

Detailed Syllabus Lecture-wise Breakup

Subject Code	15B11EC611	Even-Semester	Semester: 6 th Session 2022-23 Month from Jan 2023 to June 2023
Subject Name	Telecommunication Networks		
Credits	3	Contact Hours	40

Faculty (Names)	Teacher(s) (Alphabetically)	1. Dr. Ankur Bhardwaj 2. Dr. Bhagirath Sahu 3. Dr. Pankaj Kumar Yadav
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COURSE OUTCOMES		COGNITIVE LEVELS
C315.1	Understand the basic concepts of Telecommunication network model, Traffic Engineering and Switching technologies.	Understanding (Level II)
C315.2	Understand the concepts of OSI model and analyze the various error and flow control mechanisms introduced by data link layer.	Analyzing (Level IV)
C315.3	Understand the TCP/IP protocol, routing algorithm and apply the concept of subnetting to allocate and distribute the logical addresses in a network.	Apply (Level III)
C315.4	Understand concept of LAN access protocols, ISDN, B-ISDN and ATM, their implementation and performance issues.	Understanding (Level II)

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

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 doing assignments on different topics of switching systems and different TCP/IP layers.

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

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
Lab-wise Breakup

Course Code	15B17EC671	Semester: Even	Semester 6th Session 2022 -2023 Month from Jan-June
Course Name	TELECOMMUNICATION NETWORKS LAB		
Credits	1	Contact Hours	2

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

COURSE OUTCOMES		COGNITIVE LEVELS
C375.1	Learn about network simulator, and building/installing NS2 for conducting network simulation and summarizing OSI, TCP & UDP	Understanding Level (C2)
C375.2	Set up and analysis of the wired and LAN networks and understanding UDP/TCP agents with CBR/FTP traffic source respectively	Analyzing Level (C4)
C375.3	To create and analyze the mobile ad-hoc network and heterogenous networks and routing algorithm.	Analyzing Level (C4)
C375.4	To label and explain data trace file (.tr) of Wired, Wireless and LAN Networks and evaluating throughput in Wired networks (with and without errors).	Evaluating Level (C5)

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.	CO1
2.	OSI Model	2. (a) Introduction to OSI, TCP & UDP. (b) 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. 3. 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
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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

Course Code	15B11EC613	Semester: Even	Semester: 6th Session: 2022 -2023 Month from: Jan-June
Course Name	Control Systems		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Ruby Beniwal, Prof. Jitendra Mohan
	Teacher(s) (Alphabetically)	Dr. Ruby Beniwal, Prof. Jitendra Mohan

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Classify the open loop and closed loop control systems and construct mathematical model for physical systems.	Applying (Level III)
CO2	Solve complex systems through block diagram reduction method and signal flow graph technique.	Applying (Level III)
CO3	Determine transient response and steady state response of the systems using standard test signals.	Evaluating (Level V)
CO4	Analyze the stability of the system and select suitable controllers and compensators for linear time invariant system.	Analyzing (Level IV)
CO5	Apply time domain and frequency domain techniques to identify the stability of control systems.	Applying (Level III)
CO6	Solve continuous time and discrete time systems using state variable approach.	Applying (Level III)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Control System	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 for 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	Bodes plot and Nyquist plot , Gain Margin & Phase Margin, stability analysis	7

	and Design		
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 (Attendance : 10 Marks, Quiz:15 Marks)	
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.	I. J Nagrath and M. Gopal, Control Systems Engineering, Fifth edition, New age International, 5 th Edition, 2009.
2.	Normal S. Nise., Control Systems Engineering, 7 th Edition, John Wiley,2014
3.	K.Ogata, Modern Control Engineering, 5 th Edition, Prentice Hall, 2010

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NEC734	Semester: EVEN	Semester: VI Session: 2022-2023 Month: Jan to June
Course Name	RF and Microwave Engineering		
Credits	3	Contact Hours	3 Hours/Week

Faculty (Names)	Coordinator(s)	Mr. Raghvendra Kumar Singh (JIIT 128) and Prof. Shweta Srivastava (JIIT 62)
	Teacher(s) (Alphabetically)	Mr. Raghvendra Kumar Singh and Prof. Shweta Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C332-3.1	Explain the concepts of microwave circuits and scattering parameters.	Understanding Level (C2)
C332-3.2	Evaluate the performance of several waveguide components and determine their responses and applications.	Evaluating Level (C5)
C332-3.3	Analyze the behaviour of microwave sources based on solid state devices and tubes at microwave frequencies.	Analyzing Level (C4)
C332-3.4	Determine measurement parameters of microwave components and understand the ISM applications of Microwave Energy.	Applying Level (C3)

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	35	
TA	20	
PBL	05	
Total	100	
Project Based Learning:		
Microwave Engineering is a fundamental course in Electronics and Communication Engineering. In this course, a brief introduction about basics of RF and Microwave Engineering is presented, which can be utilized to impart knowledge to design various microwave circuits at high frequencies. The project based exercises using RF basics can be used for filter designing.		

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	17B1NEC741	EVEN Semester – 6th	Session 2022-2023 Month Jan to Jun
Subject Name	Digital Hardware Design		
Credits	3	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Gaurav Verma	
	Teacher(s) (Alphabetically)	Dr. Gaurav Verma, Ms. Priyanka Kwatra,	
Course Outcomes		Cognitive Levels	
C332-1.1	Design synchronous circuits using Finite State Machine approach	Analyzing Level (C4)	
C332-1.2	Design and analyze asynchronous circuits	Analyzing Level (C4)	
C332-1.3	Understand the advanced adders and multiplier circuit	Understanding Level (C2)	
C332-1.4	Apply the concept of different ways of pulse or pattern generation	Analyzing Level (C4)	
C332-1.5	Design digital circuits using VHDL	Analyzing Level (C4)	
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.	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	10

		modeling and simulation.	
4.	Advanced Topics in Digital Circuits	Different Types of Adders & Multipliers (Booth Algorithm).	9
5.	Asynchronous Finite State Machines	Asynchronous Analysis, Design of Asynchronous Machines, Flow table realization, reduction, state assignments and design, Cycle and race analysis.	9
Total Number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
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T1	20
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T2	20
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End Semester Examination	35
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TA	25
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Total	100
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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 2022- 2023 Month from Jan to June 2023
Subject Name	Mobile Communication		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Kuldeep Baderia, Yogesh Kumar
	Teacher(s) (Alphabetically)	Kuldeep Baderia, Yogesh Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
C331-2.1	Explain the evolution of mobile communication and basics of all the wireless standards currently being employed.	Understanding Level (C2)
C331-2.2	Perform mathematical analysis of cellular systems and cellular capacity improvement designs.	Analyzing Level (C4)
C331-2.3	Analyze large and small scale propagation models and their design both mathematically and conceptually. Analysis of various fading models.	Analyzing Level (C4)
C331-2.4	Analyze architecture of 2G, 3G and 4G systems and issues associated with them. Formulate research problems based on the issues associated with 4G systems.	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 Interoperability for Microwave Access (WiMax).	4
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25(Attendance, Performance. Assignment/Quiz)	
Total		100	
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.			

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

Subject Code	18B11EC315	Semester: Even	Semester: 6th Session: 2022 -2023 Month: January – June
Subject Name	VLSI Design		
Credits	4	Contact Hours	4
Faculty (Names)	Coordinator(s)	Dr. Akanksha Bansal and Dr. Vimal Kumar Mishra	
	Teacher(s) (Alphabetically)	Dr. Akanksha Bansal, Mr. Atul Kumar Srivastava, Dr. Saurabh Chaturvedi, and Dr. Vimal Kumar Mishra	
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	Demonstrate the operation of MOSFET, understanding technology scaling and its effects		Analyzing Level (C4)
CO3	Develop the concepts of static and dynamic characteristic of MOS inverters, combinational and sequential circuits		Analyzing Level (C4)
CO4	Understand the dynamic logic circuits, stick diagram, layout and working principle of different types of semiconductor memories		Analyzing Level (C4)
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,	9

		Delay-time definitions, calculation of delay times, Inverter design with delay 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 2022-2023 Month from January to June
Course Name	VLSI Design Lab II		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Saurabh Chaturvedi, Priyanka Kwatra
	Teacher(s) (Alphabetically)	Akansha Bansal, Priyanka Kwatra, 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	Analyze the static and switching characteristics of MOS inverters and examine the delay times. Analyze and simulate the schematic and layout of CMOS combinational and sequential logic circuits and examine 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. To obtain the NMOS-FET parameters: k_n , V_{to} , V_t , γ and λ .	C374.2
3.	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} . 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
4.	MOS combinational and sequential logic circuits	To analyze the transient response of CMOS inverter and calculate the propagation delay, rise time and fall time. To simulate the following logic gates and verify the truth tables: (a) Two-input NAND (b) Two-input NOR Layout design and simulation of NMOS and PMOS transistors. Layout design and simulation of CMOS inverter. Layout design and simulation of CMOS 2-input NAND gate. Simulation of a two-input XOR gate using CMOS transmission gates.	C374.4

		Simulation of a two-input multiplexer using CMOS transmission gates. Simulation of a CMOS D-latch.	
Evaluation Criteria			
Components		Maximum Marks	
Mid-semester viva		20	
End-semester viva		20	
Day-to-day performance		60	
(Lab record, experiment performance, discipline etc.)			
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

Course Code	18B12EC311	Semester: Even (specify Odd/Even)	Semester 6th Session 2022 -2023 Month from Jan to June
Course Name	Advanced Radio Access Networks		
Credits	3	Contact Hours	3 (L)

Faculty (Names)	Coordinator(s)	Dr. Rahul Kaushik
	Teacher(s) (Alphabetically)	Dr. Rahul Kaushik

COURSE OUTCOMES		COGNITIVE LEVELS
C331-1.1	Recall the basic concepts of Digital Communication, Antenna and Wave Propagation, and Wireless Communication.	Remembering (C1)
C331-1.2	Identify the different components of wireless network based on the 3GPP reference network model.	Applying (C3)
C331-1.3	Analyze the architecture and channel structure of LTE and also examine the LTE call flow.	Analyzing (C4)
C331-1.4	Explain the importance of Optimization and Pre-Launch Optimization in radio access network.	Evaluating (C5)

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 as it is of the utmost importance to plan the radio network as efficiently as possible. 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

Course Code	18B13EC314	Semester Even	Semester VI Session 2022 -2023 Month Jan to Jun 23
Course Name	Machine Learning for Signal Processing		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Parul Arora
	Teacher(s) (Alphabetically)	Bhawana Gupta, Parul Arora
COURSE OUTCOMES		COGNITIVE LEVELS
C331-3.1	Illustrate various machine learning approaches.	Understanding Level (C2)
C331-3.2	Experiment with the different techniques for feature extraction and feature selection.	Applying Level (C3)
C331-3.3	Apply and analyze various classifier models for typical machine learning applications.	Analyzing Level (C4)
C331-3.4	Make use of deep learning techniques in real life problems.	Applying Level (C3)

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	
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.			

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

Subject Code	23B12EC311	Semester (specify Odd/Even)	Semester: 6 th Session : 2022-2023 Month: from January2023 to June2023
Subject Name	Semiconductor Devices And Circuits		
Credits	3	Contact Hours	40

Faculty (Names)	Coordinator(s)	Dr. Garima Kapur, Dr Hemant Kumar
	Teacher(s) (Alphabetically)	

Course Objectives: The main objective of this course is to provide with a comprehensive understanding of semiconductor devices and circuits . The course presents a fundamental introduction to physical models of the operation of semiconductor devices and examines the design and operation of important circuits that utilize these devices.

COURSE OUTCOMES		COGNITIVE LEVELS
CO331-4.1	Understand the fundamentals of Semiconductors and different types of Junctions.	Understanding (C2)
CO331-4.2	Understand the basic concept of different Semiconductor devices.	Understanding (C2)
CO331-4.3	Apply the theory of theses device in application of digital logics families.	Applying (C3)
CO331-4.4	Analyze and apply the semiconductor devices in the amplifier circuits.	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Fundamentals of Semiconductors	Introduction to Semiconductor, Energy band diagram of PN diode, Metal-Semiconductor Ohmic Contacts, Ideal Nonrectifying Barriers, Tunneling Barrier, Heterojunctions, Heterojunction Materials.	10 CO331-4.1

2.	Introduction to Special Semiconductor Diodes	Tunnel Diode, PIN diode, Varactor Diode, Light Emitting Diode, Schottky Diode, Photodiode, Photo detector.	6 CO331-4.2
3.	Fundamentals of the Metal-Oxide Semiconductor Field-Effect Transistor	2 Terminal /3 Terminal MOS Capacitors, MOSFETs structures, operations and their characteristics.	8 CO331-4.2
4.	Digital Logics Families	The basic Classification of the Logic Families is as follows: A) Bipolar Family B) Unipolar Family C) Hybrid Family.	9 CO331-4.3
5.	Introduction to Amplifier	MOSFET small signal analysis, MOSFET Amplifiers, Feedback and Oscillators	9 CO331-4.4
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: Here, students will learn the basic fundamentals of semiconductor, several different junctions, get concepts of special semiconductor diodes. MOS structure analyses, MOSFET characteristics and operations develop concept for analog circuit, VLSI designing. Students attain details knowledge of basic semiconductor circuits like feedback amplifiers, oscillators, etc.

Text Books	1. S Salivahanan, N S. Kumar “ <i>Electronic Devices and Circuits</i> ”, McGraw Hill Education PrivateLtd. 2018 2. BKumar, SB.Jain “ <i>Electronic Devices and Circuits</i> ”, Prentice Hall India . 2014
Reference Books	1. R L. Boylestad, Louis Nashelsky, “ <i>Electronic Devices and Circuits</i> ”, Pearson; 11 edition, 2013 2. M. M.Mano and M. D. Ciletti., “ <i>Digital Design</i> ”. Pearson Education,5 th edition, 2013 3. D. Neamen, D. Biswas ,” <i>Semiconductor Physics and Devices</i> ”, McGraw Hill Education; 4 edition, 2017

Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B19EC691	Semester Even	Semester 6th Session 2022-23 Month from January 23 to June 23
Subject Name	Minor Project - 2		
Credits	5	Contact Hours	NA

Faculty (Names)	Coordinator(s)	Mr. Ankur Bhardwaj, Mr. Raghvendra Kumar Singh
	Teacher(s) (Alphabetically)	NA

COURSE OUTCOMES		COGNITIVE LEVELS
C351.1	Identifying, planning and initiation of the individual projects in the domain selected by them, respectively.	Applying Level (C3)
C351.2	Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.	Analyzing Level (C4)
C351.3	Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.	Analyzing Level (C4)
C351.4	Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.	Evaluating Level (C5)
C351.5	Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.	Creating Level (C6)

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS634	Semester Even (specify Odd/Even)	Semester Session 2022 -2023 Month from Jan 2023 to June2023
Course Name	Theatre and performance(Value added)		
Credits	2	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr Nilu Choudhary
	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

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	16B1NHS 531	Semester :Even (specify Odd/Even)	Semester : VI Session:2022 -2023 Month from: Jan to June
Course Name	Sociology of Youth		
Credits	3 (2-1-0)	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	2
2.	Youth Culture	Concept of Youth Culture, role of Popular culture in shaping youth culture,	2
3.	Perspectives on Youth Culture	Functionalist, Conflict, Interactionist and Feminist Perspective on Youth Culture, Youth and Gender	3
4.	Youth and Identity	Social divisions: sexuality, urban and rural youth, social identities: subcultural, digital, Experiences of youth to negotiate identities in contemporary societies	6
5.	Socialization of Youth	Concept and processs 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	7
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)	6
7.	Changing perceptive of Youth and Youth Culture in 21st century	involvement of youth in major decision making institutions, Post-modernity and Youth, Youth Unrest	2
			...

Total number of Lectures		28
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 2022 -2023 Month from January to June
Course Name	PROJECT MANAGEMENT		
Credits	3	Contact Hours	3-0-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
C304-5.1	Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context	Apply Level (C3)
C304-5.2	Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions	Analyze Level (C4)
C304-5.3	Evaluate the stages of project management and identify and determine correct techniques for planning and scheduling	Evaluate Level (C5)
C304-5.4	Evaluate management processes for budgeting, controlling and terminating projects in order to achieve overall project success	Evaluate Level (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	6
2.	Project Selection	Theoretical Models; Non-numeric models; Numeric Models; Financial Models; Project Portfolio process, Significance and applicability of Monte Carlo simulation	8
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.	6
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.	6
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-Resource Leveling and Loading.	8
6.	Budgeting, Control	Estimating Project Budgets, Improving the process of cost	8

	and Project Termination	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.	
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Total number of Lectures

42

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 (Assignment, Project, Oral Questions)
Total	100

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

1. Meredith, Mantel, Project Management-A Managerial Approach, 10th Edition, Wiley Publications,2017

2. TimmothyKloppenborg, Contemporary Project Management, 5th^t Edition, Cengage Learning, 2017

3. Harold Kerzner,Project Management: A Systems Approach to Planning, Scheduling, and Controlling,12thEdition,Wiley Publications,2017

4. Wysocki,R.K., Effective Project Management: Traditional, Agile, Extreme, Hybrid, 8th Edition, Wiley Publications,2018

5. Vohra, N. D., Quantitative Techniques in Management, 5thEdition, Tata McGraw Hill Publishing Company, 2017

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS635	Semester: Even	Semester: VI Session: 2022 -2023 Month: Jan to June 2023
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	Identify dynamic human behavior through an insight into relationships between individuals, groups and organizations.	Apply (C3)
C304-6.2	Analyze individual management style as it relates to influencing and managing behavior in the organization.	Analyze (C4)
C304-6.3	Decide and justify set of strategies for meeting the special challenges in the 21st century competitive workplace.	Evaluate (C5)
C304-6.4	Assess the potential effects of important developments in the external environment on behavior in organizations.	Evaluate (C5)

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. Robbins, T. Judge, S. Sanghi, Organizational Behavior, 13th Ed, Prentice-Hall India, 2001
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 2022 - 2023 Month: January 2023 to June 2023
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. 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 analyze the language and style adopted in filmed texts and examine them as reflections of 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.	Analysing 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, Presentation, Assignment)		
Total		100	

Project Based Learning: The Group Project consists of 3 components: A Digital Narrative Poster, Ethical Adaptation and a Report. The students pick a text (Novel /Play) of their choice which has not been covered in the syllabus. The students need to take 1 adaptation of the text in each of the following category: a) Faithful b) Acculturated/Loose and analyze all the adaptations as per the given points: a) Narrative Plot b) Conflicts c) Character development d) Thematic differences when using Literary & adaption theories. e) Narrative art and Mise-en-scene. This comparative analysis is to be submitted in the form of a Narrative Digital Poster. The students also create a brief ethical adaptation of the source text in the form of a short story/script/poem. The project includes a brief 2-3 pages report which should highlight the following: a) Objectives of the Project b) Rationale for Choosing the Text & its adaptations c) Literature Review/ Background study Method & Theories applied e) Discussion & Analysis/ Findings f) Conclusion (with reference to Objectives) g) Significance of the Findings for the Society/ Relevance in enhancing our learning for life h) Limitations i) Individual Contribution of each of the Team Member in the Whole Project j) References/Works Cited

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> , 1 st 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> , 1 st Edition, G. P. Putnam's Sons, USA, 1969
8.	Lois Lowry , <i>The Giver</i> , 1 st Edition, Houghton Mifflin Harcourt Publishing Company, USA, 1993

Course Description

Course Code	16BINMA633	Semester: Even	Semester VI Session 2022-23 Month from Jan 2023 - June 2023
Course Name	Statistics		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Shikha Pandey	
	Teacher(s) (Alphabetically)	Dr. Shikha Pandey, Dr. Pinkey Chauhan	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C302-1.1	make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data.		Applying Level (C3)
C302-1.2	apply correlation and regression in statistical analysis of data.		Applying Level (C3)
C302-1.3	explain sampling theory and its distributions.		Understanding Level (C2)
C302-1.4	explain the concepts and properties of estimation theory.		Understanding Level (C2)
C302-1.5	apply sampling and estimation theory to find the confidence interval.		Applying Level (C3)
C302-1.6	analyze small and large sample data by using the test of hypothesis.		Analyzing Level (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, testing of small and large samples for mean, variance, difference in means, and difference in variances.	7
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 students 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.	Biswas and Srivastava, A Textbook, Mathematical Statistics Ist Edition, Narosa Publishing House, New Delhi.		
2.	W. Feller, Introduction to Probability Theory and its Applications Vol. I and II. Wiley Eastern-Ltd, 1971		
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
Lecture-wise Breakup

Course Code	16B1NPH632	Semester EVEN	Semester 6th Session 2022-2023 Month from January to June
Course Name	SOLID STATE ELECTRONIC DEVICES		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr. Dinesh Tripathi and Dr. Anuj Kumar	
	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 & Dhrubes 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: 2022 -2023 Month: January to June
Course Name	Photovoltaic Techniques		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Manoj Kumar-JIIT 62 Dr. Prashant Chauhan – JIIT 128
	Teacher(s)	Dr. Manoj Kumar 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 cell technologies	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)	08

		Photovoltaic Cells, Estimating PV system size and cost, Photovoltaic safety.	
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
Lecture-wise Breakup

Course Code	16B1NPH634	Semester: Even	Semester VI Session 2022 -2023 Month: from January 2023 to June 2023
Course Name	Applied Statistical Mechanics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Prof. Navendu Goswami
	Teacher(s) (Alphabetically)	Prof. Navendu Goswami

COURSE OUTCOMES		COGNITIVE LEVELS
C302-9.1	Define the fundamental parameters of Thermodynamics and Statistical Mechanics.	Remembering (C1)
C302-9.2	Explain the Thermodynamic potentials, Maxwell's equations and Heat equations.	Understanding (C2)
C302-9.3	Apply the concepts of thermodynamics and statistical ensembles to understand the phase space and distribution functions.	Applying (C3)
C302-9.4	Determine the distribution functions in case of various types of physical and chemical ensembles.	Evaluating (C5)
C302-9.5	Evaluate the ideas of Entropy with respect to Probability and Information Theory; and conclude Liouville's equation.	Evaluating (C5)

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 [2 Quiz (6 M), Project Based Learning (PBL) (10 M), Attendance (5 M) and Internal assessment (4 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.	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 learning: Students would work on a project of their choice in any of the following fields: materials science processing, property determination and application; neural network-based ensemble, any ensemble formalism in economics, weather etc. In such projects students can not only apply the basic concepts of thermodynamics but also apply the ideas of suitable ensemble, Monte-Carlo simulation, Molecular dynamics, Ising Model etc. to determine the properties, predict its behaviour with time evolution and assess application potential. The learning obtained through this project would not only provide deeper understanding of the pertinent concepts learnt in this course but also develop the skills of applying the statistical mechanics to solve the related problems and thereby proving the employability potential in materials research-based industries, economics and meteorological departments.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH636	Semester: Even	Semester: VI Session 2022 -2023 Month from: January 2023 to June 2023
Course Name	Medical & Industrial Applications of Nuclear Radiations		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Vaibhav Subhash Rawoot	
	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

Course Code	16B19PH693	Semester: Even	Semester: 6 th Session: 2022-2023 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		COGNITIVE LEVELS
After completion of the course, students will be able to:		
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, microprocessors, 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

<p>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.</p>

Detailed Syllabus

Course Code	23B12PH311	Semester: 6 th	Semester: Even Session: 2022-23 From: January 2023 to June 2023
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	Advantages of pyrolysis over combustion and gasification, Types of pyrolysis, Design, construction and operation of waste pyrolysis units,	10

	Products	Products obtained from pyrolysis, their characteristics, Design of Biomass stoves, Factors affecting the pyrolysis products. 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 plastic 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS611	Semester EVEN (specify Odd/Even)	Semester VI Session 2022-2023 Month from : Jan – June 2023
Course Name	Marketing Management		
Credits	3	Contact Hours	(2-1-0)

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

COURSE OUTCOMES		COGNITIVE LEVELS
C304-7.1	To illustrate the fundamentals of marketing, marketing environment and market research	Understanding Level (C2)
C304-7.2	To model the dynamics of marketing mix	Applying Level (C3)
C304-7.3	To demonstrate the implications of current trends in social media marketing and emerging marketing trends.	Understanding Level (C2)
C304-7.4	To appraise the importance of marketing ethics and social responsibility	Evaluating(C5)
C-304-7.5	To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.	Creating (C6)

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 Business Buyer Behaviour	Consumer Markets and consumer buyer behaviour. The buying decision process. Business Markets and business buyer behaviour. Discuss the modern ethical standards.	5
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 (Project & Viva)
Total	100

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

1.	Kotler, Philip and Gary Armstrong, Principles of Marketing, 16 th Global Edition, New Delhi, Pearson Education, 20015.
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	18B13HS612	Semester Even (specify Odd/Even)	Semester VI Session 2022-2023 Month from Jan-June
Course Name	Effective tools for Career Management and Development		
Credits	2	Contact Hours	1-0-2

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

COURSE OUTCOMES		COGNITIVE LEVELS
C305-2.1	Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.	Evaluate Level (C5)
C305-2.2	Apply knowledge of all the Career Stages in making informed career decisions.	Apply Level (C3)
C305-2.3	Develop and maximize ones potential for achieving the desired career option.	Create Level (C6)
C305-2.4	Analyze the processes involved in securing and managing career by employees of different organizations.	Analyze Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures and Tutorial for the module
1.	Introduction to Career Life cycle	Introduction to Career Life Cycle of an individual-Role and importance of human resource in an organization, Evolution of Strategic Human Resource Management.	3
2.	Self Branding and strategies to do well in Recruitment and Selection	Introduction to complete cycle of Recruitment and Selection, Introduction to various tools used for assessment and testing candidates-aptitude test, personality test, graphology test etc. Introduction to Workforce planning, Importance and practical application of Job Analysis, Job Description and Job Specification.	3
3.	Personnel Development and your career	Introduction to various learning and development, Introduction to various techniques used for learning and development, measure of training effectiveness, Training techniques / delivery, Kirkpatrick Model, Introduction to Succession Planning, Transactional Analysis.	3
4.	Human Resource Evaluation and Compensation	Performance Management: Measurement Approach, Developing Job Descriptions, Key Result Areas, Key Performance Indicators, Assessment Centre, 360 Degree feedback, Balanced Scorecard, Effective Performance Metrics. Compensation Strategy and trends- Compensation package, ESOPs, Performance based pay, Recognition, Retrial benefits, Reward management, Team rewards.	3

5.	Human Resource Control and special topics	Human Resources Audit, The Human Resource Information System (HRIS), Human Resources Accounting, Competency Management, Human Resource Management Practices in India, Internationalization of Human Resource Management Commonly Used Jargons.	2
Total number of Lectures			14

Module No.	Title of the Module	List of Experiments/Activities	CO
1.	Introduction to Career Life cycle	Practical Sessions on Resume and Cover Letter Writing	CO1, CO2
2.	Self Branding and strategies to do well in Recruitment and Selection	Practical Sessions on Job Description, Job Specification and Self-Branding, Psychometric self-reflection tools on Personal Orientation and behavior-Personal Efficacy, Personal effectiveness, Locus of Control, Emotional Intelligence and Assertiveness.	CO3, CO4
3.	Personnel Development and your career	Practical Sessions on Johari Window-Knowing Thyself, Transaction Analysis-Parent, Child, Adult Ego State for effective interpersonal communication.	CO1, CO3
4.	Human Resource Evaluation and Compensation	Practical Sessions on HR Interview and Mock HR Interview	CO2, CO4
5.	Human Resource Control and special topics	Practical Sessions on Group Discussions and Mock Group Discussions	CO2, CO4

Evaluation Criteria	
Components	Maximum Marks
Mid Term	30 (Project)
End Term	40 (Written)
TA	30 (Class Mock Activities, 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 IIIT, 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

SYLLABUS AND EVALUATION SCHEME

Lecture-wise Breakup

Course Code	19B12HS611	Semester : EVEN (specify Odd/Even)	Semester: VI Session 2022-23 Month from: January to June
Course Name	Econometric Analysis		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Manas Ranjan Behera
	Teacher(s) (Alphabetically)	Manas Ranjan Behera

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	<i>Demonstrate</i> the key concepts from basic statistics to understand the properties of a set of data.	Understanding Level - C2
CO2	<i>Apply</i> Ordinary Least Square method to undertake econometric studies.	Apply Level - C3
CO3	<i>Examine</i> whether the residuals from an OLS regression are well-behaved.	Analyze Level - C4
CO4	<i>Evaluate</i> different model selection criteria for forecasting.	Evaluation Level - C5
CO5	<i>Create</i> models for prediction from a given set of data.	Creation Level - C6

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Statistical Inference	Point and interval estimation; ;The Z distribution ;The Null and Alternate hypotheses ;The chi-square distribution; The F distribution; The t distribution	3

2.	Regression Analysis	Two variable regression model; The concept of the PRF; Classical assumptions of regression; Derivation of the OLS estimators and their variance; Properties of OLS estimators under classical assumptions; Gauss-Markov Theorem; Tests of Hypothesis, confidence intervals for OLS estimators; Measures of goodness of fit: R square and its limitations; Adjusted R square and its limitations	7
3.	Econometric Model Specification	Identification: Structural and reduced form; Omitted Variables and Bias; Misspecification and Ramsay RESET; Specification test; Endogeneity and Bias	5
4.	Failure of Classical Assumptions	Multi-collinearity and its implications; Auto-correlation: Consequences and Durbin-Watson test ;Heteroskedasticity: Consequences and the Goldfeld - Quandt test	2
5.	Forecasting	Forecasting with a)moving averages b) linear trend c) exponential trend CAGR; Forecasting with linear regression; Classical time series decomposition; Measures of forecast performance: Mean square error and root mean square error; Limitations of econometric forecasts	5
6.	Time Series Analysis	Univariate Time Series Models: Lag Operator, ARMA , ARIMA models, Autoregressive Distributed Lag Relationship	3
7.	Linear Programming	Linear programming; Dual of a linear programming problem; Simplex method Transportation	3
Total number of Lectures			28
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	

End Semester Examination	35
TA	25 (Quiz+Project+Viva -Voce)
Total	100

Project based Learning: Students have to form a group (maximum 5 students in each group) and have to do an econometric analysis on the topic assigned. Students will use the different statistical methods using quantitative data to develop theories or test existing hypothesis. Students will also be encouraged to forecast future economic trends.

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.	Gujarati, D.N. (2002), Basic Econometric (4 th ed.), New York: McGraw Hill.
2.	Greene, W.H. (2003), Econometric Analysis, New Jersey: Prentice Hall.
3.	Madala, G.S. (1992), Introduction to Econometrics (2 nd ed.), New York: Macmillan.
4.	Wooldridge, J (2010), Econometric Analysis of Cross Section and Panel Data (2 nd ed.), Cambridge, The MIT Press.
5.	Stock, J. H., and M. W. Watson. (2015). Introduction to Econometrics, (Third Update), Global Edition. Pearson Education Limited.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS612	Semester:Even	Semester VI Session 2022 -2023 Month from Jan 2023 to June 2023
Course Name	Social Media and Society		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr. Shirin Alavi
	Teacher(s) (Alphabetically)	Dr. Shirin Alavi

COURSE OUTCOMES		COGNITIVE LEVELS
C304-1.1	Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape	Apply Level(C3)
C304-1.2	Elaborate the implications of cyber branding and digitization on online marketing mix decisions	Create Level (C6)
C304-1.3	Develop specific models related to social media and social media analytics	Create Level (C6)
C304-1.4	Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis	Evaluate Level(C5)
C304-1.5	Illustrate the new age marketing practices	Understand Level (C2)

Mod ule No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction, Individuals Online and Rules for engagement for social media	What is social media marketing, the importance of social media for influencing target audience, Patterns of internet usage, Internet user demographics, The Behavioural Internet, E-Marketing, The Virtual world, the changing Marketing Landscape, E -Marketing-Strengths and Applications, Online Marketing Domains, Digital Marketing Optimization, The Need for Digital Engagement	4
2.	The Online Marketing Mix	The Online Marketing Mix, Consumer Segmentation, Consumer Traits, Consumers and Online Shopping Issues, E-Product, E-Place, E-Price, E-Promotion, Website Characteristics affecting online purchase decision.	3
3.	The Online Consumer and Social Media	The Digital Ecosystem, Online Consumer Behavior, Cultural Implications of key web characteristics, Models of website visits, Web 2.0 and Marketing, The collaborative web, Network evolution, Network science, Marketing with networks, Metcalfe's law, Netnography, Social Media Model by McKinsey, social media Tools-Blogs, Wikis, Online Communities, Facebook, Twitter, You Tube, Flickr, Microblogging.	4

4.	Online Branding and Traffic Building	Cyberbranding, Online brand presence and enhancement, The Digital Brand Ecosystem, Brand Experience, Brand Customer Centricity, Brands and Emotions, The Diamond Water paradox, Internet Traffic Plan, Search Marketing Methods, Internet Cookies and Traffic Building, Traffic Volume and quality, Traffic Building Goals, Search Engine Marketing, Keyword Advertising, Keyword value, Internet Marketing Metrics, Websites and Internet Marketing.	4
5.	Web Business Models ,Social Media Strategy ,Social Media Marketing Plan	The value of a Customer Contact, Customer Centric Business Management, Web Chain of Events, Customer Value Analysis and the Internet, Business Models, Revenue Benefits, Value Uncertainty, Purchase Importance, Define a social media plan, explain the social Media marketing planning cycle, list the 8C's of strategy development.	4
6.	Market Influence analytics in a Digital Ecosystem	Engagement Marketing through Content Management, Online Campaign Management, Consumer Segmentation, Targeting, and Positioning using Online Tools, Market Influence Analytics in a Digital Ecosystem, The Digital Ecosystem, Knowledge as a value proposition, CGM and Consumer behavior, The value of the power of influence, Amplifying Social Media Campaigns.	4
7.	The Contemporary Digital Revolution and its impact on society	Online Communities and Co-creation, The fundamentals of online community management strategies, The World of Facebook, The Future of Social media Marketing—Gamification and Apps, Game based marketing The world of Apps, Apps and the Indian Diaspora	3
8.	Integrating Mobile into Social Media Marketing	Types of Mobile Marketing, Progression of the mobile as a Marketing channel, some Indian mobile marketing campaigns, Impact of social media on government, the economy, development, and education	2
Total number of Lectures			28
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Project-Report and Viva)	
Total		100	

Project Based Learning: The project is to be done in a group size of 4 -5 members. Students were asked to identify one brand/company on social media. Read the information available on social media and browse through campaigns. Study the consumer engagement and comments. Write their opinion about it. Analyze the same with a social media tool and compare the results. Also identify and elucidate the strategies used by the brand in the context of online branding. This helped the students to understand concepts of cyber branding and social media analytics and enhanced their employability skills in an 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.	Digital Marketing, Seema Gupta,First Edition ,Mc Graw Hill Education (India) Private Limited ,2018
2.	Social Media Marketing A Strategic Approach, Melissa Barker, Donald Barker,Second Edition Cengage Learning ,2017.
3.	Digital Marketing, Vandana Ahuja, First Edition, Oxford University Press, 2015
4.	Social Media Marketing, Liana “Li” Evans, First Edition, Pearson, 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS613	Semester: Even	Semester VI Session 2022-23 Month from: Jan 2023-June 2023
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	Explain the foundations of international trade and finance in the era of globalization.	Understanding Level (C2)
C304-8.2	Analyze the major models and theories of international trade.	Analyzing Level (C4)
C304-8.3	Identify the effects of tariffs, quotas and technical progress on economic growth.	Applying Level (C3)
C304-8.4	Examine the equilibrium in the Balance of Payments (BOP) and measures to correct disequilibrium.	Analyzing Level (C4)
C304-8.5	Compare the fixed and flexible exchange rate, monetary policy, foreign trade multiplier & trade policy.	Analyzing Level (C4)
C304-8.6	Analyze the working of regional blocks & international organizations.	Analyzing Level (C4)

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
Total number of Lectures			28

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 VI Session 2022-23 Month from Jan - June
Course Name	Global Politics		
Credits	3(2-1-0)	Contact Hours	3

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

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	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	Understanding (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

		global commons debate Proliferation of Nuclear Weapons-history of nuclear proliferation, threat of proliferation with increase in globalization	
4.	Contemporary Global Issues-II	International Terrorism: globalization and global terrorism, impact of terrorism on globalization, role of non-state actors and state terrorism; the US and war on terrorism Migration and Human Security- globalization, violent extremism and migration; new global regime	6
Total number of Lectures			28

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

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	C. Hay, Ed. <i>New Directions in Political Science: Responding to the Challenges of an Interdependent World</i> . New York, USA: Palgrave Macmillan Education, 2010
2.	D.Held & A. McGrew, <i>Globalization/Anti-globalization: Beyond the Great Divide</i> . Cambridge, UK: Polity Press, 2007
3.	F. Halliday, "Terrorism in Historical Perspective"., <i>Open Democracy</i> . 22 April, 2004 [Online] Available: http://www.opendemocracy.net/conflict/article_1865.jsp
4.	J. Baylis and S. Smith, Ed. <i>The Globalization of World Politics: An Introduction to International Relations</i> . Oxford, UK: Oxford University Press, 2017
5.	L.Gordon and S. Halperin, "Effective Resistance to Corporate Globalization" in <i>Contesting Global Governance</i> , R.O'Brien, A.M. Goetz, J.C. Scholte & M.Williams. Cambridge, UK: Cambridge University Press,2000

Detailed Syllabus

CourseCode	21B12HS311	Semester: EVEN (specify Odd/Even)	Semester: VI Session: 2022-23 Month from: Jan to 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 amandeep.kaur@mail.jiit.ac.in

COURSE OUTCOMES		COGNITIVE LEVELS
C304-10.1	Understand the concept, philosophy and determinants of rural development	Understanding Level- (C2)
C304-10.2	Assess public policies related to rural development	Analyze Level –(C4)
C304-10.3	Explain the role of local self-governance in planning and development of rural areas.	Understanding Level- (C2)
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 -2019-20 and 2020-21: 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	21B13HS311	Semester Even (specify Odd/Even)	Semester VI Session 2022 -2023 Month from Jan-June
Course Name	Poverty, Inequality and Human Development		
Credits	2	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr Akarsh Arora
	Teacher(s) (Alphabetically)	Dr Akarsh Arora

COURSE OUTCOMES		COGNITIVE LEVELS
C305-13.1	Understand the concepts and dimensions of Poverty, Inequality and Human Development	Understand (Level 2)
C305-13.2	Evaluate different approaches to measure Poverty, Inequality and Human Development	Evaluate (Level 5)
C305-13.3	Apply an analytical framework to understand the factual or proximate causes or determinants of Poverty and Inequality	Apply (Level 3)
C305-13.4	Analyze the role of public policy and affirmative action to tackle Poverty and Inequality and strengthen Human Development.	Analyze (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Concepts and Dimensions	Concepts and Dimensions of Poverty, Inequality and Human Development	3
2.	Measurement	Measurement of Poverty and Inequality: Steps and Axioms. Steps to calculate Human Development	4
3.	Data Sources	Census Data, Unit level Household Data, Geospatial Data, Satellite Image Data	2
4.	Determinants	Determinants/ Factors: Demographics, Household, Individual, and Macroeconomic variables Introduction to Stata, Regression- Linear and Binary models	3
5.	Public Policies and Affirmative Actions	Review of different public policies of GOI to eradicate poverty. Role of education and health care policies to strengthen human development	2
Total number of Lectures			14

Module No.	Title of the Module	List of Experiments/Activities	CO
1.	Concepts and Dimensions	Practical sessions on different dimensions of poverty and inequality.	CO1, CO2
2.	Measurement	Practical sessions on STATA/Python software to measure poverty, inequality, and human development.	CO1, CO2
3.	Data Sources	Practical sessions on key survey issues and	CO2, CO3

		problems while collecting data on poverty, inequality and human development.	
4.	Determinants	Practical sessions on STATA/ Python software to find and interpret the determinants of poverty using regression analysis.	CO2, CO3
5.	Public Policies and Affirmative Actions	Practical sessions on the impact of different Government of India policies and programmes on poverty, inequality and human development.	CO3, CO4

Project based Learning: Students, in groups of 2-3, are required to submit a detailed report on the measurement of poverty and inequality for the selected Indian state. Students are expected to follow official poverty estimation reports in India and measure poverty in a genuine sense based on the existing poverty methodology. They also need to check the data's compatibility, process the data after cleaning for various issues and analyse poverty and inequality at aggregated and disaggregated levels. Furthermore, they need to support findings/ arguments based on previous research studies. Measurement, interpretation and empirical-based argumentation in this sense will upgrade students' knowledge regarding economic development issues and strengthen their skills to tackle extensive and multiple data sets and develop their core competencies in respect of social data science.

Evaluation Criteria

Components	Maximum Marks
Mid Term	30 (Project)
End Term	40 (Written)
TA	30 (Project Assignment, Quiz)
Total	100

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

1.	A. V. Banerjee and E. Duflo, <i>Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty</i> . New York: Public Affairs, 2011
2.	J. Haughton and S. R. Khandker, <i>Handbook on Poverty and Inequality</i> . Washington, DC: The World Bank, 2009.
3.	A. Tarozzi and A. Deaton, "Using census and survey data to estimate poverty and inequality for small areas," The review of economics and statistics, vol. 91, no. 4, pp. 773-792, 2009.
4.	D. Ray, <i>Development Economics</i> , 19 ed. New Delhi, India: Oxford University Press, 2012
5.	A. Sen, <i>On Economic Inequality</i> . Oxford: Clarendon Press, 1997.
6.	S. Alkire and M. E. Santos, "Acute Multidimensional Poverty: A New Index for Developing Countries," OPHI Working Paper. 2017.
7.	A. V. Banerjee and E. Duflo, <i>Good Economics for Hard Times</i> . New Delhi: Juggernaut, 2019.

Detailed Syllabus
Lecture-wise Breakup

Course Code	23B18HS311	Semester Even (specify Odd/Even)	Semester Session 2022-2023 Month from January to June
Course Name	Workplace Communication (Value added)		
Credits	0	Contact Hours	3(1-0-2)

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

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C305-14.1	Describe different types of communication and how they are used in the workplace	Understanding level(C2)
C305-14.2	Applying the understanding of professional writing and design various professional documents	Applying level (C3)
C305-14.3	Assess the interaction of verbal communication with non – verbal cues and communicate efficiently with the target audience	Analyzing level(C4)
C305-14.4	Understand the dynamics of team communication and learn to communicate effectively with their peers, superiors and other colleagues	Applying Level (C3)
C303-14.5	Recognize the kinds of virtual communication at workplaces and interpret its significant impact on overall communication at workplace	Understanding level (C2)

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

Course Description

Course Code	20B12MA311	Semester Even	Semester VI Session 2022-23 Month from Jan 2023 - June 2023
Course Name	Applicational Aspects of Differential Equations		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr Richa Sharma	
	Teacher(s) (Alphabetically)	Dr Richa Sharma	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C302-2.1	solve ordinary differential equations in LCR and mass spring problems.		Applying Level (C3)
C302-2.2	explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems.		Applying Level (C3)
C302-2.3	apply matrix algebra to find the solution of system of linear differential equations.		Applying Level (C3)
C302-2.4	formulate and solve first and second order partial differential equations.		Applying Level (C3)
C302-2.5	evaluate solution of differential equations arising in engineering applications.		Evaluating Level (C5)
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 transform methods, applications of differential equations in mechanics.	14
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, 2004.
2.	Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, 3 rd Ed., Narosa Publishing House, 2012
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	18B12MA611	Semester Even	Semester VI Session 2022-23 Month from Jan - Jun 2023
Course Name	Operations Research		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Pato Kumari	
	Teacher(s) (Alphabetically)	Dr. Mohd. Sarfaraz, Dr. Amita Bhagat	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:			
C302-3.1	construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method.		Applying Level (C3)
C302-3.2	apply two-phase, Big-M and dual simplex method for linear programming problems.		Applying Level (C3)
C302-3.3	make use of sensitivity analysis to linear programming problems.		Applying Level (C3)
C302-3.4	solve transportation, assignment and travelling salesman problems.		Applying Level (C3)
C302-3.5	apply cutting plane and branch & bound techniques to integer programming problems.		Applying Level (C3)
C302-3.6	examine optimality conditions and solve multivariable nonlinear 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.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	20B16CS32 3	Semester Even (specify Odd/Even)	Semester VI Session 2022-2023 Month: Jan-June 2023
Subject Name	Problem Solving using C and C++ NBA Code: C305-9		
Faculty (Names)	Coordinator(s)	Dr. Sonal (Sec-62) & Dr. Neeraj Jain (Sec 128)	
	Teacher(s) (Alphabetically)	Dr. Neeraj Jain, Dr. Sonal	

COURSE OUTCOMES		COGNITIVE LEVELS
C305-9.1	Apply and use library functions, pointer arithmetic, arrays, and regular expressions and secure coding practices in programs.	Applying Level (C3)
C305-9.2	Use critical thinking skills and creativity to choose the appropriate containers, iterators and algorithms for a given problem.	Applying Level (C3)
C305-9.3	Demonstrate the use of concurrency principles, input and output streams and defensive techniques in programs.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	Assigned COs
1.	Review and practice problems on Functions in C/C++	Functions, Alt function syntax, Function return type deduction, static, const and inline functions, default parameters, overloaded functions- operator and members, friends, overriding functions.	CO1
2.	Practice problems on Arrays and Pointers and Indirections	Smart pointers, pointers and dynamic memory allocation, type inference, array and pointers and their arithmetic and indirections	CO1
3.	Secure Coding practices in C/C++	Common String, Integer and dynamic memory allocation Errors, Integer and dynamic memory allocation and String vulnerabilities their mitigation strategies.	CO1
4.	String Localization and Regular Expression	Localization and working with regular expression, Programming with Regex library	CO2
5.	Practice problems on Exception Handling and Assertions	Errors and Exceptions, Exception Mechanisms, Exceptions and Polymorphism, Stack unwinding and Cleanup, Common error handling issues	CO2
6.	Applications with Disk Files and other I/O	Using streams, Input and Output with Streams, String Streams, File Streams and Bidirectional	CO2

		I/O	
7.	Generic Programming with Templates	Class templates, Function templates, variable templates, Template parameters, Specialization of templates, template recursion, variadic templates, Meta-programming	CO3
8.	Working with Standard Template Library	Understanding and working with containers, container adapters and iterators, Lambda expressions, Function objects, STL algorithms, Customize and extend STL	CO3
9.	Programming using Dynamic Memory Allocation Model	Working with dynamic memory, array-pointer duality, low level memory operations, smart pointers and common memory pitfalls	CO3
10.	Problems on Concurrency in Programming	Introduction, Threads, Atomic operations library, Mutual Exclusion, Conditional variables	CO3
			14
Evaluation Criteria			
Components		Maximum Marks	
Mid Tern Evaluation		30	
End Semester Examination		40	
TA		30 (Attendance = 07, Quizzes = 08, Internal assessment = 07, Assignments in PBL mode = 08.)	
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:			
Text Books			
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			
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 2022 - 2023 Month from Jan 2023 to Jun 2023
Course Name	Non-linear Data Structures & Problem Solving		
Credits		Contact Hours	1- 0 - 2

Faculty (Names)	Coordinator(s)	Sarishty Gupta
	Teacher(s) (Alphabetically)	Deepika Varshney, Sarishty Gupta, Vivek Kumar Singh

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C305-10.1	Demonstrate operations on different data structures.	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	Identify the correctness and efficiency of the solution by constructing different test cases.	Apply Level (C3)
C305-10.4	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	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	Tournament tree, Decision tree, Cartesian tree	2

	on optimization 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 – 10, Quizes/Mini Project – 20)	
Total		100	

Project based Learning: Each student in a group of 3-4 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.
2.	Handbook of Data Structures and Applications, 2nd Edition by Sartaj Sahni, Dinesh P. Mehta, CRC Press
References	
3.	Data structures and Algorithms in C++, Michael T. Goodrich, R. Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
4.	Data structures, Algorithms and Applications in C++, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
5.	Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
6.	Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
7.	Problem solving with C++, The OOP, Fourth edition, W. Savitch, Pearson education

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B16CS326	Semester EVEN	Semester VI Session 2022 -2023 Month from JAN-JUN
Course Name	Front End Programming		
Credits		Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr. Amanpreet Kaur (J62), Dr. Shailesh Kumar(J128)
	Teacher(s) (Alphabetically)	Dr. Amanpreet Kaur, Dr. Bhawna Saxena, Dr. Lakshmi, Dr. Megha Rath, Dr. Niyati Aggrawal, Dr. Shailesh Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
C305-11.1	Demonstrate new technologies by applying foundation paradigms	Understanding [Level 2]
C305-11.2	Build strong foundations for basic front end tools & technologies thereby making them understand the application development lifecycle.	Apply [Level 3]
C305-11.3	Develop elegant and responsive Front-end by leveraging latest technologies	Apply [Level 3]
C305-11.4	Explain activity creation and Android UI designing	Understanding [Level 2]
C305-11.5	Develop an integrated mobile application to solve any complex real time problem	Create [Level 6]

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Object Oriented Programming Concepts	Objects, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism	1
2.	Introduction to basic front end techniques	HTML 5, CSS 3, Javascript, jquery, bootstrap	3
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 2022-23 (Jan to June)
Course Name	Cyber Security		
Credits	3	Contact Hours	3-0-0
NBA Code			

Faculty (Names)	Coordinator(s)	Dr. SAKSHI GUPTA
	Teacher(s) (Alphabetically)	Dr. SAKSHI GUPTA

COURSE OUTCOMES		COGNITIVE LEVELS
1	Understand the cyber world, overview of computer and web technologies in general and concepts of cyber-crimes.	Understand Level (C2)
2	Develop a deeper understanding and familiarity with various types of cyberattacks, cyber-crimes, vulnerabilities and remedies thereto.	Understand Level (C2)
3	Analyse and evaluate the security aspects of social media platforms and ethical aspects associated with use of social media.	Analyze Level (C4)
4	Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.	Analyze Level (C4)
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, Organisation dealing with cyber crime 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

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, Author 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, CathyO'Neil and RachelSchutt,O'Reilly (2014).
2.	Gibbons, J.D., Non-Parametric Statistical Inference, 2/e, MarckelDecker,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., & Grolemond, G. (2016). R for data science: import, tidy, transform, visualize, and model data."O'Reilly Media, Inc."

Detailed Syllabus

Course Description with CO

Course Code	20B16CS322	Semester Even	Semester VI Session 2022 -2023 Month from Jan to Jun
Course Name	Java Programming		
Credits	Audit	Contact Hours	[1- 0 - 2]

Faculty (Names)	Coordinator(s)	Mr. Janardan Kumar Verma , Shariq Murtuza
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C305-8.1	Write basic Java programs using Java constructs – loops, switch-case and arrays.	Understand Level (C2)
C305-8.2	Define all basic concepts related to OOP concepts	Remember Level (C1)
C305-8.3	Develop java programs using Java collection framework	Apply Level (C3)
C305-8.4	Create or design 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 = 07, Quizzes = 08, Internal assessment = 07, Assignments in PBL mode = 08.)	
Total		100	

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. (2014). <i>Java: the complete reference</i> . McGraw-Hill Education Group.
2.	Bloch, J. (2016). <i>Effective java</i> . Pearson Education India.
Referenc Books	
1.	Sierra, K., & Bates, B. (2005). <i>Head First Java: A Brain-Friendly Guide</i> . " O'Reilly Media, Inc."
2.	Mughal, K. A., & Rasmussen, R. W. (2003). <i>A programmer's guide to Java certification: a comprehensive primer</i> . Addison-Wesley Professional.