



Integral University, Lucknow
Attributes &SDGs Common for all Branches/Disciplines

Course Code	Course Title	Attributes							SDGs No.
ES203	Disaster Management and Mitigation	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
						√			SDGs 3,11 & 17

B.Tech. (All Branches)

Effective from Session: 2025-26

Course Code	ES203	Title of the Course	Disaster Management and Mitigation	L	T	P	C
Year	II	Semester	III	3	0	0	3
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	1. Understand the various types of disasters and analyze their profiles in the Indian context. 2. Explain the causes and evaluate the impacts of different disasters through case studies of national and global events. 3. Apply risk reduction approaches in disaster management and analyze safety measures for mitigating industrial disasters. 4. Comprehend the fundamental concepts of the Disaster Management Cycle and implement appropriate risk reduction strategies. 5. Examine national disaster mitigation acts and policies, and assess the roles of key stakeholders such as the Army, Police, Community, Corporate sector, and Media in post-disaster management from both national and global perspectives.						
Course Outcomes							
CO1	Students will be able to learn types of disasters and its profile in India						
CO2	Students will be able to understand the causes and impacts of disasters on environment						
CO3	Students will be able to learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.						
CO4	To understand the concept of Disaster Management Cycle and its Risk Reduction						
CO5	Students will be able to learn the role of Acts, Policies, National and International Organizations in Disaster Management						
CO6	Students will be able to learn about Global Perspectives of Disasters						

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to disaster	Introduction to Disasters, Concepts, Definition and types (Natural and Man-made), Disaster profile of India.	6	CO1
2	Impact of Disaster	Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem., Case studies from Disasters, Large Hydro projects and its risks for Disasters.	8	CO2
3	Disaster Risk Reduction	Approaches to Disaster risk Reduction, Risk Assessments and Vulnerability Analysis Techniques, Safety issues in mitigating, Case studies, EHS	7	CO 3
4	Disaster Management	Disaster Management Cycle. Reconstruction and Rehabilitation. Early warning Systems Pre-Disaster Management, Post Disaster Management	6	CO4
5	Disaster Act and Policies	National Acts and policies for mitigating Disasters (Disaster Management Act 2005, NDRF, National Policy for Disaster Management 2009, Role of Army and Police Force in Disaster, Role of International/National Humanitarian aid/ Relief Organizations for Disaster management, Role of Community, Corporate, Media etc. for post Disaster Management.	9	CO5
6	Global Perspective (Natural and Manmade Disasters)	Case Studies of disasters induced by Human Activities and climate change such as earthquake, forest fire, flood, drought, landslides, Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.	9	CO 6

Reference Books:

- (1) Gupta Harsh K., Disaster Management, Hyderabad University Press, Publications-Meerut.
- (2) Sethi, V.K., Disaster Management, New Delhi Maxford Books
- (3) Bhattacharya, Tushar, Disaster Science and Management, New Delhi Tata Mc Graw Hill.
- (4) Nidhi Gauba, Dhawan/ Ambrina Sardar Khan, Disaster Management and Preparedness, CBS

e-Learning Source:

https://www.youtube.com/watch?v=9WIwlljva_s

https://www.youtube.com/watch?v=uA_OLKtQpYA

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	1	1	1	2	3	-	2	2	1	2	1	2	-	-	-	-
CO2	2	2	2	1	2	2	3	-	2	2	2	2	1	2	-	-	-	-
CO3	3	2	2	1	2	2	3	-	2	2	1	2	1	2	-	-	-	-
CO4	2	2	3	1	2	2	3	-	2	1	1	2	1	2	-	-	-	-
CO5	1	1	2	2	1	1	2	-	2	2	1	2	1	2	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Department of Electronics & Communication Engineering, Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	EC201	Title of the Course	Electronic Devices and Circuits	L	T	P	C
Year	II	Semester	III	3	0	2	4
Pre-Requisite		Co-requisite					
Course Objectives	- To understand the basic concepts of PN Junction Diode and analyze the transport phenomena of various current components in a Semiconductor device and also understand the behavior and characteristic features of special diodes like LED, Schottky, Laser, etc - To understand the concepts of Bipolar Junction Transistor and analyze the terminal behavior of the devices such as Junction Diode, BJT & MOSFET, also infer the region of operation with its equivalent circuit model. - To understand the concept of MOSFET and apply the same to understand the MOS characteristics and model various MOS based circuits. - To understand and develop analytical capability to analyze feedback in amplifiers and apply it to check the stability of feedback amplifiers. - To understand the concept of Oscillators and analyze the working of different oscillators. To study the concept of regulated power supply.						

Course Outcomes	
CO1	The learners shall recall the basic concepts of semiconductor physics and analyze the characteristics of PN Junction Diode and analyze the transport phenomena of various current components in a Semiconductor device and also understand the behavior and characteristic features of special diodes like LED, Schottky, Laser, etc..
CO2	The learners shall understand the concepts of Bipolar Junction Transistor and analyze the terminal behavior of the devices such as Junction Diode, BJT & MOSFET, also infer the region of operation with its equivalent circuit model.
CO3	The learners shall understand the concept of MOSFET and apply the same to understand the MOS characteristics and model various MOS based circuits
CO4	The learners shall understand and develop analytical capability to analyze feedback in amplifiers and apply it to check the stability of feedback amplifiers.
CO5	The learners shall understand the concept of Oscillators and analyze the working of different oscillators. The learners shall understand the concept of regulated power supply
CO6	Student shall be able to analyze and understand the characteristics of diodes and transistors and different analog circuits.
CO7	Student shall be able to design and demonstrate the functioning of operational amplifier, different oscillators and amplifiers, regulators etc.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Map ped CO
1	Diode	PN Junction Diode -application oriented diode characteristics, simple dc circuit applications, space charge and the diode capacitances, switching characteristics. Special purpose diodes Tunnel diode, Varactor Diode, Schottkey Diode, Light Emitting Diode, Laser Diode with their working principle and characteristics.	8	1
2	Bipolar Junction Transistor	Review of Configuration and characteristics of BJT, Early effect, Ebers Moll Model, biasing the BJT, Bias compensation, analysis of BJT amplifier, Darlington pair, cascode amplifier, bootstrapping circuits. Classification of Amplifiers, Coupling methods, Audio Amplifiers, Power amplifier.	8	2
3	MOSFET	Review of device structure, operation & V I characteristic. Ohmic and saturation region equations. Classification of MOS (NMOS, PMOS, CMOS, principle of working and comparison, biasing of MOS amplifier circuit,	8	3
4	Feed Back Amplifiers	Basic concept of feedback, General Characteristics of negative feedback amplifiers, Classification of feedback, Voltage/Current shunt and series feedback, stability of feedback amplifiers	8	4
5	Oscillators	Condition for oscillation, generalized form of oscillator circuit, The phase shift oscillator, Hartley & Colpitt's oscillator. The Wein Bridge oscillator, Crystal oscillator, frequency stability. Introduction to Regulated Power Supplies.	8	5
Practical				
S.no	Experiment No.	List of experiments	Contact Hrs.	Mapped CO

1	Experiment No. 1	To Study of clipper and clamper circuit.	2	CO6
2.	Experiment No. 2	To study different types of diodes .Plot the VI characteristics.	2	CO6
3	Experiment No. 3	Study of LED (Red /Green /Yellow) a. Measure minimum current for sufficient intensity of light b. What is the value of Threshold voltage	2	CO6
4	Experiment No. 4	Study of single stage RC coupled transistor amplifier. a. To measure the input signal this can be amplified by the amplifier without clipping in output at 1 KHz at no load.	2	CO6
5	Experiment No. 5	Study of Emitter follower circuit and determine maximum signal handling capacity at 1 KHz at no load Plot frequency response at no load.	2	CO6
6	Experiment No. 6	Study of Wein's Bridge oscillator, Determine the frequency of oscillation, Determine the value of unknown capacitance C_x .	2	CO7
7	Experiment No. 7	Application of operation amplifier as Inverting, Non- Inverting and unit gain amplifier (buffer)	2	CO7
8	Experiment No. 8	Application of an operational amplifier as a differentiator and integrator. Plot frequency response	2	CO7
9	Experiment No. 9	Study of MOSFET, plot V-I characteristics of N-MOS.	2	CO7
10	Experiment No. 10	To study a Zener regulator Circuit.	2	CO7

Text Books:

1. Integrated Electronics Analog Digital Circuits, Jacob Millman and D. Halkias, McGraw Hill.

2. Electronic Devices and Circuits Theory, Boylestad, Prentice Hall Publications.

Reference Books:

1. Shilling & Belove, Electronic Circuit, McGraw-Hill Education India.

2. Streetman, B.G. Banerjee Sanjay, Solid State Electronic Devices, PHI

3. Salivahanan, Kumar, Suresh & Vallavraj, Electronic Devices & Circuits, McGraw-Hill Education India.

4. Millman & Halkias, Integrated Electronics, McGraw-Hill Education India.

e-Learning Source:

1. You tube link: <https://www.youtube.com/watch?v=9FJJre>

2. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1		2					3	1	2		
CO2	3	2	2	1		2					3	3	3		
CO3	2	1	2			2					3	2	3	1	
CO4	2	1	2			2					3	3	3	1	
CO5	2	1	2			2					3	2	3	1	
CO6	3	3	2	2					2			3	3	2	1
CO7	3	3	2	2					2			3	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Department of Electronics & Communication Engineering, Integral University, Lucknow

Effective from Session: 2025-26

Course Code	EC251	Title of the Course	Robotics	L	T	P	C
Year	II	Semester	III	3	0	2	4
Course Objectives	To understand robot configuration, structures, basic components, workspace and generations of robots						

Course Outcomes	
CO1	To understand the basic concept of robotics and robot, its component along with its advantages and disadvantages
CO2	Students shall be able to understand the different types of Arduino microcontrollers and ESP32 devices to design electronic devices, including robotics and IoT projects
CO3	Students shall be able to identify and describe the anatomy and motion analysis of robotics system.
CO4	To provide a comprehensive understanding of the physical structure of robots, including their joints, links, and actuators, along with the mathematical analysis of their movement.
CO5	To equip students with a comprehensive understanding of how to integrate AI techniques into robotic systems and applications of ESP 32
CO6	Students shall be able to understand utility of Artificial Intelligence in Robotics, its importance and benefits in real life applications
CO7	Students shall be able to understand utility of Artificial Intelligence in Robotics, its importance and benefits in real life applications and its utility in the field of medical, household, agriculture, defense, and disaster management

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Robotics and Robot	What is robotics? & Robot? History, Laws of Robots, Types of robot, Components of robot, classification of robots, advantages and disadvantages of robot	08	CO1
2	Arduino Microcontroller & ESP32 Device	Arduino in robotics: Interfacing Arduino, Relays, Relay Configurations and uses, Motor-controller ICs (L293D dual 1-amp motor-controller IC), ESP32 Wi-Fi & Bluetooth SoC: ESP32 features and specifications, ESP32 functions	08	CO2
3	Sensors	Types of Robot Sensors: Light Sensors, Proximity & Distance Sensor: Infrared (IR) Transceivers, Ultrasonic Sensor, Environmental Sensors: Temperature & Pressure Sensors, Acceleration Sensor and Navigation/Positioning Sensors	08	CO3
4	Robot Anatomy and Motion Analysis	Anatomy of a Robot: Robot configurations: polar, cylindrical and jointed arm configurations. Robot links and joints: Degrees of freedom: types of movements, vertical, radial and rotational traverse, roll, pitch and yaw.	08	CO4
5	Artificial Intelligence in Robotics & Applications	Role of Robotics in Artificial Intelligence, Benefits of AI in Robotics, Applications of AI in Robotics, Real-Life Applications of AI-Powered Robots Industrial applications of robots, Medical, agriculture, defence, and disaster management.	08	CO5

Practical				
S. No.	Experiment No	List of experiments	Contact Hrs.	Mapped CO
1	Experiment 1	To Study and understand the microcontroller Arduino /ARM cortex.	4	CO6
2	Experiment 2	Interfacing the Arduino microcontroller with an LED blinking and changing different delay timing.	4	CO6
3	Experiment 3	Interfacing the microcontroller to control wireless connected LED via Wi-Fi using ESP 32	4	CO6
4	Experiment 4	Connecting and moving a servo motor to specific angle by analogue input for robot arm and gripper.	4	CO6
5	Experiment 5	Interfacing controlling stepper motor with controller (a) speed variation (b) changing direction for robot shoulder.	4	CO6
6	Experiment 6	Interfacing ultrasonic sensor to measure distance of an object for stopping a running robot.	4	CO7
7	Experiment 7	Interfacing IR sensor with controller to follow a black line over white surface for line following robot.	4	CO7
8	Experiment 8	Measuring ambient temperature and humidity by Arduino microcontroller by humidity temperature sensor.	4	CO7
9	Experiment 9	Measure the tilt angle of an object using accelerometer and Gyro scope	4	CO7

		and display the real time angle via Arduino used in self-balancing Robot.		
10	Experiment 10	To detect human motion using a PIR sensor and trigger an LED or buzzer via Arduino, which use this sensed data to a robot for appropriate action.	4	CO7

Text Books:

1. S. K. Saha, "Introduction to Robotics", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. J. J. Graig, "Introduction to Robotics – Mechanics and Control", 2nd edition, Pearson Education, Inc.
3. John-David Warren, Josh Adams, Harald Molle, Arduino Robotics, Apress

Reference Books:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G Odrey, Industrial Robotics Technology, Programming and Application, Tata –McGraw Hill Pub. Co., 2008
2. Deb.S.R and Sankha Deb, Robotics Technology and Flexible Automation", Tata McGraw Hill Publishing Company Limited, 2010.
3. Klafter.R.D, Chmielewski.T.A, and Noggin's., Robot Engineering: An Integrated Approach, Prentice Hall of India Pvt. Ltd., 1994
4. Fu.K.S, Gonzalez. R.C & Lee. C.S.G, Robotics control, sensing, vision and intelligence, Tata- McGraw Hill Pub. Co., 2008
5. Yu. Industrial Robotics, MIR Publishers Moscow, 1985

e-Learning Source:

1. <https://mrce.in/ebooks/Robotics-springer%20Handbook%20of%20Robotics%202nd%20Ed.pdf>
2. <https://www.botasys.com/post/robot-sensors>
3. <https://ecs-pw-facweb.ecs.csus.edu/~dahlquid/eee174/S2016/handouts/Labs/ArduinoLab/ArduinoInfo/Arduino%20Robotics.pdf>

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3					2					3	2			1
CO2	3	2			3	2					2		1		2
CO3	3		2		2	1					3	3			2
CO4	3	3	2		2	2			1		3	2	3	3	1
CO5	3	2	3	1		3			2		3	2	3	2	2
CO6	3	2	3	1		3			2		3	2	3	2	3
CO7	3	2	3	1		3			2		3	2	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD
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Department of Electronics & Communication Engineering, Integral University, Lucknow

Effective from Session: 2025-26

Course Code	EC203	Title of the Course	Network Analysis and Synthesis	L	3	T	0	P	2	C	4
Year	II	Semester	III								
Course Objectives	- To understand the concepts of signals and their applications. To provide a systematic approach for analysis of circuits and solution of electric circuits by differential equations and Laplace Transform. - To learn the analysis of electrical circuits by basic law's, AC theorems and Kirchhoff's law. - To understand the Transient and Frequency response of different combinations of basic elements like resistance, capacitance and inductance. - To understand the concept of Poles and Zeros, stability. To learn the synthesis of circuits. - To understand the analysis of two Port network by network parameters and their interconnections for two port networks. To develop skills in formulating and solving network equations using graph-theoretic methods and principles.										

Course Outcomes	
CO1	Given a circuit, students shall be able to represent signals in mathematical form, identify type of system, apply Kirchhoff's laws, and formulate differential equation for LTI system and solve using Laplace transform.
CO2	Given a circuit of passive elements with sources, student shall be able to analyze and evaluate the circuits using Kirchhoff's laws and AC-DC theorems
CO3	For a given circuit of R, L, C, student shall be able to generate its transient/ frequency response and examine, analyze and evaluate the circuit characteristics
CO4	For a given transfer function, students shall be able to identify its pole zeros and for stable circuits, select suitable design of implementation, develop series / parallel combination to synthesize the circuit.
CO5	Given a two-port network, student shall be able to define its parameters, solve, analyze, and modify its form. In graph theory students shall be able to Understand and explain the fundamental concepts of graph theory. Apply principles of graph theory to formulate, solve and Evaluate network equations of the given networks
CO6	Given a circuit, students shall be able to conduct experiments to analyze and evaluate the circuits using Kirchhoff's laws and understand, analyze the circuits by using the AC-DC different Theorems.
CO7	For a given circuit of R, L, C, student shall be able to generate experimentally and investigates, examine, analyze and evaluate the transient response characteristics. Given a two-port network, student shall be able to understand its parameters, solve, analyze, and modify its form as per requirement

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to continuous time signals and system, Basic continuous time signals: unit step, unit ramp, unit impulse and gate function and associated wave forms. Review of Laplace transforms, initial and final value theorems. Solution of differential equations using Laplace transforms.	08	CO1
2	Network Theorems	Kirchhoff's Law, Source transformation, Loop variable analysis, node variable analysis and duality. Network theorems: Superposition, Thevenin's Norton's, Millman, Tellegen's and Maximum Power transform theorems.	08	CO2
3	Transients in First and Second order RL, RC and RLC	Steady state sinusoidal analysis using phasors. Frequency domain analysis of RLC circuits, Transient Analysis for R-L, R-C and R-L-C Circuits.	08	CO3
4	Network Synthesis	Concept of Pole and Zeros and stability, Hurwitz Polynomials, positive real functions. Foster Forms and Cauer Forms.	08	CO4
5	Two Port Network & Graph Theory	Two port parameters, Inter-Conversion of two port Parameters, Interconnections of Two port networks, Reciprocity and Symmetry. Definitions: Branch, Graphs, Tree, Co- tree, Path and Loop, Concept of Planner and non-planner network, Incidence, Cut-set, Tie-set matrices for planer network.	08	CO5

Practical				
S. No.	Name of shop	List of experiments	Contact Hrs.	Mapped CO
1	Experiment 1	To Verify Thevenin's Theorem.	2	CO6
2	Experiment 2	To Verify Norton's Theorem.	2	CO6
3	Experiment 3	To Verify the Maximum Transfer Theorem.	2	CO6

4	Experiment 4	Obtain the transient response of RC circuit.	2	CO6
5	Experiment 5	Obtain the frequency response of series RLC circuit.	2	CO6
6	Experiment 6	To determine the z-parameters of two port resistive network.	2	CO7
7	Experiment 7	Obtain the transient response of RL circuit.	2	CO7
8	Experiment 8	ABCD-Parameter of Two Port Resistive Network	2	CO7
9	Experiment 9	Transient Response of Series RLC Circuit	2	CO7
10	Experiment 10	h- Parameter of Two Port Resistive Network	2	CO7

Text Books:

1. Networks and Systems, Ashfaq Husain, Khanna Books Publishing Co. (P) Ltd. New Delhi
2. Network Analysis & Synthesis, C.L. Wadhwa, New Age International Publishers.
3. Networks and Systems, D. Roy Chowdhury, New Age International Publishers.

Reference Books:

1. Introductory Circuit Analysis, Robert Boylestad, Pearson Education, Pearson Education, Prentice Hall.
2. Circuit Analysis Principles and Applications, Allan H. Robbins and Wilhelm C. Miller, Cengage Learning India Private Limited

e-Learning Source:

1. https://onlinecourses.nptel.ac.in/noc22_ee07/preview
2. <https://www.udemy.com/instructor/course/4827352/manage/promotions/>
3. <https://www.youtube.com/@s.h.tutorials>
4. <https://ekeeda.com/degree-courses/electronics-engineering/electrical-network-analysis-and-synthesis>

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	2	1			1	3	3	3	3	2	1
CO2	3	3	1	1	2	2			2	3	3	3	3	3	1
CO3	3	3	1	1	2	2			2	3	3	3	3	2	1
CO4	3	3	1	1	2	2			2	3	3	3	3	3	1
CO5	3	3	2	1	2	2			1			3	3	2	1
CO6	3	3	3	3		1			1			2	2	2	2
CO7	3	3	3	3		1			1			3	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Department of Electronics & Communication Engineering, Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	EC253	Title of the Course	Data Structure with Python	L	T	P	C
Year	II	Semester	III	3	0	2	4
Course Objectives	- Implement Object Oriented Programming concepts in Python. - Understand Lists, Dictionaries and Regular expressions in Python. - Understanding how searching and sorting is performed in Python. - Understanding how linear and non-linear data structures works. - To learn the fundamentals of writing Python scripts						

Course Outcomes	
CO1	Implement Object Oriented Programming concepts in Python.
CO2	Understand Lists, Dictionaries and Regular expressions in Python.
CO3	Understanding how searching and sorting is performed in Python.
CO4	Understanding how linear and non-linear data structures works.
CO5	To learn the fundamentals of writing Python scripts
CO6	To write and execute programs in python to solve problems using data structures such as trees, graphs, hash tables and search trees.
CO7	To write and execute write programs in python to implement various sorting and searching methods.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Oops Concepts & Inheritance	Class, object, constructors, types of variables, types of methods. Single, multiple, multi-level, hierarchical, hybrid, Polymorphism: with functions and objects, with class methods, with inheritance, Abstract classes	08	CO1
2	Python Specific Data Structures	Definition, Linear Data Structures, Non-Linear Data Structures List, Tuples, Set, Dictionaries, Comprehensions and its Types, Strings, slicing.	08	CO2
3	Array	Overview, Types of Arrays, Operations on Arrays, Arrays vs List. Searching - Linear Search and Binary Search. Sorting - Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort	08	CO3
4	Linked List, Stacks and Queues	Implementation of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists. Overview of Stack, Implementation of Stack (List & Linked list), Applications of Stack Overview of Queue, Implementation of Queue (List & Linked list), Applications of Queues, Priority Queues	08	CO4
5	Graph & Trees	Introduction, Directed vs Undirected Graphs, Weighted vs Unweighted Graphs, Representations, Breadth First Search, Depth First Search. Overview of Trees, Tree Terminology, Binary Trees: Introduction, Implementation, Applications. Tree Traversals, Binary Search Trees: Introduction, Implementation, AVL Trees: Introduction, Rotations, Implementation.	08	CO5

Practical				
S. No.	Experiment No.	List of experiments	Contact Hrs.	Mappe d CO
1	Experiment No. 1	Write a program that uses functions to perform the following operations on singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal.	2	CO6
2	Experiment No. 2	Write a program that uses functions to perform the following operations on doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal	2	CO6
3	Experiment No. 3	Write a program that uses functions to perform the following operations on circular linked List i) Creation ii) Insertion iii) Deletion iv) Traversal.	2	CO6
4	Experiment No. 4	Write a program that implement stack (its operations) using i) Arrays ii) Linked list (Pointers)	2	CO6
5	Experiment No. 5	Write a program that implement Queue (its operations) using i) Arrays ii) Linked list (Pointers).	2	CO7

6	Experiment No. 6	Write a program that uses both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers: a) Linear search b) Binary search.	2	CO7
7	Experiment No. 7	Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort	2	CO7
8	Experiment No. 8	Write a program that implements the following i) Insertion sort ii) Merge sort iii) Heap sort.	2	CO7
9	Experiment No. 9	Write a program to implement all the functions of a dictionary (ADT) using Linked List	2	CO7
10	Experiment No. 10	Write a program to perform the following operations: a) Insert an element into a binary search tree. b) Delete an element from a binary search tree. c) Search for a key element in a binary search tree	2	CO7

Text Books:

1. Data structures and algorithms in python by Michael T. Goodrich
2. Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi

Reference Books:

1. Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
2. Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
3. Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
4. Core Python Programming -Second Edition, R. Nageswara Rao, Dreamtech Press

e-Learning Sources:

https://onlinecourses.nptel.ac.in/noc22_cs26/preview

https://onlinecourses.nptel.ac.in/noc24_cs57/preview

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	2	1					1	3	3	3	2
CO2	3	3	1	1	2	1					1	3	3	3	2
CO3	3	3	1	1	2	1		2				3	3	3	2
CO4	3	3	1	1	2			2				3	3	3	2
CO5	3	3	2	1	2			2				3	3	3	2
CO6	3	3	2	2	2	1		2				3	3	2	1
CO7	3	3	2	2	2	1		2				3	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD
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Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS203	Title of the Course	Cyber Law and Information Security	L	T	P	C
Year	II	Semester	III	3	0	0	3
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	● Knowledge about cyber law, intellectual property and cybercrimes (internet security threats), trademarks and domain theft. ● Knowledge on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents. ● Knowledge about Information System and principles of Information Security (as confidentiality, integrity, and availability). ● Knowledge of cryptography and techniques used to detect and prevent network intrusions.						

Course Outcomes	
CO1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes (internet security threats), trademarks and domain theft.
CO2	Apply and analyze knowledge of technology, E-business, and law to minimize the occurrence and impact of information security incidents.
CO3	Understand and evaluate the principles of Information Security, including confidentiality, integrity, and availability, in relation to information systems.
CO4	Understand and apply cryptographic techniques and methods to detect and prevent network intrusions, ensuring secure data transmission.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamentals of Cyber Law	Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, CopyRight, Trademark law, Law related to semiconductor layout & design.	8	CO1
2	E - Commerce	Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, EGovernance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E- Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, and Requirements of Digital Signature System.	8	CO2
3	Investigation and Ethics	Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking. Internet security threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Finger prints, Cyber crime forensic: CASE STUDY in Cyber Crime.	8	CO3
4	Information Security	Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.	8	CO4

Reference Books:

Harish Chander "Cyber Law and IT Protection", PHI Publication, New Delhi

Merkov, Breithaupt, "Information Security", Pearson Education

"Cyber Law in India" - Farooq Ahmad-Pioneer books.

K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh Publication, Delhi

e-Learning Source:

<https://nptel.ac.in/courses/106106248>

https://onlinecourses.swayam2.ac.in/cec24_cs14/preview

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO														
CO1	1	2	1	2	1	3	1	1		1	1	2		2
CO2	3	1	2		2			2	2		2		2	
CO3	2	2		1	1	1	3	2	1	1	1	2	1	3
CO4	1		2		2			1					3	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation



Department of Electronics & Communication Engineering, Integral University, Lucknow

Effective from Session: 2025-26

Course Code	EC254	Title of the Course	Principles of Management & Entrepreneurship	L	T	P	C
Year	II	Semester	III	3	0	0	3
Course Objectives	To develop foundational management and entrepreneurship skills for real-world business applications.						

Course Outcomes	
CO1	Understand the principles, functions, and role of management in organizations.
CO2	Apply management skills such as planning, organizing, and leadership in projects.
CO3	Understand the fundamentals of entrepreneurship and its contribution to economic development.
CO4	Analyze the startup ecosystem, business plans, and government support systems.
CO5	Develop entrepreneurial attitude, innovation skills, and ethical values in business practices.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Management	Management Concepts, Levels, Functions of Management, Role of Manager, Management as art or science, art or profession, Modern management approaches, Decision Making, communication and motivation.	08	CO1
2	Functions of Management	Planning, Organizing, Staffing, Directing, Controlling – Concepts and Techniques,	08	CO2
3	Introduction to Entrepreneurship	Concept, Types of Entrepreneurs, Role of Entrepreneur in Economic Development, Traits of Entrepreneur, Stages in entrepreneurial process.	08	CO3
4	Startup Ecosystem	Business Plan, Idea Generation, Bootstrapping, Angel Investors, Venture Capital, Entrepreneurship in India- Government Policies, Financial Assistance, Incubators, SEZs.	08	CO4
5	Innovation & Ethics in Business	Opportunity Identification, Market Analysis & Customer Research, Creativity, Innovation, Ethical Management, IP Protection (Patents, Trademarks, Copyright), Social Responsibility in Entrepreneurship	08	CO5

Text Books:

1. Koontz and Weihrich, "Essentials of Management", Tata McGraw Hill.
2. Vasant Desai, "Entrepreneurship Development and Management", Himalaya Publishing House.

Reference Books:

1. Peter F. Drucker, "Innovation and Entrepreneurship" Harper Business.

e-Learning Source:

1. https://www.nios.ac.in/media/documents/249_Enterpreneurship/English_pdf/249_Enterpreneurship_Lesson_1.pdf
2. <https://egyankosh.ac.in/handle/123456789/79259>
3. https://onlinecourses.swayam2.ac.in/nou21_mg02/preview

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	3	3	2	3	2	3	2	2	1	2	3
CO2	1	2	1	2	2	2	3	3	2	3	3	1	2	3	3
CO3	1	1	2	1	3	2	3	3	2	3	3	1	1	3	3
CO4	1	2	1	2	3	2	3	3	1	3	3	1	2	2	3
CO5	1	2	1	2	3	2	3	3	1	3	3	1	1	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD
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