Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B11EC611	Even-Semester	Semester: 6th 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

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.m Students will be will 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, 4th Edition TMH
3.	A.S. Tanenbaum, Computer Networks, PHI
4.	John C. Bellamy, Digital Telephony, 3rd 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 anlaysis 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

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, 4th Edition TMH
4.	A.S. Tanenbaum, Computer Networks, PHI

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

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, 5th Edition, 2009.
2.	Normal S. Nise,, Control Systems Engineering, 7th Edition, John Wiley,2014
3.	K.Ogata, Modern Control Engineering, 5th Edition, Prentice Hall, 2010

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. Raghvenda Kumar Singh (JIIT 128) and Prof. Shweta Srivastava (JIIT 62)
	Teacher(s) (Alphabetically)	Mr. Raghvenda 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 measurent 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 (2nd Ed.), John Wiley, 1998.
2.	S.Y. Liao, Microwave Devices and Circuits (3rd 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.

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

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

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

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", 4th Edition, McGraw-Hill Higher Education, Indian Edition,2019.
2.	J. M. Rabaey, A. Chandrakasan, B. Nikolic, "Digital Integrated Circuits: A Design Perspective", 2nd Edition, Pearson Education Inc., 2016.
3.	Neil Weste and David Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th 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", 6th 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 VOH, VOL, VIH, VIL and Vth. To analyze the voltage transfer characteristics (VTC) of CMOS inverter and calculate VOH, VOL, VIH, VIL and Vth.	C374.3
4.	MOS ombinational 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," 4th edition, McGraw-Hill Higher Education, Indian Edition, 2019.
2.	J. M. Rabaey, A. Chandrakasan, and B. Nikolic, "Digital Integrated Circuits: A Design Perspective", 2nd Edition, Pearson Education Inc., 2016.
3.	N. H. E. Weste and D. M. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective," 4thEdition,Pearson Education India, 2015.

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.

Subject Code	23B12EC311	Semester (specify Odd/Even)	Semester: 6th 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 "*Electronic Devices and Circuits*", **McGraw** Hill Education PrivateLtd. 2018 2. BKumar, SB.Jain "*Electronic Devices and Circuits*"**, Prentice Hall India**. 2014
Reference Books	1. R L. Boylestad, Louis Nashelsky, "*Electronic Devices and Circuits*", Pearson; 11 edition, 2013 2. M. M.Mano and M. D. Ciletti., "*Digital Design*". Pearson Education,5th edition, 2013 3. D. Neamen, D. Biswas ,"*Semiconductor Physics and Devices"*, 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. Raghvenda 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**

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

<table>
<tr><td colspan="3" align="center">Evaluation Criteria</td></tr>
<tr><td align="center">Components</td><td align="center" colspan="2">Maximum Marks</td></tr>
<tr><td align="center">T1</td><td align="center" colspan="2">20</td></tr>
<tr><td align="center">T2</td><td align="center" colspan="2">20</td></tr>
<tr><td align="center">End Semester Examination</td><td align="center" colspan="2">35</td></tr>
<tr><td align="center">TA</td><td align="center" colspan="2">25 (Project, Presentation, Assignment)</td></tr>
<tr><td align="center">Total</td><td align="center" colspan="2">100</td></tr>
</table>

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

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 Evaluationand 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 JIIT, Noida. Students have to study the Recruitment and Selection process of the Company selected. The information can be collected with the help of an interview or some kind of questionnaire pertaining to the Recruitment and Selection process from seniors who have been placed in the given company.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Joshi, Campus to Corporate, Your Roadmap to Employability, Sage Publications India Pvt. Ltd., 2015
2.	Mathur, Mastering interviews and group discussions, CBS Publishers& Distributors Pvt. Ltd., New Delhi, 2018
3.	Mitra, Personality Development and soft skills, Oxford University Press, New Delhi, 2011

4.	Pareek and Purohit, Training Instruments in HRD and OD, Sage Publications India Pvt. Ltd., 2018
5.	Pande and Basak, Human Resource Management- Text and Cases, Pearson, 2012
6.	Dessler and Varkkey, Human Resource Management, Pearson, 2011

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

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 *Workplace Communication*, vol. 1, New York, Routledge, 2019.
5.	M. S. &. A. Aira, "Technology-Mediated Communication in the Workplace," in *Workplace Communication*, 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, 29th Impression, OxfordUniversity Press, New Delhi, 2009

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 MGNGEGA, 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 (73rd 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

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, 3rd Ed., John Wiley & Sons, 2004.
2.	**Jain, R.K. and Iyengar, S.R.K.,** Advanced Engineering Mathematics, 3rd Ed., Narosa Publishing House, 2012
3.	**Chandramouli, P.N.,** Continuum Mechanics, Yes Dee Publishing India, 2014.
4.	**Kreysizg, E.,** Advanced Engineering Mathematics, 10th Edition, John Wieley & Sons, Inc. 2013.

Course Code	23B12PH311	Semester: 6th		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 After completion of the course, students will be able to:		COGNITIVE LEVELS
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, Elsiever, ISBN-13: 978-0-8155-1132-8, ISBN-10: 0-8155-1132-9

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

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 emsembles	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, *Fundamentals of Statistical and Thermal Physics*, Waveland Pr Inc, 2008.
2.	Kerson Huang, *Statistical Mechanics*, Wiley, 2nd Ed., 1987.
3.	R K Pathria, Paul D. Beale, *Statistical Mechanics*, Academic Press, 3rd Ed., 2011.
4.	Daniel V. Schroeder, *An Introduction to Thermal Physics*, Addison-Wesley, 1st Ed., 1999
5.	L D Landau, *Statistical Physics, Part 1: Volume 5 (Course of Theoretical Physics)*, Butterworth-Heinemann, 3rd 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.

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 precision, 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 differen 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 β+γ 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.

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 Rathi, 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.

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, Auther Press, Edition 2010.
2.	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by sumit belapure and Nina Godbole, Wiley India pvt.Ltd.(First Edition, 2011)
3.	Security in the Digital Age Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform (Pearson, 13th 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, 2nd 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., & Grolemund, G. (2016). R for data science: import, tidy, transform, visualize, and model data."O'Reilly Media, Inc.".