
C302-9.5	Evaluate the ideas of Entropy with respect to Probability and Information Theory; and conclude Liouville's equation.	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Thermodynamics	Overview of basic laws of Thermodynamics; Microscopic and macroscopic parameters, Thermodynamic potentials; Introduction to equilibrium and non-equilibrium systems and related problems; Entropy and probability;	3
2.	Statistical Ensembles	Concept of Statistical ensembles, Density of States; Micro canonical, Canonical, Grand-canonical ensembles	5
3.	Distribution functions	Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac and their applications	6
4.	Non-equilibrium systems	Liouville's equation, von Neumann equation; Random walk, Stochastic methods;	6
5	Modeling and Simulations	Ising model and its applications, Molecular dynamics, Monte-Carlo simulations and Multi-scale modeling for materials properties and engineering applications.	15

6	Applications	Applications of ensemble formalism in dynamics of neural networks, ensemble forecasting of weather, propagation of uncertainty over time, regression analysis of gravitational orbits etc.,	5
Total number of Lectures			40

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [Quiz (06), PBL (10), Attendance (05), Teacher's assessment (04)]
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.	Frederick Reif , <i>Fundamentals of Statistical and Thermal Physics</i> , Waveland Pr Inc, 2008.
2.	Kerson Huang , <i>Statistical Mechanics</i> , Wiley, 2 nd Ed., 1987.
3.	R K Pathria, Paul D. Beale, <i>Statistical Mechanics</i> , Academic Press, 3 rd Ed., 2011.
4.	Daniel V. Schroeder, <i>An Introduction to Thermal Physics</i> , Addison-Wesley, 1 st Ed., 1999
5.	L D Landau, <i>Statistical Physics, Part 1: Volume 5 (Course of Theoretical Physics)</i> , Butterworth-Heinemann, 3 rd Ed., 1980

Project Based earning: Students will be suggested to choose their PBL topics from the structured syllabus, so that they can have basic knowledge of the subject and they can be familiar with the applications of the subject. Freedom will be given to the students for choosing the PBL topics, which will be approved by the instructor finally.
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Employability: The course mainly focuses on the basic learning and applications of statistical mechanics in different spheres of Physics as well as beyond the scope of Physics.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH636	Semester: Even	Semester: VI Session 2023 -2024 Month from: January 2024 to June 2024
Course Name	Medical & Industrial Applications of Nuclear Radiations		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Sandeep Mishra	
	Teacher(s) (Alphabetically)	Dr. Sandeep Mishra Dr. Vaibhav Subhash Rawoot	
COURSE OUTCOMES			COGNITIVE LEVELS
CO1	Define nuclear structure, properties and reactions; Nuclear magnetic resonance process.		Remembering (C1)
CO2	Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays.		Understanding (C2)
CO3	Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc.		Applying (C3)
CO4	Analyze different radiocarbon dating mechanisms and processes.		Analyzing (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Nucleus, Radioactivity & Dating	Structure of matter; Nucleus: Nuclear Size, Structure and forces; Binding energy and Nuclear stability, mass defect; Nuclear reaction: Fission, Fusion, chain reaction. Nuclear fusion in stars, Formation of basic elements: proton-proton chain, CNO cycle, Hydrostatic equilibrium; Applications: atom bomb, hydrogen bomb, nuclear power plants, Nuclear reactor problems, precautions. ii) Radioactive decay, kinetics of radioactive decay, Types of radioactive decay and their measurement, Half life, decay constant, Population of states, Production of radionuclides. Radioactive dating, Radiocarbon dating: Formation, mechanism of dating, carbon cycle, radiocarbon clock and applications, advantages, disadvantages, precautions; Other dating techniques, protein dating, accuracy in dating;	17
2.	Radiation and matter interactions	Dosimetry and applications: Interaction of Radiation of matter: Biological effects of radiations; dosimetry, working principles, Tools and radiotherapy, Doses, Radioisotopes, Radiotracers;	09
3.	NMR and MRI	Nuclear Magnetic Resonance: General Introduction to Magnetic Resonance, Reference Frame; RF Pulses, Larmor precession, Basic principles of NMR & ESR Spectroscopy, Nuclear shielding, Chemical shifts; Couplings, Nuclear Imaging; 1D,2D, 3D Images, Application of NMR in medical industry as MRI, working MRI, Types of different MRI, Applications of NMR in quantum computation;	09

4.	Nuclear Medicine and Nuclear Imaging	Nuclear Medicine and Nuclear imaging techniques, preclinical imaging, detector designing, photon counting, Medical imaging using $\beta+\gamma$ coincidences, SPECT AND PET: Radiation tomography, applications;	05
Total number of Lectures			40

Evaluation Criteria

Components Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25
Total	100

Project Bad Learning: Different groups of students with 5-6 students in each group may be formed and these groups may be given to complete a task like identifying common applications to nuclear science, recent developments in medical applications, etc. These problem domains (elemental and content analysis, materials modification, radiation gauging, solid/liquid Interface, and heart imaging) may be also chosen based on their potential interest to students. Students may be given a task of presenting the working of devices like MRI, PET scan, X-rays and other imaging techniques. Within each of these problem domains, the students will learn to work in a team. It will improve their analytical skills and the students will learn to achieve their common goal through mutual discussion and sharing of knowledge, information & understanding.

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.	Basic Sciences of Nuclear Medicine; Magdy M K halil, Springer
2.	Physics and Radibiology of Nuclear Medicine; Gopal B Saha, Springer
3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.
4.	Radionuclide Techniques in Medicine, JM McAlister (Cambridge University Press, 1979).
5.	Nuclear Physics; S.N.Ghosal

Employability: In this course, students learn about the principles and mechanism of working of various medical imaging instruments like MRI, SPECT, PET, PETCT. This course enhances the skill among the students to develop new theories, mechanisms for today's medical industry. By obtaining knowledge in this domain, students may get job opportunity in medical and biomedical industries like nuclear pharmacy, nuclear medicine radiology etc.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B19PH691	Semester: VI	Semester: VI Session 2023 -2024 Month from: Jan-June
Subject Name	Computational Photonics (Value added course)		
Credits	2	Contact Hours	3

Faculty (Names)	Coordinator(s)	Suneet Kumar Awasthi
	Teacher(s) (Alphabetically)	Suneet Kumar Awasthi

COURSE OUTCOMES		COGNITIVE LEVELS
C302-12.1	Learn and understand the fundamentals of electromagnetism and their applications through MATLAB.	Remembering Level (C1)
C302-12.2	Explain the concepts of Finite Difference Time Domain and Beam Propagation Method in computational photonics.	Understanding Level (C2)
C302-12.3	Apply the principles of photovoltaics to design a solar cell.	Applying Level (C3)
C302-12.4	Analyze the results in context of engineering applications of metamaterials.	Analyzing Level (C4)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Basic facts of electromagnetism	Maxwell's equations, boundary conditions, wave equation, time harmonic fields, polarized waves, Fresnel coefficients and phases, polarization by reflection from dielectric surfaces, Bragg mirrors.	8
2.	Finite Difference time domain	General formulation three dimensional, two dimensional and one dimensional model, Gaussian pulse and modulated Gaussian pulse.	6
3.	Beam Propagation Method	Paraxial formulation, General theory, The 1+1 dimensional FD-BPM theory with concluding remarks	3
4.	Solar cells	Principles of photovoltaics, Equivalent circuit of solar cell: basic and other models, Multijunctions.	4

5.	Metamaterials	Veselago approach of metamaterials, Left handed materials, simple applications of metamaterials	5
Total number of Lectures			26
Evaluation Criteria			
Components		Maximum Marks	
Mid Term		30	
End Semester Examination		45	
TA (04M), Assignments in PBL mode (10 M)]		25 [Attendance (5 M), Class Test/Quizzes (6 M), Internal assessment	
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.	Computational Photonics, Marek S Wartak, Cambridge, 2013.
2.	Wave propagation from electrons to photonic crystals and left handed materials, P. Markos and Costas M Soukoulis, Princeton University press, 2008
3.	Waves in Metamaterials, Laszlo Solymas and Ekaterina Shamonina, Oxford, 2009
4.	Integrated Nanophotonics devices, Zeev Zalevsky & Ibrahim Abdulhalim, Elsevier, 2010
5.	Electromagnetic Waves and Antennas: Sophocles J Orfanidess, 2004

This course provides platform to the students to complete small MATLAB based projects based on electromagnetic theory, finite difference time domain method, beam propagation method, solar cell and metamaterials. Moreover, this course may also be beneficial for students to understand the fundamental to advance level research pertaining to computational photonics and plasmonics.

Detailed Syllabus
Course Description

Course Code	20B16CS322	Semester: Even	Semester: VI Session 2023 -2024 Month from Jan to Jun
Course Name	Java Programming		
Credits	Audit	Contact Hours	[1- 0 - 2]

Faculty (Names)	Coordinator(s)	Dr. Kirti Aggarwal
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES: At the completion of the course, Students will be able to		COGNITIVE LEVELS
C305-8.1	Apply basic Java programs using Java constructs – loops, switch-case, arrays & strings.	Apply Level (C3)
C305-8.2	Apply all basic concepts of oops using java programming	Apply Level (C3)
C305-8.3	Examine java programs using Exception Handling, Multithreading	Analyze Level (C4)
C305-8.4	Determine the use of Java collection framework	Evaluate Level (C5)
C305-8.5	Create an application based on Java programming constructs	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Overview of OOA (Object Oriented Analysis) and Java basics	Classes, Objects, OOPs concept using JAVA, Packages and Interfaces.	3
2.	JVM Internals	Memory management, Garbage Collection	1
3.	String Handling	Using String and StringBuilder class. String Immutability(toString())	2
4.	Exception Handling in JAVA	Fundamentals, Exception types, Java built-in exceptions, Custom Exceptions, Chained Exceptions.	2
5.	Collections Framework	Collection Overview, List, Map (hashCode & Equals), Set, Queue & other collections	4
6.	Multithreading in Java	Multithreading overview and requirement, Thread state diagram, Java multithreading implementation (Thread/Runnable), Challenges in multithreading/Mutual Exclusion, Java handling of mutual exclusion (synchronization), Communication between threads (wait/notify)	2
Total number of Lectures			14

Evaluation Criteria	
Components	Maximum Marks
Mid Tern Evaluation	30
End Semester Examination	40
TA	30 (Attendance = 10, Quizzes = 10, PBL = 10)
Total	100

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Project based learning: Assignments on different topics are given to each student. They utilize the java concepts and try to solve different problems given as assignments.

The course emphasized on the Skill development of students in Java Programming. Topics like inheritance, classes, exception handling, multithreading, collection frameworks, etc. are taught to enhance the programming skills of the students for making them ready for employability in software development companies.

Recommended Reading material:	
Text Books	
1.	Schildt, H. (2021). Java: The Complete Reference, Twelfth Edition. United States: McGraw Hill LLC.
2.	Reges, S., Stepp, M. (2020). Building Java Programs: A Back to Basics Approach. United Kingdom: Pearson.
Reference Books	
1.	Horstmann, C. S. (2021). Core Java: Fundamentals, Volume 1. United Kingdom: Pearson.
2.	Curry, C. (2020). Object-Oriented Programming with Java. United States: Addison-Wesley Professional.
3.	Loy, M., Niemeyer, P., Leuck, D. (2020). Learning Java: An Introduction to Real-World Programming with Java. United States: O'Reilly Media.

Detailed syllabus
Lecture-wise Breakup

Subject Code	20B16CS323	Semester Even	Semester VI Session 2023-2024 Month: Jan-June 2024
Subject Name	Problem Solving using C and C++		NBA Code: C305-9
Faculty (Names)	Coordinator(s)	Mr. Amitesh (Sec-62), Ms.Ambalika Sarkar (Sec 128)	
	Teacher(s) (Alphabetically)	Ambalika Sarkar, Amitesh, Ankit Vidyarthi, Deepti Tripathi, Indu Chawla, Kedar Nath Singh, Mohit Singh, Shikha Jain, Sumeshwar Singh	

COURSE OUTCOMES		COGNITIVE LEVELS
C305-9.1	Understand the differences between procedural and object-oriented programming and design patterns.	Understand (C2)
C305-9.2	Apply thorough understanding of modular programming concepts in developing solutions to problems with secure coding practices.	Apply Level (C3)
C305-9.3	Apply the concepts and understanding of various algorithmic techniques, dynamic programming, templates, containers, iterators, and mathematical techniques for solving diverse problems.	Apply Level (C3)
C305-9.4	Evaluate and determine the suitable data structure for a given problem.	Evaluate Level (C5)
C305-9.5	Design a strategic approach for developing an effective solution to various real-world problems.	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. Of Lectures
1	Review and practice problems on Functions in C/C++, STL fundamentals and their advance usage	Functions, Alt function syntax, Function return type deduction, static, const and inline functions, default parameters, overloaded functions- operator and members, friends, overriding functions, STL introduction, vector basics, operations, and complexity. Explores strings for manipulation, sets/maps for usage, and stacks/queues for implementations and use cases.	1
2	Practice problems on Pointers and Indirections, Arrays, their relevant algorithms used for problem solving	Smart pointers, pointers and dynamic memory allocation, type inference, array and pointers and their arithmetic and indirections, Algorithms, and Optimization: Covers basic array operations, traversal, and manipulation. Explores Kadane's Algorithm for understanding and implementation, Two Pointer Approach for various applications, and Binary Search with theory, implementation, and optimization techniques.	2
3	Secure Coding practices in C/C++, Practice problems on Arrays and their relevant algorithms used for problem solving	Common String, Integer and dynamic memory allocation Errors, Integer and dynamic memory allocation and String vulnerabilities their mitigation strategies.Arrays, Algorithms, and Optimization: Covers basic array operations, traversal, and manipulation. Explores Kadane's Algorithm for understanding and implementation, Two Pointer Approach for various applications, and Binary Search with theory,	2

		implementation, and optimization techniques.	
4	Practicing Recursion, Backtracking, and Dynamic Programming with Concepts and Examples	Algorithmic Techniques in C++: Includes Recursion with concepts and examples, Backtracking Techniques with understanding and examples, and an introduction to Dynamic Programming (DP) along with basic problems.	1
4.	Tackling Advanced Problems and Optimization Techniques, progressing to Intermediate Problems and their Variations	Dynamic Programming in C++: Explores advanced problems and optimization techniques, followed by intermediate problems and their variations.	1
5.	Unveiling Greedy Algorithms and Graph Algorithms, Delving into Advanced Graph Topics and Unveiling their applications	Algorithmic Concepts in C++: Covers Greedy Algorithms, Graph Algorithms with DFS and BFS traversal, and Shortest Path Algorithms including Dijkstra's Algorithm and Bellman-Ford Algorithm, Minimum Spanning Tree with Prim's and Kruskal's Algorithms, explores advanced topics like Eulerian path/cycle and Topological Sort, and discusses applications of DFS and BFS in various contexts.	2
6.	Generic Programming with Templates	Class templates, Function templates, variable templates, Template parameters, Specialization of templates, template recursion, variadic templates, Meta-programming	1
7.	Unveiling advanced DS with Real-world Applications	Advanced Data Structures in C++: Covers Heaps and Priority Queues, Segment Trees with construction, queries, and updates, and Fenwick Trees (Binary Indexed Trees) with applications.	1
8.	Problems on catering advanced Mathematical concepts and bit related problems, Usage of advanced string algorithms	Advanced Techniques and Math Concepts in C++: Covers Bit Manipulation, Number Theory (Prime Numbers, Sieve, Modular Arithmetic), and Combinatorics along with Probability. String Algorithms in C++: Covers Pattern Matching and explores Prefix/Suffix Array with its applications.	2
9.	Problems on Concurrency in Programming	Working with dynamic memory, array-pointer duality, low-level memory operations, smart pointers and common memory pitfalls	1
			14
Evaluation Criteria			
Components		Maximum Marks	
Mid Tern Evaluation		30	
End Semester Examination		40	
TA		30 (Attendance = 5, Assignments = 15, Internal Assessment = 5, Assignments in PBL mode = 5)	
Total		100	

Project based learning: Project based learning: Each student in a group of 2-4 will choose an industrial application for development. To fulfil the objective of this lab i.e., learning and applying the programming skills in C and C++. Students need to consider a trending industrial requirement for application development using the programming language skills learned. Understanding programming application development helps the students in enhancing knowledge on industry need of software design and development using programming languages.

Recommended Reading material:

Textbooks

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|----|---|
| 1. | Schildt, H. (2003). C++: The complete reference. McGraw-Hill/Osborne. |
| 2. | Lafore, R. (2002). Object-oriented programming in C++. Pearson Education. |
| 3. | Deitel, P., & Deitel, H. (2016). C++ how to Program. Pearson. |

Reference Books

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|----|---|
| 1. | Savitch, W. J., Mock, K., Msanjila, S., & Muiche, L. (2015). Problem Solving with C++. Pearson. |
| 2. | Seacord, R. C. (2005). Secure Coding in C and C++. Pearson Education. |
| 3. | Drozdek, A. (2012). Data Structures and algorithms in C++. Cengage Learning. |

Detailed Syllabus

Course Code	20B16CS324	Semester Even	Semester VI Session 2023 -2024 Month from Jan 2024 to Jun 2024
Course Name	Non-linear Data Structures & Problem Solving		
Credits		Contact Hours	1- 0 - 2

Faculty (Names)	Coordinator(s)	Dr.Ghazaala Yasmin
	Teacher(s) (Alphabetically)	Manish Thakur, Manju Chaudhury, Shakshi Agarwal, Kashav Ajmera

COURSE OUTCOMES At the completion of the course, students will be able to,		COGNITIVE LEVELS
C305-10.1	Understand and Differentiate Non-linear Data Structures and its operation on different data structure	Understand Level (C2)
C305-10.2	Use critical thinking skills and creativity to choose the appropriate data structure and solve the given problem.	Apply Level (C3)
C305-10.3	Design and implement advance graph algorithm for constructing different test cases.	Apply Level (C3)
C305-10.4	Explore and Implement Advanced Non-linear Data Structures B-trees, Trie, and Skip List	Apply Level (C3)
C305-10.5	Develop solutions to real world problems by incorporating the knowledge of data structures	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Review of Problem Solving and Data Structures	Concepts of Problem Solving, Performance metrics for Algorithm Analysis, Why study Data structures and Abstract Data Types. Practice problems on Sparse Matrix	1
2.	Practice problems on advanced list structures	Multi-list, skip list, XOR linked list, self organizing list, unrolled linked list, skip list	2
3.	Practice problems on point and range queries using tree structures	Suffix array and suffix tree, Trie and persistent trie, Segment tree and persistent segment tree, Interval tree, K dimensional tree, Binary indexed tree, Splay tree, Treap (randomized BST), Order statistics tree	4
4.	Practice problems on optimization	Tournament tree, Decision tree, Cartesian tree	2

	problems using tree structures.		
5.	Practice problems on heaps and sets	Sparse set, Disjoint set, Leftist heap, K-aryheap	2
6.	Problem solving using graphs	Social graphs, Transportation system graphs, Resource allocation graphs	3
Total number of Lectures			14
Evaluation Criteria			
Components		Maximum Marks	
Mid Tern Evaluation		30	
End Semester Examination		40	
TA		30 (Attendance – 15, Quizzes/Mini Project – 15)	
Total		100	

Project based Learning: Each student in a group of maximum 3 will develop a simulator with the help of various advanced data structures. Students will be able to understand and apply algorithms and advanced data structures properly; know how to evaluate, choose appropriate algorithms or data structures; know how to design and implement algorithms or data structures to serve the purpose of designing solution. Selecting **the appropriate data structure** is an integral part of the programming and problem-solving process. The project typically incorporates various advanced data structure concepts to enable the synthesis of knowledge from real-life experiences.

Recommended Reading material:	
Text Books	
1.	Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Fourth Edition (2014).
2.	Handbook of Data Structures and Applications, 2nd Edition by Sartaj Sahni, Dinesh P. Mehta, CRC Press (2018).
3.	Problem solving with algorithms and data structures, Miller, B., & Ranum, D. (2013).
References	
1.	Data Structures and Algorithms Made Easy, by Narasimha Karumanchi, CareerMonk Publications; 5th edition (2016)
2.	An Introduction to Data Structures with Application, by Jean-Paul Tremblay, Paul Sorenson, McGraw Hill Education; 2 edition (2017)
3.	Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012)
4.	Data structures and algorithms in Python, Goodrich, Michael T., Roberto Tamassia, and Michael H. GoldwasserWiley Publishing (2013).

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B16CS326	Semester EVEN	Semester VI Session 2023 -2024 Month from JAN-JUN
Course Name	Front End Programming		
Credits		Contact Hours	1-0-2
Faculty (Names)	Coordinator(s)	Dr. Shailesh Kumar(J128), Ms. Neha (J62)	
	Teacher(s) (Alphabetically)	Dr. Aastha Maheshwari, Dr. Amit Mishra, Dr. Arpita Jadav Bhatt, Dr. Jagriti, Dr. Megha Rathi, Ms. Neha	

COURSE OUTCOMES		COGNITIVE LEVELS
C305-11.1	Familiarity with the fundamental principles of different Front End Tools.	Remembering [Level 1]
C305-11.2	Understand the core principles of Front End Programming	Understanding [Level 2]
C305-11.3	Apply understanding of different programming paradigms.	Apply [Level 3]
C305-11.4	Utilize Front End Technologies in the creation of practical applications for the real world.	Apply[Level 3]
C305-11.5	Create a comprehensive mobile application to address a challenging real-time issue.	Create [Level 6]

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to basic Front End Techniques	HTML 5, CSS 3, JavaScript, jquery, bootstrap	3
2.	Object Oriented Programming Concepts	Objects, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism	1
3.	Java Fundamentals	Decision Making, Loop Control, Operators, Array, String, Overloading, Inheritance, Encapsulation, Polymorphism, Abstraction	2
4.	Advanced Front End Programming Concepts	Storing and retrieving data, Python Programming Concepts, Python for developing Android Application.	2
5.	Designing Android Application	Android development lifecycle, Learning UI and layout, controller, component, Directives, Services & views.	3
6.	Android with Database	Data base Application Development	2
7.	Privacy & Security Issues	Security Issues with Android Platform	1
		Total number of Lectures	14

Evaluation Criteria

Components	Maximum Marks
Mid Semester Examination	30
End Semester Examination	40
TA	30 (Attendance-10,Assignments/ Class Test/ Quiz/ LAB Record -05, Project-15)
Total	100

Project based learning: In this subject students will learn the latest front end technology. After completing the subject, each student in a group of 3-4 will be able to create a mobile application.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
Reference Books:	
1.	Schildt, H. (2014). Java: The Complete Reference. McGraw-Hill Education Group.
2.	Mughal, K. A., & Rasmussen, R. W. (2016). A Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA). Addison-Wesley Professional.
3.	Gaddis, T., Bhattacharjee, A. K., & Mukherjee, S. (2015). Starting out with Java: early objects. Pearson.
Text Books:	
4.	Duckett, J. (2014). Web Design with HTML, CSS, JavaScript and jQuery Set. Wiley Publishing.
5.	Shenoy, A., & Sossou, U. (2014). Learning Bootstrap. Packt Publishing Ltd.
6.	Lee, W. M. (2012). Beginning android for application Development. John Wiley & Sons.
7.	Hardy, B., & Phillips, B. (2013). Android Programming: The Big Nerd Ranch Guide. Addison-Wesley Professional.

Detailed
Syllabus Lecture-wise
Breakup

Course Code	23B12CS341	Semester: EVEN	Semester VI Session 2023-24 (Jan to June)
Course Name	Cyber Security		
Credits	3	Contact Hours	3-0-0
NBA Code	C302-14		

Faculty (Names)	Coordinator(s)	Dr. SANGEETA MITTAL
	Teacher(s) (Alphabetically)	Dr. SANGEETA MITTAL

COURSE OUTCOMES		COGNITIVE LEVELS
C302-14.1	Understand the cyber world, overview of computer and web technologies in general and concepts of cyber-crimes.	Understand Level (C2)
C302-14.2	Develop a deeper understanding and familiarity with various types of cyberattacks, cyber-crimes, vulnerabilities and remedies thereto.	Understand Level (C2)
C302-14.3	Analyse and evaluate the security aspects of social media platforms and ethical aspects associated with use of social media.	Analyze Level (C4)
C302-14.4	Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.	Analyze Level (C4)
C302-14.5	Understand the concepts of mobile phone security and configuration of basic security policy and permissions.	Apply Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Cyber Security	Defining Cyberspace and Overview of computer and web-technology, Architecture of cyberspace, Communication and Web Technology, Internet, World-wide-web, Advent of internet, Internet Infrastructure for data transfer and governance, Internet Society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	8
2.	Cyber Crime and Cyber Law	Classification of cyber crimes, Common cyber crimes – Cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attack, zero day attack, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedials and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organization dealing with cybercrime and cyber security in india, Case studies.	9

3.	Social Media Overview and Security	Introduction to social networks, Types of social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, Opportunities and pitfalls in online social network, Security issues related to social media, flagging and reporting of inappropriate content, Best practices for the use of Social media, Case Studies.	8
4.	E-Commerce and Digital Payments	Definition of E-Commerce, Main Component of E-Commerce, Elements of E-Commerce security, E-commerce threats, E-commerce security best practices, Introduction to digital payments, components of digital payment and stake holders, Modes of digital payments-Banking cards, Unified Payment Interface (UPI), E-wallets, Unstructured Supplementary Service data (USSD),Aadhar enabled payments, digital payments related common frauds and preventive measures. RBI Guidelines on digital payments and customer protection in unauthorized banking transaction, Relevant Provision of payment settlement Act, 2007,	9
5.	Digital Device, security tools and technologies for cyber security.	End point device and mobile phone security, password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and anti-virus, Management of host firewall and antivirus, WI-FI security, Configuration of basic security policy and permissions.	8

Total number of Lectures			42
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Project based learning:
Each student in a group of 3-4 has to work on a mini-project, in which they will identify a real-life problem and develop the solution by utilizing skills learned throughout the course. The project implementation can be in any language or tool concerning to cyber security preferably along with well documentation on different aspects of the software. This enhances the understanding of students towards different concepts of cyber security and also helps them during their employability as security analyst or Cyber Security Engineer.

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance and Tut Performance ,Quiz/ Mini-Project/Assignment)
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)

Text Book(s)

1.	Prashant Mali, Cyber Law & Cyber Crimes Simplified, Fourth Edition, Snow White Publications, 2017.
2.	W. Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall, 7th Ed., 2017.
3.	Sean-Philip Oriyano, CEH v9: Certified Ethical Hacker Version 9 Study Guide, 1st Ed., Wiley & Sons, 2016.

Reference Books

1.	Cyber Crime Impact in the new millennium, by R.C Mishra, Auther Press, Edition 2010.
2.	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by sumit belapure and Nina Godbole, Wiley India pvt.Ltd.(First Edition, 2011)
3.	Security in the Digital Age Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform (Pearson, 13 th November, 2001).
4.	Electronic Commerce by Elias M. Awad, Prentice Hall of India pvt Ltd.
5.	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6.	Network Security Bible, Eric Cole, Ronald Kruz, James W. Conley, 2 nd editions, Wiley India Pvt.Ltd
7.	Fundamental of Network Security by E. Maiwald, McGraw Hill.

More References

1.	Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014).
2.	Gibbons, J.D., Non-Parametric Statistical Inference, 2/e, Marckel Decker, 1985.
3.	Robert Johansson, Numerical Python Scientific Computing and Data Science Applications with NumPy, SciPy and Matplotlib, A press, 2019
4.	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt.Ltd., 2016
5.	Nelli, F., Python Data Analytics: with Pandas, NumPy and Matplotlib, A press, 2018.
6.	Wickham, H., & Golemund, G. (2016). R for data science: import, tidy, transform, visualize, and model data."O'Reilly Media, Inc."

Detailed Syllabus

Course Code	23B12PH311	Semester: Even	Semester: 6 th Session: 2023-24 From: January 2024 to June 2024
Course Name	Waste to Energy Conversion		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Manoj Tripathi
	Teacher(s) (Alphabetically)	Dr. Manoj Tripathi

COURSE OUTCOMES		COGNITIVE LEVELS
After completion of the course, students will be able to:		
C302-15.1	Recall the importance of non-conventional energy sources, their potential and challenges.	Remember Level (Level 1)
C302-15.2	Explain and compare basics of different techniques used for the processing of biomass waste.	Understand Level (Level 2)
C302-15.3	Apply the knowledge to analyze various aspects of waste to energy conversion systems.	Apply Level (Level 3)
C302-15.4	Apply the knowledge to develop/ choose a suitable waste processing technique for different types of wastes.	Analyze Level (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Energy Scenario	Introduction to energy demand, Depletion of fossil fuels, Environmental impact of excessive usage of fossil fuels, Non-conventional energy sources as alternate source-Solar, wind & bio-energy, Comparison of non-conventional energy sources. Waste disposal techniques and their environmental impacts, Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and Alternate Energy source, Carbon capture, World-wide energy generation from waste, Challenges and future of waste to energy concept.	8
2.	Biomass Treatment Techniques	Waste: definition, classification, types, sources, availability, chemical composition, Potential in energy generation, Characterization of waste for energy utilization. Waste Selection criteria. Conversion techniques: Thermo-chemical conversion: Principles of the thermo chemical route for energy conversion, Combustion, gasification, hydrolysis, Plasma based heating and pyrolysis; Difference and comparison, Types of pyrolysis; Slow, fast, flash, vacuum pyrolysis: principle and comparison. Biological conversion: Biodegradation and biodegradability of substrate, Anaerobic digestion, Bio-methanation process, Properties of methane, Bioconversion of substrates into alcohol: Production of methanol & ethanol, organic acids, solvents, amino acids, antibiotics etc.	10
3.	Pyrolysis Products	Advantages of pyrolysis over combustion and gasification, Types of pyrolysis, Design, construction and operation of waste pyrolysis units, Products obtained from pyrolysis, their characteristics, Design of Biomass stoves, Factors affecting the pyrolysis products.	10

		Bio char: Production of bio char, Suitable conditions for bio char production, Chemical composition and properties of bio char. Applications of bio char. Bio oil: Production of pyrolytic oils, Suitable conditions for bio oil production, Chemical composition of bio oil, Energy content in bio oil, treatment of bio oil. Applications of bio-oil, Suitability of bio oil as fuel. Syn-gas: Constituents of syn-gas, heating value of syn-gas, Potential applications.	
4.	Process control and utilization of products	Efficiency of the pyrolysis process, Key parameters in pyrolysis process & their role in product yield and characteristics. Optimization of processing parameters, Optimization techniques for pyrolysis process. Recycling of waste plastic, energy production from waste plastic Environmental and health impacts of waste to energy conversion, Safety issues.	8
5	Environmental & Economical Implications	Environmental standards for Waste to Energy Plant operations and gas clean-up., Safety issues in large scale pyrolysis plants. Carbon Credits: Carbon foot calculations and carbon credits transfer mechanisms, Savings on non-renewable fuel resources.	4
Total number of Lectures			40

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

Recommended Reading material:	
1.	Shah, Kanti L., Basics of Solid & Hazardous Waste Management Technology, Prentice Hall, 2000
2.	Recovering Energy from Waste Various Aspect,: Velma I. Grover and Vaneeta Grover, ISBN 978-1-57808-200-1; 2002
3.	Biomass Power for the World: Transformations to Effective Use, Wim van Swaaij, Sascha Kersten, and Wolfgang Palz, eds., Volume 6, Published by Pan Stanford Publishing Pte. Ltd., ISBN 978-981-4613-89-7, 2015
4.	Biofuels - Securing the Planet's Future Energy Needs, Edited by A Demirbas Springer 2009
5.	Waste-to-Energy by Marc J. Rogoff, DEC-1987, Elsevier, ISBN-13: 978-0-8155-1132-8, ISBN-10: 0-8155-1132-9

Project Based learning: Different groups of students with 5-6 students in each group may be formed and these groups may be given to complete a task like collecting and classifying the wastes and identifying their potential in energy generation. These groups may be provided with different waste materials and may be asked to analyze their suitability in energy generation. Students may be given a task of identifying futuristic techniques for waste to energy conversion, challenges in waste to energy conversion. Students may be given a small experimental work where they can design optimized conditions for waste to energy conversion. Students may be given a task of recycle the pastic waste. Within each of these problem domains, the students will learn to work in a team. It will improve their analytical skills and the students will learn to achieve their common goal through mutual discussion and sharing of knowledge, information & understanding.

Employability: The course mainly focuses on the advanced techniques to convert the waste into energy rich products.
The students will learn the fundamental

Detailed Syllabus
Lecture-wise Breakup

Subject Code	24B12HS313	Semester: Even	Semester: VI Session: 2023-24 Month: Jan 2024 to June 2024
Subject Name	Political Philosophy		
Credits	3	Contact Hours	(2-1-0)

Faculty (Names)	Coordinator(s)	Dr. Namreeta Kumari
	Teacher(s) (Alphabetically)	Dr. Namreeta Kumari

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
CO1	Understand how to read and decode the classics and use them to solve contemporary socio-political problems	Understanding (C2)
CO2	Demonstrate how the ancient philosophers, like Plato & Aristotle, responded to political problems of their times.	Analyzing (C4)
CO3	Analyze and appraise the modern state and constitutional government, featuring the work of Machiavelli, Hobbes, John Locke, & Rousseau.	Analyzing (C4)
CO4	Evaluate & assess the texts of political philosophers of from enlightenment era.	Evaluating (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	<ul style="list-style-type: none"> • Text and Interpretation • Meaning and Context: The Importance of Language 	4
2.	Ancient Political Philosophy	<ul style="list-style-type: none"> • Plato- Context of the <i>Republic</i>, Philosopher Ruler, Justice, Education Community of Wives and Property • Aristotle- Conception of Human Nature and State Nature of Happiness or Eudaimonia, Household (Slaves, Women and Property) Rule of Law and Constitution 	6
3	Modern Political Philosophy	<ul style="list-style-type: none"> • Machiavelli- Renaissance and Its Impact, Machiavelli's Political Theory Science of Statecraft • Hobbes- Human nature, Women and the Gender Question • Locke - Locke and the Glorious Revolution, state of nature, Human nature 	10

		<ul style="list-style-type: none"> Rousseau- Analysis of Inequality, Institution of Private Property, Civil Society, General Will and Individual Freedom 	
4.	Enlightenment and Liberalism	<ul style="list-style-type: none"> Immanuel Kant- Political Ideas, Philosophy of History J S Mill- Critique of Utilitarianism, Defence of Individual Freedom and Individuality, Equality within the Family and between the Sexes, Democracy and Representative Government 	8
Total number of Lectures			28

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project/Term Paper, Presentation and Attendance)
Total	100

Project Based Learning:

Students will prepare project in a group (3-4 students). The projects will focus on reading of political thought or original texts which will facilitate student in thinking critically and trying to link the thoughts of the political thinkers and the relevance in contemporary times.

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.	T. . Ball, "History and Interpretation," in C. Kukathas and G. Gaus, Eds., Handbook of Political Theory. London: Sage Publications Ltd., 2004, pp. 18-30
2.	Q. Skinner, "Meaning and understanding in the history of ideas," History and Theory, vol. 8, pp. 3–53, 1969.
3.	S. Mukherjee and S. Ramaswamy, <i>A History of Political Thought</i> , PHI Learning Pvt. Ltd., 2004.
4.	A.K. Mukhopadhyay, <i>Western Political Thought</i> , Calcutta: KP Bagchi and Company, 1990.
5.	B. R. Nelson, <i>Western Political Thought</i> , 2nd ed, 1996.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B1NHS831	Semester Even (specify Odd/Even)	Semester VI Session 2023-2024 Month from Jan-June
Course Name	Effective tools for Career Management and Development		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr Kanupriya Misra Bakhru
	Teacher(s) (Alphabetically)	Dr Kanupriya Misra Bakhru

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Understand one's personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.	Understand Level (C 2)
CO2	Apply knowledge of all the Career Stages in managing career effectively.	Apply Level (C 3)
CO3	Examine and maximize one's potential for achieving the desired career option.	Analyze Level (C4)
CO4	Develop the competencies required by the job market	Create Level (C 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures and Tutorial for the module
1.	Introduction to Career Development	Introduction to Professional Career Development-Role and importance of human resource in an organization, Introduction to Career Planning: Self-Concept.	4 (CO1)
2.	Self-Assessment and strategies for Recruitment and Selection	Introduction to complete cycle of Recruitment and Selection, various tools used for assessment and testing candidates- aptitude test, personality test etc. Introduction to Workforce planning, Job Analysis, Job Description and Job Specification.	6 (CO3)
3.	Self-Branding, Social Media and Personnel Development	Pitch your Brand (Elevator pitches and their use), Personal Branding, creating a Positive Professional Image (Business etiquette) – Social Media and your online image, Using Social Media to Find Job. Introduction to various techniques used for learning and development, training effectiveness, Transactional Analysis-Parent, Adult and Child Ego States.	6 (CO3)
4.	Managing Career -Performance Review and Compensation	Transitioning from college to work Strategies to thrive at work- Performance Management: Key Result Areas, Key Performance Indicators, Different Performance Review Methods. Compensation Strategy and trends- Compensation package, ESOPs, Performance based pay, Recognition, and Rewards.	6 (CO2)

5.	Individuals and Job Markets	The New Employment Reality and Job Market Trends, Developing Competencies and Abilities, Human Resource Management Practices in India, Internationalization of Human Resource Management Commonly Used Jargons.	6 (CO4)
Total number of Lectures			28

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Term	35
TA	25(Class Mock Activities, Project, Assignment, Quiz)
Total	100

Project Based Learning:

Students, in groups of 3-4, are required to select a company that has come for Campus placement at JIIT, Noida. Students have to study the Recruitment and Selection process of the Company selected. The information can be collected with the help of an interview or some kind of questionnaire pertaining to the Recruitment and Selection process from seniors who have been placed in the given company.

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.	Joshi, Campus to Corporate, Your Roadmap to Employability, Sage Publications India Pvt. Ltd., 2015
2.	Mathur, Mastering interviews and group discussions, CBS Publishers& Distributors Pvt. Ltd., New Delhi, 2018
3.	Mitra, Personality Development and soft skills, Oxford University Press, New Delhi, 2011
4.	Pareek and Purohit, Training Instruments in HRD and OD, Sage Publications India Pvt. Ltd., 2018
5.	Pande and Basak, Human Resource Management- Text and Cases, Pearson, 2012
6.	Dessler and Varkkey, Human Resource Management, Pearson, 2011

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Biotech PSOs			CSE PSOs		ECE PSOs		IT PSOs	
													1	2	3	1	2	1	2	1	2
CO1								1	3	3	1	3				1			1		
CO2								1	3	3	1	3									
CO3								1	3	3	1	3				1				1	
CO4								1	3	3	1	3									
Avg.								1	3	3	1	3							1		1

Course Description

Course Code	18B12MA611	Semester Even	Semester VI Session 2023-24 Month from Jan - Jun 2024
Course Name	Operations Research		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Ram Surat Chauhan	
	Teacher(s) (Alphabetically)	Dr. Amita Bhagat	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:			
C302-3.1	demonstrate understanding of mathematical models for optimization problems and interpret primal-dual relationship.	Understanding Level (C2)	
C302-3.2	apply different methods for the solution of linear, non-linear and integer programming problems.	Applying Level (C3)	
C302-3.3	solve various transportation and assignment models.	Applying Level (C3)	
C302-3.4	examine optimality conditions and perform sensitivity analysis for linear and non-linear programming problems.	Analyzing Level (C4)	
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Preliminaries	Introduction, Operations Research Models, Phases and Scope of O.R. Studies.	3
2.	Linear Programming Problems (LPP)	Convex Sets, Formulation of LPP, Graphical Solutions, Simplex Method, Big-M Method, Two Phase Method, Special Cases in Simplex Method.	8
3.	Duality and Sensitivity Analysis	Primal-Dual Relationship, Duality, Dual Simplex Method, Sensitivity Analysis.	8
4.	Transportation Problems	Introduction, Matrix Form, Applications, Basic Feasible Solution- North West Corner Rule, Least Cost Method, Vogel's Approximation Method. Degeneracy, Resolution on Degeneracy, Optimal Solution, Maximization TP Model.	5
5.	Assignment Problems	Definition, Hungarian Method, Traveling Salesmen Problems.	4
6.	Integer Linear Programming Problems	Pure and Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method.	6
7.	Non-Linear Programming	Introduction to NLP, convex functions and graphical solution, Unconstrained Problem, Constrained Problems - Lagrange Method for equality constraints, Kuhn-Tucker Conditions for inequality constraints, Quadratic Programming - Wolfe's Method	8
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	

Total	100
Project based learning: Each student in a group of 4-5 will collect literature on transportation, assignment and integer programming problem to solve some practical problems. To make the subject application based, the students analyze the optimized way to deal with afore mentioned topics.	
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.	Taha, H. A. - Operations Research - An Introduction, Pearson Education, 2011.
2.	Hadley, G. - Linear Programming, Massachusetts: Addison-Wesley, 1962.
3.	Hiller, F.S. and Lieberman, G. J. - Introduction to Operations Research, San Francisco, 1995.
4.	Wagner, H. M. - Principles of Operations Research with Applications to Managerial Decision, PHI, 1975.
5.	Vohra, N. D., Quantitative Techniques in Management, Second Edition, TMH, 2003.

Course Description

Course Code	20B12MA311	Semester Even	Semester VI Session 2023 -2024 Month from Jan 2024-June 2024
Course Name	Applicational Aspects of Differential Equations		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Richa Sharma	
	Teacher(s) (Alphabetically)		
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C302-2.1	recall Fourier series, Laplace Transformation and methods for solving ODE.	Remembering (C1)	
C302-2.2	explain orthogonality of functions, Sturm - Liouville boundary value problems and formulation of PDE.	Understanding (C2)	
C302-2.3	solve partial differential equations and system of ordinary differential equations.	Applying (C3)	
C302-2.4	simplify differential equations arising in the field of science and engineering.	Analyzing (C4)	
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Theory of Ordinary Differential Equations	Existence and uniqueness of solutions, applications to ordinary differential equations in LCR and mass spring problem.	10
2.	Sturm-Liouville Boundary Value Problem	Sturm-Liouville problems, orthogonality of characteristic functions, the expansion of a function in a series of orthogonal functions, trigonometric Fourier series.	10
3.	Matrix Methods to solve ODE's	Matrix Method for Homogeneous Linear systems with Constant Coefficients.	4
4.	Basic Theory of Partial Differential Equations	Solution of first order equations: Lagrange's equation, Charpit's method, higher order linear equations with constant coefficients.	4
5.	Applications of Differential Equations	Fourier integrals, Fourier transforms, solution of partial differential equations by Laplace and Fourier	14

		transform methods, applications of differential equations in mechanics.	
Total number of Lectures			42
Evaluation Criteria			
Components	Maximum Marks		
T1	20		
T2	20		
End Semester Examination	35		
TA	25 (Quiz , Assignments, Tutorials)		
Total	100		
Project based learning: Each student in a group of 3-4 will apply the concepts of differential equations arising in engineering applications.			
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.	Ross, S.L., Differential Equations, 3 rd Ed., John Wiley & Sons, 2007.		
2.	Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, 5 th Ed., Narosa Publishing House, 2016.		
3.	Chandramouli, P.N., Continuum Mechanics, Yes Dee Publishing India, 2014.		
4.	Kreyszig, E., Advanced Engineering Mathematics, 10 th Edition, John Wiley & Sons, Inc. 2013.		

Course Description

Course Code	15B11MA301	Semester Even	Semester IV Session 2023-2024 Month from Jan 2024- June 2024
Course Name	Probability and Random Processes		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Manish Kumar Bansal, Dr. Kamlesh Shukla	
	Teacher(s) (Alphabetically)	Dr. Bhagwati Prasad Chamola, Dr. Nisha Shukla, Dr. Aradhana Narang, Dr. Lakhveer Kaur, Dr. Kamlesh Shukla, Dr. Manish Kumar Bansal, Dr. Gaurav Agarwal, Dr. Shikha Pandey, Dr. Shashank Goel, Dr. Amita Bhagat, Dr. Sarfraz, Dr. Neha Ahlawat	
COURSE OUTCOMES:			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C201.1	recall the concepts of probability theory and probability distributions.		Remembering Level (C1)
C201.2	explain random variables, probability distributions and reliability models.		Understanding Level (C2)
C201.3	solve the problems concerning random variables, their distributions, reliability models and random processes.		Applying Level (C3)
C201.4	examine random process models and solve the related problems.		Analyzing Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Probability	Three basic approaches to probability, conditional probability, total probability theorem, Bayes' theorem.	5
2.	Random Variables	One dimensional random variables (discrete and continuous), distribution of a random variable (density function and cdf). MGF and characteristic function of a random variable and its utility. Bivariate random variable, joint, marginal and conditional distributions, covariance and correlation.	8
3.	Probability Distributions	Bernoulli, binomial, Poisson, negative binomial, geometric distributions. Uniform, exponential, normal, gamma, Erlang and Weibull distributions.	8
4.	Reliability	Concept of reliability, reliability function, hazard rate function, mean time to failure (MTTF). Reliability of series, parallel, series-parallel, parallel-series systems.	6
5.	Random Processes I	Introduction, Statistical description of random processes, Markov processes, processes with independent increments. Average values of random processes. Strict sense and wide sense stationary processes, their averages. Random walk, Wiener process. Semi-random telegraph signal and random telegraph signal process. Properties of autocorrelation function.	7

6.	Random Processes II	Ergodic processes. Power spectral density function and its properties. Poisson processes. Markov chains and their transition probability matrix (TPM).	8
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
Total		100	
Project based learning: Each student in a group of 4-6 will apply the concept of probability distributions of random variables and reliability models arising in different real-life situations.			
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.	Veerarajan, T., Probability, Statistics and Random Processes, 3 rd Ed. Tata McGraw-Hill, 2008.		
2.	Papoulis, A. & Pillai, S.U., Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill, 2002.		
3.	Ross, S. M., Introduction to Probability and Statistics for Engineers and Scientists, 4th Ed., Elsevier, 2004.		
4.	Palaniammal, S., Probability and Random Processes, PHI Learning Private Limited, 2012.		
5.	Prabha, B. and Sujata, R., Statistics, Random Processes and Queuing Theory, 3rd Ed., Scitech, 2009.		

Course Description

Course Code	16B1NMA633	Semester: Even	Semester VI Session 2023-24 Month from Jan - June 2024
Course Name	Statistics		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Anuj Bhardwaj	
	Teacher(s) (Alphabetically)	Dr. Anuj Bhardwaj	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:			
C302-1.1	recall measures of central tendency and dispersion for visualizing the data.	Remembering (C1)	
C302-1.2	explain skewness, kurtosis, correlation, regression and sampling theory.	Understanding (C2)	
C302-1.3	apply skewness, kurtosis, correlation, regression and estimation theory to find the confidence interval.	Applying (C3)	
C302-1.4	analyze small and large sample data by using the test of hypothesis.	Analyzing (C4)	
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Descriptive Statistics	Graphical representation such as histogram, frequency polygon, AM, GM, HM, median, mode, measures of dispersion, skewness and kurtosis such as central and non-central moments, population variance, β , γ coefficient, Box and Whisker plot.	8
2.	Correlation and Regression Analysis	Scatter diagram. Karl Pearson's and Spearman's rank correlation coefficient, regression lines, regression coefficient and their properties.	5
3.	Sampling and Sampling Distributions	Populations and Sample, random sample, statistics, sample moments, law of large numbers, central limit theorem, distribution of sample mean and sample variance, MGF, Chi-square distribution, F-distribution, Student's t distribution.	7
4.	Parametric Point Estimation	General concept of point estimation, methods of moments and maximum likelihood for finding estimators, unbiasedness, consistency, efficiency, UMVUE, Cramer-Rao inequality, sufficiency, factorization theorem, completeness, Rao-Blackwell theorem.	10
5.	Parametric Interval Estimation	definition of confidence interval, pivotal quantity, confidence interval for mean, variance, difference of means and difference of variances for small and large samples.	5
6.	Hypothesis Testing	The basic idea of significance test. null and alternative hypothesis, type-I and type II errors,	7

		testing of small and large samples for mean, variance, difference in means, and difference in variances.	
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
Total		100	
Project based learning: Students in a group of 4 will collect sample data set and make simple regression models. They will validate the model by hypothesis testing. By this student will be able to make simple linear regression models and validate it.			
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. Biswas, G. L. Sriwastav , Mathematical Statistics: A Textbook, Alpha Science International, 2011.		
2.	W. Feller , An Introduction to Probability Theory and its Applications Vol. I, 3 rd Edition, 2011.		
3.	V. K.Rohatgi , An Introduction to Probability Theory and Mathematical Statistics Wiley Eastern, 1984		
4.	R. V. Hogg, A. T. Craig , Introduction to Mathematical Statistics, McMillan, 1971		
5	AM. Mood, F. A. Graybill, and D. C. Boes , Introduction to the Theory of Statistics McGraw Hill, 1974		
6.	Des Raj & Chandak , Sampling Theory, Narosa Publishing House, 1998.		
7.	Sheldon Ross , A First Course in Probability, 10th edition, Pearson Education Asia, 2018.		
8.	Meyer, P.L , Introductory Probability and Statistical Applications Addison-Wesley Publishing Company, 1965.		

Detailed Syllabus Lab-wise Breakup

Course Code	15B19EC691	Semester Odd (specify Odd/Even)	Semester: 6th Session: 2023 -2024 Month: January to June
Course Name	Minor Project - 2		
Credits	2	Contact Hours	NA

Faculty (Names)	Coordinator(s)	Mr. Ritesh Sharma, Dr. Atul Kumar
	Teacher(s) (Alphabetically)	Dr. Bhartendu Chaturvedi, Mr. Ankur Bhardwaj

COURSE OUTCOMES: At the completion of the course, students will be able to:		COGNITIVE LEVELS
C350.1	Recall the essential concepts and find the potential areas to work.	Remembering Level (C1)
C350.2	Explain the project objectives through exhaustive literature survey in the chosen area.	Understanding Level (C2)
C350.3	Identify the project gaps and organize, demonstrate and communicate the learning through project report and oral presentation.	Applying Level (C3)
C350.4	Examine and integrate the knowledge gained in various courses into the practical form.	Analyzing Level (C4)
C350.5	Evaluate the existing techniques/algorithms comes under project objectives.	Evaluating Level (C5)
C350.6	Design and implement a working model to justify the project objectives.	Creating Level (C6)

Evaluation Criteria	
Components	Maximum Marks
Mid Semester Evaluation	40
End Semester Evaluation	40
Report	20
Total	100