



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



4th Semester Syllabus for B.Tech ECE Batch-2024

Index:

Content	Page No.
Analog and Digital Communication	2
Digital Electronics	8
Introduction to Artificial Intelligence and Machine Learning	14
Sustainability & Environmental Science	20
Mathematics-IV	28
Object Oriented Programming with Java	33
Essential Studies for Professionals – IV	45
Skill Development for Professionals – IV	55
Analog & Digital Communication Laboratory	64
Artificial Intelligence and Machine Learning Laboratory	68
Digital Electronic Laboratory	77

Syllabus Structure:

Sl. No.	Type	Subject Code	Subject Name	L	T	P	Total	Credit
1.	CC	PCCEC401	Analog & Digital Communication	3	0	0	3	3
2.	CC	PCCEC402	Digital Electronics	3	0	0	3	3
3.	CC	PCCEC403	Introduction to Artificial Intelligence and Machine Learning	3	0	0	3	3
4.	MC	MCC471	Sustainability & Environmental Science	2	0	0	2	2
5.	BSC	BSM401	Mathematics - IV	3	0	0	3	3
6.	GSC	ESP401	Essential Studies for Professionals - IV	2	0	0	2	0.5
7.	CC	PCCEC491	Analog & Digital Communication Laboratory	0	0	2	2	1
8.	CC	PCCEC492	Digital Electronic Laboratory	0	0	2	2	1
9.	CC	PCCEC493	Artificial Intelligence and Machine Learning Laboratory	0	0	2	2	2
10.	OEC	OEC481	Object Oriented Programming using JAVA	1	0	2	3	2
11.	GSC	SDP482	Skill Development for Professionals - IV	0	0	2	2	0.5
12.	ECP	PRJEC481	Mini Project	-	-	-	1	1
13.	Mandatory Course	MAR481	Mandatory Additional Requirement (MAR)	0	0	0	0	0
14.	IFC	IFC	Industry and Foreign Certification	0	0	0	0	0
15.		MOOCS						
Total Credit Points =								22



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Subject Name: Analog and Digital Communication
Subject Code: PCCEC401
Credit: 3
Lecture Hours: 36

Pre-requisite: Signals and Systems, Mathematics.

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

COURSE OBJECTIVES:

1. To learn about Analog Modulation
2. To learn about Digital Modulation
3. To learn impact of Noise in communication
4. To learn about Digital Data Transmission
5. To learn about Superheterodyne Receiver

COURSE OUTCOMES:

CO 1: Analyze and compare different analog modulation schemes for their efficiency and bandwidth.

CO 2: Understand the behavior of a communication system at receiver in presence of noise.

CO 3: Investigate pulsed modulation system, baseband transmission and analyze their system performance.

CO 4: Analyze different digital modulation schemes and can compute the bit error performance trade off issues, equalization, carrier recovery

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Analog modulation	Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB, Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.	International Academia: (https://web.stanford.edu/class/ee179/) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: MATLAB/ Simulink applications designs and real time implementation.	6	1. Design, Simulation and implementation of amplitude modulation and demodulation using MATLAB. 2. Design, Simulation and implementation of frequency modulation and demodulation using MATLAB. 3. Measurement of Modulation Index of An Amplitude Modulated Signal using Transistor/ IC 1496. 4. Study of Modulation and Demodulation of Single Side Band Suppressed Carrier (SSB-SC) using IC 1496.

			Hardware: IC-1496, IC-8038.		5. Study of Modulation and Demodulation of Frequency Modulation using IC-8038.
2	Noise	Noise Introduction, Sources of Noise, Classification of Noise, Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.	International Standards: (https://web.stanford.edu/class/ee179/) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: MATLAB/ Simulink applications designs and real time implementation. Hardware: IC	5	1. Study of SNR calculation using MATLAB. 2. SNR measurement for audio frequency using IC.
3	Waveform Coding Techniques	Pulse modulation, Sampling process, Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation, Delta modulation, Noise	International Standards: (https://web.stanford.edu/class/ee179/)	6	1. Design, Simulation and implementation of PCM. 2. Design, Simulation and implementation of DPCM. 3. Design, Simulation and implementation of DM.

		considerations in PCM, Time Division multiplexing, Digital Multiplexers.	AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: MATLAB/Simulink applications designs and real time implementation. Hardware: Transistor and IC.		- Design, Simulation and implementation of ADM. - Study of Modulation and Demodulation of Pulse Amplitude Modulation (PAM) using Transistor. - Study of Pulse code Modulation using IC. - Study of Delta Modulation using IC.
4	Digital Modulation Techniques	Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying	International Standards: https://web.stanford.edu/class/ee179/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf	6	- Study of Modulation and Demodulation of Amplitude Shift Keying (ASK) using MATLAB. - Study of Modulation and Demodulation of Phase Shift Keying (PSK) using MATLAB. - Study of Modulation and Demodulation of Frequency Shift Keying (FSK) using MATLAB. - Study of Modulation and Demodulation of Amplitude Shift Keying (ASK) using Transistor.

			Industry Mapping: MATLAB/Simulink applications designs and real time implementation. Hardware: Transistor, IC-8038		5. Study of Modulation and Demodulation of Phase Shift Keying (PSK) using IC. 6. Study of Modulation and Demodulation of Frequency Shift Keying (FSK) using IC-8038.
5	Concepts of Information Rate and Channel Capacity	Information Measures: Discrete Source models – Memoryless and Stationary, Mutual Information, Self-Information, Conditional Information, Average Mutual Information, Entropy, Entropy of the block, Conditional Entropy, Information Measures for Analog Sources.	International Standards: (https://web.stanford.edu/class/ee179/) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: MATLAB/ Simulink applications designs and real time implementation.	5	1. Study of Entropy calculation using MATLAB.

6	Radio Transmitters and Radio Receivers	Overview of Radio Transmitter and Radio Receivers. Super heterodyne receivers: Super heterodyning principle, Intermediate frequency, Local oscillator frequency, Image frequency. Overview of Amplifier, Mixer, Local Oscillator, LNA, Filter.	International Standards: (https://web.stanford.edu/class/ee179/) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: Hardware: IC.	8	1. Detailed study of intermediate frequency, radio frequency and audio frequency response of super-heterodyne receiver using Trainer Kit. 2. Frequency Division Multiplexing and Demultiplexing Through Optical Fiber Cable. 3. Analog Communication through Optical Fiber Cable. 4. Study of Satellite Communication.
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TEXT BOOK:

1. [B.P.Lathi, Zhi Ding “Modern Digital and Analog Communication”, Oxford.](#)

REFERENCE BOOKS:

2. Principles of Communication Systems: Taub and Schilling, 2nd ed., Mc-Graw
3. Hill Haykin S., "Communications Systems", John Wiley and Sons, 2001
4. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002



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Subject Name: Digital Electronics

Subject Code: PCCEC402

Credit: 3

Lecture Hours: 36

Pre-requisite: Mathematics, Basic Electronics

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

[Infosys Springboard](#)

COURSE OBJECTIVES:

1. To introduce basic postulates of Boolean algebra and to introduce the methods for simplifying Boolean expressions.
2. To study formal procedures for the analysis and design of combinational and sequential circuits.
3. To introduce the concept of logic families, semiconductor memories and implementation of digital circuits using programmable logic devices.

4. To illustrate the concept of synchronous and asynchronous sequential circuits.

COURSE OUTCOMES:

CO 1: Students will have a thorough knowledge of number system and different codes and also they will be able to apply those knowledge while required.

CO 2: After completing this course, the students will be able to design and analyze combinational logic circuits.

CO 3: Students will acquire a knowledge about sequential circuits and solid states memory devices.

CO 4: They will be able to design ADC and DAC and also they will acquire knowledge on logic families.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Number System and Logic Families	Introduction to number systems, Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, gray codes and their conversions, thermometric codes, Signed binary number representation with 1's and 2's complement methods ,basic logic functions Standard forms of logic expressions, and simplification of logic expressions using K Map. Review of TTL and CMOS families, their operations and specifications. Overview of Verilog	International Academia: (https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: SPICE software, Verilog	5	1. Simulation of MOS Inverter with different loads using SPICE software. 2. Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in SPICE software. 3. Introduction to programming using Verilog
2	Introduction to Boolean Algebra and K-map	Basic Definitions and Axiomatic Definition of Boolean Algebra, Boolean Functions, Canonical and Standard Forms. The Map Method - K-map, Product of Sums and Sum of Products Simplification, NAND and NOR Implementation.	International Standards :(https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html)	5	1. Design of BCD-Excess 3 code and vice-versa using basic gates (IC 7408, 7432,7404) 2. Design of basic digital circuits using Tinkercad.

			AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipsets (IC 7408, 7432, 7404), Software-TinkerCad		
3	Designing Combinational Logic Circuits:	Arithmetic circuits (ADDER and SUBTRACTOR), multiplier, comparators, decoders, encoders, multiplexers, demultiplexers, parity generator and checker and their use in logic synthesis; Potential hazards in combinational circuits.	International Standards : https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipset (IC 7408, 7432, 7404, 74153, 74155, 74180) Software: LogiSim and VHDL	6	1. Design of Adder and Subtractor using basic gates (IC 7408, 7432, 7404) and use of IC 74LS83 as BCD adder. 2. Design of MUX and DEMUX using basic gates (IC 74153, 74155) and also study the available ICS of MUX and DEMUX. Implement logic functions using these ICs. 3. Design and implementation of 16-bit odd/even parity checker/generator using IC

					74180. 4. Implementation of combinational circuits using LogiSim and VHDL
4	Designing Sequential Logic Circuits:	Basic memory element-S-R, J-K, D and T Flip Flops, various types of Registers and counters and their design, Design of Synchronous Sequential Circuits- State Table and State Diagrams, Design of Mealy and Moore FSM - Sequence Detection.	International Standards: (https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: Hardware Chipset (IC 7476, 7474) Software: LogiSim and VHDL	6	1. Design of R-S, J-K, D and T Flip flops using universal gates and also study master slave J-K flip flop IC 7476. 2. Design of synchronous and asynchronous counter using Flip Flop IC 7476. 3. Design of 4-bit shift register (shift right) IC 7476/7474. 4. Implementation of sequential circuits using Logisim and VHDL

5	Introduction to Digital Logic Devices:	Introduction of ROM and RAM, PLA, PAL and FPGA. IC iCE40 FPGA family	AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipset (IC 7408, 7432,7404), FPGA Kit https://www.latticesemi.com/~media/LatticeSemi/Documents/DataSheets/iCE/iCE40LPHXFamilyDataSheet.pdf	4	1. Design of PLA and PAL using basic logic gates (IC 7408, 7432,7404) 2. Design and testing of half/full adder and multiplexer by burning FPGA Kit.
6	Analog and Digital Data Conversions:	D/A converter -specifications - weighted resistor type, R-2R Ladder type. A/D Converters specifications - Flash type- Successive Approximation type, Pipeline ADC AFEx8201 16-Bit and 14-Bit Digital-to-Analog Converters (DACs) With Voltage Reference and Diagnostic ADC for Low-Power Applications	AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipset AFEx8201 ADC AD570, DAC 0808 Software TinkerCad	4	1. Design of ADC and DAC using IC ADC AD570, DAC 0808 2. Design of ADC and DAC using TinkerCad

			(https://www.ti.com/lit/ds/symlink/afe88201.pdf ?ts=1700473002665&ref_url=https%253A%252F%252Fwww.ti.com%252Fdata-converters%252Fintegrated-special-function%252Fprecision-adcs-and-dacs%252Fproducts.html)		
7	Modeling of Logic Circuits:	Ports and Modules, Levels of Abstraction, Gate Level Modelling, Operators, Data Flow Modelling, Behavioral level Modelling, Testbench, Modelling of Combinational and Sequential Logic Circuits using Verilog HDL.	International Standards : (https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html) Industry Mapping: Software Verilog, VHDL	6	1. Implementation of combinational and sequential circuits using VHDL

TEXT BOOK:

1. [Digital Circuit & Design, Salivahan, VIKAS Publication](#)

REFERENCE BOOKS:

1. Digital Design, M. Morris. Mano & Michael D. Ciletti, PEARSON Publication
2. Fundamentals of Digital Circuits; Anand Kumar; PHI Publication
3. Digital Electronics; Tokheim; TMH Publication



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Subject Name: Introduction to Artificial Intelligence & Machine Learning

Subject Code: PCCEC403

Credit: 3

Lecture Hours: 48

Pre-requisites: Mathematics (Linear Algebra, Probability and Statistics, Multivariate Calculus), Data Structures and Algorithms

Relevant Links:

[Study Materials](#)

[NPTEL](#)

[Coursera](#)

[LinkedIn Learning](#)

Course Objective: After completion of this course, the students would be able to:

Obj 1: Understand the basics concepts of Artificial Intelligence and Machine Learning

Obj 2: Apply different AI and ML models to various datasets

Course Outcomes:

CO1: Understand core concepts and applications of Artificial Intelligence

CO2: Understand and be able to implement various supervised, unsupervised and reinforcement learning algorithms

CO3: Explore various tools associated with Artificial Intelligence and Machine Learning Tasks

CO4: Develop industry-standard projects using modern Machine Learning pipelines

Module number	Topic	Sub-topics	Mapping with Industry And International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Artificial Intelligence	Introduction to Artificial Intelligence and its applications – What is AI, Foundations and History of AI, State of the Art, Risks and Benefits of AI, Advice for a career in AI, Hotbeds of AI Innovation. Intelligent Agents: Agents and Environments, Good Behaviour: The concept of rationality, The nature of environments, the structure of agents;	International Academia: https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf IndustryMapping: AI using Python	4	Basic Practice programs using Python and libraries (Numpy, Matplotlib, Pandas, etc.)
Textbooks: (1) Russell and Norvig (4th ed): Ch.1 & 2 (2) David L. Poole and Alan K. Mackworth (3rd ed): Ch. 1 & 2 (3) Amit Konar: Ch. 1					

2	Problem solving techniques	<u>Solving Problems by Searching:</u> <u>Uninformed Search:</u> State Space Search, BFS, DFS, Bidirectional Search, Iterative Deepening, <u>Informed (Heuristic) Search Strategies:</u> Greedy Best First Search, A* Search, Heuristic Functions, <u>Search in Complex Environments:</u> Hill-Climbing Search, Simulated Annealing, Constraint Satisfaction Problem, Means-Ends Analysis <u>Adversarial Search and Games:</u> Game Theory, Optimal Decision in Games: Min- Max Search, Alpha-Beta Pruning, Heuristic Alpha-Beta Search Tree, Monte-Carlo Tree Search <u>Knowledge Representation:</u> Propositional Logic, Predicate Logic	<i>AICTE-prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/UG_Emerging.pdf <i>International Academia:</i> https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-1-introduction-and-scope/ <i>Industry Mapping:</i> Python	8	1. Python programming, symbolic algebra, Water Jug Problem 2. Perform BFS and DFS analysis on Facebook SN Dataset 3. Implementation of A* search 4. N-Queens Problem
<u>TEXTBOOKS:</u> (1) Russell and Norvig (4th ed): Ch. 3, 4, 5, 6, 7, 8 (2) David L. Poole and Alan K. Mackworth (3rd ed): Ch. 3, 4, 5, 15.3 (3) Amit Konar: Ch. 4, 5					
3	Introduction to Machine Learning	Machine Learning Definition & Scope – Evolution of Learning Systems Data Representation – Features, Covariance, Orthogonality, Feature Selection vs Feature Extraction overview, Missing Data, Outliers, Noise, Normalization, Standardization, Training Validation and Testing. Model Selection- Holdout, Cross-validation, k-fold Cross-validation, random sampling, Bias-Variance tradeoff, overfitting, underfitting. Machine Learning Types – Supervised, Unsupervised, Reinforcement, Adversarial	<i>International Academia:</i> https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/syllabus/ <i>AICTE-prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf <i>Industry Mapping:</i> Python, Weka Toolkit	10	1) Introduction to Weka Toolkit. Load and Interpret Data with Weka in the ARFF format or CSV format using Python. 2) Distinguish between normalization and standardization of data sets. 3) Implement an algorithm in Python to handle missing data. 4) Data visualization using- Histogram Plot, Scatter Plot, etc.
<u>TEXTBOOKS:</u> (1) Aurelien Geron (3rd ed): Ch. 1, 2, 3, 4, 9 (2) Ethem Alpaydin (3rd ed): Ch. 1, 2 (3) Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: Ch. 1, 2, 3					

4	Supervised Learning	Regression–Linear regression, Polynomial Regression, regularization. Classification – Logistic Regression, Decision Trees, K-Nearest Neighbors (KNN), Support Vector Machines.(SVM), Ensemble Learning – Bagging and Boosting, Random Forest Probabilistic Reasoning under Uncertainty: Probability, conditional probability, Bayes Rule, Bayesian Classifier, Parametric and Non-parametric estimation of probability densities (Maximum Likelihood Estimate, Bayesian Estimation), Naïve Bayes Classifier, Baye’s Rule and its Use, Naïve Bayes Models, Bayesian Networks- representation, construction and inference Performance Metrics–Confusion Matrix, Precision, Recall,F- Measure, SSE, MME, R2, Kappa, ROC- Curve & AUC, Cross-Entropy Loss	International Academia: https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/syllabus/https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf IndustryMapping: Python and Weka Toolkit, Sci-kit Learning and Matplotlib Visualization	8	1) Using Weka and Python compare the performance of Decision Trees, Random Forest, Naïve Bayes and K-Nearest Neighbor algorithms 2) Using LibSVM implement support vector machines and compare the different kernel functions. 3) Implement K Nearest Neighbor Algorithm 4) Implement a perceptron using python and develop the perceptron training rule.
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TEXTBOOKS:

For the sub-modules: Regression, Classification, Performance Metrics:

- (1) Aurelien Geron (3rd ed): Ch. 4, 5, 6, 7, 9
- (2) Ethem Alpaydin (3rd ed): Ch. 2, 5, 8, 13, 3, 4, 19.7
- (3) Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: Ch. 3, 4, 7, 9

For the sub-module: Probabilistic Reasoning under Uncertainty:

- (1) Tom Mitchell: Ch.6;
- (2) Russell and Norvig (4th ed): Ch. 12;

5	Unsupervised Learning	Dimensionality Reduction: Eigen Value Decomposition, Principal Component Analysis, Linear Discriminant Analysis, Singular Value Decomposition Clustering: Gaussian Mixture Models, Expectation Maximization, K-Means Algorithms, DBSCAN, Hierarchical Clustering (AGNES) Metrics: Similarity Measures, silhouette coefficient, Cluster Linkage Metrics, Cluster Validity Indices.	International Academia: https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Weka Toolkit, Sci-kit Learning and Matplotlib Visualization	6	1) Use Weka and Python to implement various feature extraction techniques 2) Visualize data clusters using t-SNE visualization and silhouette coefficient 3) Implement K-Means Clustering 4) Find the correct value of K in K Means Clustering using Cluster Validity Indices.
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TEXTBOOKS:

- (1) Aurelien Geron (3rd ed): Ch. 8, 9
- (2) Ethem Alpaydin (3rd ed): Ch. 6, 7

(3) Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: Ch. 10

6	Reinforcement Learning	Probabilistic Reasoning over Time: Time and Uncertainty, Inference in Temporal Models, Hidden Markov Models and Kalman Filters; Markov Chain Monte Carlo, Markov Decision Process (MDP) and Dynamic Programming, temporal model, MDP formulation, utility theory, utility functions, value iteration, Hidden Markov Model (HMM), policy iteration and partially observable MDPs. Definition and Key Concepts: Agent, Environment, Reward, Policy, Value Function, Agentic AI (without RL) Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning. Applications and Social Impact of Reinforcement Learning – Data-Driven Model-less Optimal Control Engineering, in game playing, robot-control, driverless cars, self-guided drones, etc. Agentic AI with use of RL	International Academia: https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/syllabus/https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/pages/syllabus/AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Open AI Gymnasium	12	Project 3: Use the OpenAI Gymnasium to train a Reinforcement Learning Bot.
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TEXT-BOOKS:

- (1) Russell and Norvig (4th ed): Ch. 14, 16, 22
- (2) Poole and Mackworth (3rd ed): Ch. 9, 12, 13
- (3) Ethem Alpaydin (3rd ed): Ch. 15, 18
- (4) Tom Mitchell: Ch.13

REFERENCE BOOKS:

- (5) Aurelien Geron (3rd ed): Ch. 18;
- (6) Sutton, Barto, Bach (2nd ed): 1,3,4,5,6

Text-Books for Artificial Intelligence (Modules 1,2,3):

- (1) ‘Artificial Intelligence: A Modern Approach’--- by Stuart Russell and Peter Norvig (Pearson India, 4thed, 2022);
- (2) 'Artificial Intelligence: Foundations of Computational Agents' - by David L. Poole and Alan K. Mackworth (Cambridge University Press, 3rded, 2023);
- (3) ‘Artificial Intelligence and Soft Computing’ – by Amit Konar (CRC Press, 2000)

Text-Books for Machine Learning (Modules 4,5,6):

- (1) ‘Hands-On Machine Learning with Scikit-Learn and PyTorch’ (Part-I: Machine Learning) - by Aurelien Geron, (O’Reilly, First Early Release, 2025)
- (2) ‘Introduction to Machine Learning’ - by Ethem Alpaydin (MIT Press and PHI, 3rd ed, 2014)
- (3) ‘An Introduction to Statistical Learning – with Applications in Python’ by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani (Springer, 2023)

Reference Books for Artificial Intelligence (Modules 1,2,3):

- (1) ‘ArtificialIntelligence’ – by George Luger, (Pearson, 6thed, 2021)
- (2) ‘Artificial Intelligence’ – by Saroj Kaushik (Cengage, 2011)
- (3) ‘Artificial Intelligence’ - by N. P. Padhy, (Oxford University Press, 2005)
- (4) ‘A First Course in Artificial Intelligence’ – by Deepak Khemani (McGraw Hill, 2013)

ReferenceBooks for Machine Learning (Modules 4,5,6):

- (1) ‘Pattern Recognition and Machine Learning’ – by Christopher M. Bishop (Springer, 2006)
- (2) ‘Pattern Recognition’ – by Richard O. Duda, Peter E. Hart, and David G. Stork (WILEY India, 2021)
- (3) ‘Pattern Recognition – An Introduction’ – by V. Susheela Devi and M. Narasimha Murty (Universities Press (India) Pvt. Ltd., 2011)
- (4) ‘Understanding Machine Learning From Theory to Algorithms’ - by Shai Shalev-Shwartz and Shai Ben-David (Cambridge University Press, 2014)
- (5) ‘Machine Learning The Art and Science of Algorithms that Make Sense of Data’ - by Peter Flach (Cambridge Univ. Press, 2012)
- (6) ‘Machine Learning’ – by Tom Mitchell (McGraw Hill, 1997)
- (7) ‘Reinforcement Learning’ - by Richard S. Sutton, Andrew G. Barto, Francis Bach (MIT Press; 2nd ed., 2018)



University of Engineering and Management
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University of Engineering & Management, Jaipur



Subject Name: Sustainability, Climate Actions & Environmental Sciences

Subject Code: MCC471

Credit: 2

Lecture Hours: 24

[Study Material](#)

[LinkedIn](#)

[NPTEL](#)

[Coursera](#)

Course objectives:

1. To introduce fundamental concepts of environmental systems, sustainability and United Nations Sustainable Development Goals
2. To apply knowledge of sustainable practices and societal challenges.
3. To be able to analyze the challenges and strategies associated with climate change mitigation.
4. To understand the principles of the circular economy.

Course Outcomes:

The concepts developed in this course will help the students in their higher studies. The course will enable the student to

CO1: Understand fundamental concepts of environmental systems, sustainability, United Nations Sustainable Development Goals (UNSDGs) and their interrelationship with human society.

CO2: Apply knowledge of sustainable practices, different technical tools and existing frameworks to address environmental and societal challenges.

CO3: Analyze the challenges and strategies associated with climate change mitigation, sustainable cities, and waste management within the context of international agreements and frameworks

CO4: Evaluate and design innovative approaches to energy, water, and waste management, considering the principles of the circular economy and global SDG progress reports.

Module Number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
I	Overview - United Nations Sustainable Development Goals (UNSDGs)	Basic ideas of environment, basic concepts: man, society & environment, their interrelationship. Significance of sustainability in today's world. 17 United Nations Sustainable Development Goals (UNSDGs) - background, significance, interconnectedness of goals, global challenges and recent progress. Climate change and mitigation. Explain and evaluate the evidence for human-caused climate change, in the context of historical climate change, as well as the relevant scientific uncertainties and possible evidence to the contrary.	International Academia: https://unccelearn.org/course/view.php?id=170&page=overview https://unccelearn.org/course/view.php?id=181&page=overview Industry Mapping:	4	Assess the college campus alignment with the United Nations Sustainable Development Goals (SDGs) and rank the performance across selected goals mentioning the actionable strategies for improvement.
II	Sustainable Management	Sustainable management of water and sanitation-introduction, key components, challenges and innovative approaches. Ensure access to affordable, reliable, sustainable, and modern energy-introduction, importance, key targets, challenges and strategies. Sustainable Cities and Communities- Definition of sustainable cities, current challenges, strategies, innovative solution, smart city	International Academia: https://ocw.mit.edu/courses/res-env-006-teaching-with-sustainability-january-iap-2022/ Industry Mapping:	4	Design and propose innovative, sustainable solutions for managing water, energy, and urban systems, inspired by the principles of SDG 6, SDG 7 and SDG 11.

III	Climate Action	-Climate change and its consequences, international agreements on climate change, strategies and actionable step, Life Below Water- Importance of water bodies and marine ecosystem, strategies for protecting aquatic life and water bodies, Life on Land- importance of biodiversity, carbon sequestration, Food security, Strategies for Conservation and Restoration of Ecosystems, Sustainable Land Management, Biodiversity Conservation, Accountable steps for life on land. The successes and failures of past national and international efforts to address climate change, and evaluate prospects for future management of climate change. Provisions of the United Nations Framework Convention on Climate Change, Paris Agreement	International Academia: https://unccelearn.org/course/view.php?id=7&page=overview&lang=en https://unccelearn.org/course/view.php?id=145&page=overview https://unccelearn.org/course/view.php?id=48&page=overview https://ocw.mit.edu/courses/res-env-001-climate-action-hands-on-harnessing-science-with-communities-to-cut-carbon-january-iap-2017/ Industry Mapping:	4	Using data analytics and modeling tools - evaluate climate change impacts, assess ecosystem health, and propose technical solutions for mitigation and conservation efforts.
IV	UN-call for Action	Focus on annual SDG Goals Report and the United Nations Secretary-General's calls for action to accelerate the progress on the Sustainable Development Goals (SDGs). Examine the global progress trends, challenges highlighted in recent reports, and key priorities proposed by the Secretary-General to achieve the 2030 Agenda.	International Academia: https://unccelearn.org/course/view.php?id=175&page=overview	4	Using quantitative analysis, strategic planning, and innovative approaches, evaluate the global progress on the Sustainable Development Goals (SDGs) as highlighted in the annual SDG Goals Report.

			Industry Mapping:		
V	Environmental Systems Analysis	Environmental impact assessment - lifecycle assessment (LCA), Using of LCA software tools – OpenLCA, Environmental, social, and governance (ESG), Integrated Impact Assessment of ESG, Carbon Management, Green Hydrogen, Importance of green building (LEED, IGBC etc.) certification. Environmental Management System (EMS) in industry - ISO 14001.	International Academia: https://www.lse.ac.uk/unit-ed-states/Assets/Documents/Syllabus-Hub-PDFs/Michael-Carbajales-Dale-Clemson-Environmental-Systems-Analysis.PDF https://www.igmpi.ac.in/environmental-social-governance?gad_source=1 https://www.iso.org/standard/60857.html#:~:text=ISO%2014001%20is%20the%20internationally,continually%20improve%20their%20environmental%20performance. Industry Mapping:	4	Life Cycle Assessment of a college building using OpenLCA software.
VI	Waste Management	Waste Management Rules - Hazardous Waste, E-waste, Municipal Solid Waste, Bio-medical waste, Plastic Waste & Construction and Demolition Waste. Management of different waste streams – collection, transportation, treatment, storage and disposal. Basel Convention, Extended producer responsibility (EPR) Energy & Resource Recovery - Incineration, Co-processing,	International Academia: https://cpcb.nic.in/rules/6/	4	Mapping the supply chain of different waste management system and finding the issues & challenges.

		Composting, Bio-methanation, Management of solar photo-voltaic modules or panels or cells, Battery Waste Management Rules, Circular Economy. .	https://ocw.mit.edu/courses/ec-716-d-lab-waste-fall-2015/ https://unccelearn.org/course/view.php?id=131&page=overview https://unccelearn.org/course/view.php?id=87&page=overview Industry Mapping:		

Field works will be assigned for each and every student/ group of students, on completion of which they have to give a presentation alongwith a model display if possible.

Lesson Plan:

Module 1: Overview - United Nations Sustainable Development Goals (UNSDGs)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Syllabus discussion, Introduction to Basic ideas of environment, basic concepts: man, society & environment, their interrelationship. Significance of sustainability in today's world.
2	17 United Nations Sustainable Development Goals (UNSDGs) - background, significance, interconnectedness of goals, global challenges and recent progress.

3	Climate change and mitigation.
4	Explain and evaluate the evidence for human-caused climate change, in the context of historical climate change, as well as the relevant scientific uncertainties and possible evidence to the contrary.

Module 2: Sustainable Management

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Sustainable management of water and sanitation- introduction, key components, challenges and innovative approaches
2	Ensure access to affordable, reliable, sustainable, and modern energy- introduction, importance, key targets, challenges and strategies.
3	Sustainable Cities and Communities- Definition of sustainable cities, current challenges, strategies, innovative solution, smart city
4	Sustainable Cities and Communities- Definition of sustainable cities, current challenges, strategies, innovative solution, smart city

Module 3: Climate Action

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Climate change and its consequences, international agreements on climate change, strategies and actionable step.
2	Life Below Water- Importance of water bodies and marine ecosystem, strategies for protecting aquatic life and water bodies, Life on Land- importance of biodiversity, carbon sequestration, Food security, Strategies for Conservation and Restoration of Ecosystems, Sustainable Land Management, Biodiversity Conservation, Accountable steps for life on land.
3	Life Below Water- Importance of water bodies and marine ecosystem, strategies for protecting aquatic life and water bodies, Life on Land- importance of biodiversity, carbon sequestration, Food security, Strategies for Conservation and Restoration of Ecosystems, Sustainable Land Management, Biodiversity Conservation, Accountable steps for life on land.
4	The successes and failures of past national and international efforts to address climate change, and evaluate prospects for future management of climate change. Provisions of the United Nations Framework Convention on Climate Change, Paris Agreement

Module 4: UN-call for Action

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Focus on annual SDG Goals Report and the United Nations Secretary-General's calls for action to accelerate the progress on the Sustainable Development Goals (SDGs).
2	Focus on annual SDG Goals Report and the United Nations Secretary-General's calls for action to accelerate the progress on the Sustainable Development Goals (SDGs).
3	Examine the global progress trends, challenges highlighted in recent reports, and key priorities proposed by the Secretary-General to achieve the 2030 Agenda.
4	Examine the global progress trends, challenges highlighted in recent reports, and key priorities proposed by the Secretary-General to achieve the 2030 Agenda.

Module 5: Environmental Systems Analysis

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Environmental impact assessment - lifecycle assessment (LCA), Using of LCA software tools – OpenLCA, Environmental, social, and governance (ESG), Integrated Impact Assessment of ESG, Carbon Management, Green Hydrogen.
2	Environmental impact assessment - lifecycle assessment (LCA), Using of LCA software tools – OpenLCA, Environmental, social, and governance (ESG), Integrated Impact Assessment of ESG, Carbon Management, Green Hydrogen
3	Importance of green building (LEED, IGBC etc.) certification. Environmental Management System (EMS) in industry - ISO 14001.
4	Importance of green building (LEED, IGBC etc.) certification. Environmental Management System (EMS) in industry - ISO 14001.

Module 6: Waste Management

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Waste Management Rules - Hazardous Waste, E-waste, Municipal Solid Waste, Bio-medical waste, Plastic Waste & Construction and Demolition Waste.
2	Management of different waste streams – collection, transportation, treatment, storage and disposal.

3	Basel Convention, Extended producer responsibility (EPR) Energy & Resource Recovery - Incineration, Co-processing, Composting, Bio-methanation, Management of solar photo-voltaic modules or panels or cells, Battery Waste Management Rules, Circular Economy. .
4	Basel Convention, Extended producer responsibility (EPR) Energy & Resource Recovery - Incineration, Co-processing, Composting, Bio-methanation, Management of solar photo-voltaic modules or panels or cells, Battery Waste Management Rules, Circular Economy. .

Learning Resources:

Text Books:

This syllabus has been designed on the United Nations Sustainability Development Goals, so there is no prescribed text books. Please refer to the study material and online courses.



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Mathematics - IV
Subject Code: BSM401
Credit: 3
Lecture Hours: 42

Pre-requisite: Mathematics – III

Relevant Links:

[Study-material-BSM401](#)

[NPTEL](#)

[Coursera](#)

COURSE OBJECTIVES:

1. To learn about Calculus of Complex functions.
2. To learn about Fourier series and Fourier Transform.
3. To learn about Laplace transform.

4. To learn about Z-transform.
5. To develop a basic understanding of Data analysis using Python.

COURSE OUTCOMES:

- CO 1:** Identify different tools for differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
- CO 2:** Appraise the notions of Fourier series and Transform to solve advanced engineering problems.
- CO 3:** Apprehend the concept of Laplace Transform together with its applications in evaluating integrals and solving ordinary differential equations.
- CO 4:** Relate the use of Z-Transform for discrete functions and solve difference equations using Z-Transform technique.
- CO 5:** Acquire an understanding of handling and analyzing datasets, creating data visualizations, solving linear equations.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1.	Calculus of Complex Functions	Complex function, Limit, Continuity and Differentiation; Analytic functions, Cauchy-Riemann equations (statement only); Harmonic functions, Harmonic Conjugate; construction of Analytic functions; elementary Analytic functions (exponential, trigonometric, logarithmic) and their properties. Statement for Cauchy's Integral formula for evaluation of $\oint_C f(z)dz$ where C is a circle.	International Academia: https://ocw.mit.edu/courses/18-04-complex-variables-with-applications-spring-2018/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: To analyze the frequency response of filters by evaluating the	8	Text book 1: Chapter 19 & Chapter 20	❖ Evaluation of contour integrals using MATLAB .

			behavior of complex functions that represent signals or system responses along a contour. https://in.mathworks.com/help/matlab/math/complex-line-integrals.html			
2.	Fourier Series & Transform	<i>Fourier Series:</i> Even function, Odd function. Periodic function, Euler's formula, Dirichlet's conditions; Sum of the Fourier series at the point of discontinuity and end points of an interval; Half Range Sine and Cosine Series; Parseval's Theorem (statement only). <i>Fourier Transforms:</i> Fourier Transform and its properties; Fourier Sine and Cosine Transforms, Fourier Transform of derivatives (statement only); Inverse Fourier Transform (statement only); Convolution theorem (statement only), related problems.	International Academia: • https://see.stanford.edu/Course/EE261 AICTE-prescribed syllabus: • https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: To analyze periodic signals and transform them into frequency components. https://in.mathworks.com/help/matlab/math/fourier-transforms.html	10	<i>Fourier Series:</i> Textbook 1: Chapter 10 <i>Fourier Transform:</i> Textbook 1: Chapter 22	❖ Perform Fourier sine and cosine transforms using MATLAB. ❖ Write Fourier series for some elementary functions using MATLAB. ❖ Compare Fourier Transform results with Spectrum Analyzer outputs in real-world signal frequency analysis.
3.	Laplace Transform	Laplace Transform and its properties; First and Second Shifting theorems; Laplace Transform of Periodic functions; Inversion of Laplace Transform by different methods, Convolution theorem; evaluation of integrals by Laplace Transform; solving boundary value problems by Laplace Transform method.	International Academia: • https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/resources/mit6_003f11_1ec06/ • https://web.stanford.edu/~boyd/ee102/ AICTE-prescribed syllabus:	8	Textbook 1: Chapter 21	❖ Perform Laplace transform of some elementary functions using MATLAB. ❖ Perform inverse Laplace transform using MATLAB. ❖ Analyze system stability using Laplace Transform and verify results through control

			• https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: To analyze system dynamics, stability, and control in electrical circuits and automation. https://in.mathworks.com/help/symbolic/sym.laplace.html			lab experiments with real-world systems.
4.	Z-Transform	Sequence, representation of sequence, Z-Transform and its properties, Shifting theorems, Inverse Z-transform, Convolution theorem, region of convergence, concept of difference equation and their solution by Z-Transform method.	International Academia: • https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/64490a008c1c5c25c86044351465abf7_MIT6_003F11_1ec05.pdf AICTE-prescribed syllabus: • https://www.aicte-india.org/sites/default/files/MModel_Curriculum/Final_ECE.pdf Industry Mapping: To analyze discrete-time systems, especially in control systems and digital signal processing (DSP). https://in.mathworks.com/help/symbolic/sym.ztrans.html	6	Textbook 1: Chapter 23	❖ Compute Z-transform of some elementary functions using MATLAB. ❖ Solve linear difference equations with constant coefficients using MATLAB.

5.	Data Analysis using Python	Arithmetic, logical operations; List, tuple, dictionary, set; Managing arrays and matrices; Solving linear equations; Data handling: Import, clean, sort, filter, summarize, handle missing data; Calculating central tendency, standard deviation of datasets; Data visualization: Line plot, Bar plot, Histogram.	International Academia: • https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/lecture-notes/ • https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/readings/ Industry Mapping: 1. To handle datasets and visualize for real-time insights. 2. To solve systems of equations for applications like signal processing.	4	Textbook 2:	❖ Handling of data using Panda Library. ❖ Plot data using Matplotlib. ❖ Compute Matrix operations using Numpy library. ❖ Calculate central tendencies, standard deviation of a dataset.
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TEXT BOOKS:

1. **B. S. Grewal**, “Higher Engineering Mathematics”, 44th Edition (2021), Khanna Publishers. (Chapter No.s: 10, 19, 20, 21, 22, 23)
2. **Wes Mckinney**, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, 2nd Edition (2017), United States: O'Reilly Media.

REFERENCE BOOKS:

1. **Biswadip Basu Mallik & Krishanu Deyasi**, “Engineering Mathematics” – Vol. 2B, 1st Edition (2020), Cengage Learning.
2. **B. K. Pal & K. Das**, “Engineering Mathematics” - Vol. IIB, 13th Edition (2019), Vol. IIIB, 8th Edition (2019), U. N. Dhur& Sons.
3. **Erwin Kreyszig**, “Advanced Engineering Mathematics”, 10th Edition (2017), John Wiley & Sons.
4. **R. K. Jain and S. R. K. Iyengar**, “Advanced Engineering Mathematics”, 5th Edition (2016), Narosa Publication House .
5. **B. V. Ramana**, “Higher Engineering Mathematics”, 11th Reprint (2017), Tata McGraw



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Object Oriented Programming with Java

Subject Code: OEC481

Credit: 2

Lecture Hours: 30

Pre-requisite: C, Basic knowledge of programming language.

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

[Infosys Springboard](#)

COURSE OBJECTIVES:

1. To introduce the object-oriented programming concepts.
2. To understand object-oriented programming concepts, and apply them in solving problems.
3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes,

the concepts of exception handling.

4. To introduce the design of Graphical User Interface using applets and swing controls.

COURSE OUTCOMES:

- CO1:** Identify the need for solving the real world problems using the concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class.
- CO2:** Understand the implementation of Object oriented concepts using Java through. Class, object, message passing, inheritance, encapsulation, polymorphism.
- CO3:** Apply the concept of mutable and immutable string, basics of I/O operations – keyboard input using Buffered Reader & Scanner classes for real life applications.
- CO4:** Create web applications and GUI based applications.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Concepts of object oriented programming language using Java	Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access modifiers, operators, control statements & loops, array, creation of class.	International Academia: https://drive.google.com/file/d/10z00dMd26WjiPThhCercGbsi6u3ciE62/view?usp=drive_link https://drive.google.com/file/d/1k3qrfDL9p5_IJR_iP	5	1. Define a class UEMIEM and print your name. 2. Write down the steps to execute a Java program from command line. 3. Declare and initialize different variable in Java and print all. 4. Perform different arithmetic operations and print output of all.

			2mt6c6AzwmByNtf/view?usp=sharing AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.		5. Write a program to swap the values between two variables. 6. Declare four different variables of int with four different access specifiers and show their access limitations. 7. Write a program to find highest number between two numbers. 8. Write a program to find sum of all numbers from an array of int. 9. Write a program to find highest number from an array of int. 10. Write a program to find all the even and odd numbers from an array of int separately. 11. Consider a given array, perform reverse the elements and store in the same array. 12. Consider an array of characters, print only the vowels from that.
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					13. Consider an array of characters in lower cases, convert all char to upper cases. 14. Perform matrix multiplication.
2	Object oriented concepts	Implementation of Object oriented concepts using Java. Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism.	International Standards https://drive.google.com/file/d/1Rc1KOzkVRHqLEWApFBplwz7s8IwsyFlf/view?usp=sharing https://drive.google.com/file/d/1e8g7D6nuMwEruToXtNDbh68vx2VKUrgS/view?usp=sharing AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICT	5	1. Define a user defined method (add, subtract, division, multiplication) to perform different arithmetic operations. Call them from main method. 2. Define user-defined methods for the following: without argument and without return type, with argument/s and without return type, with argument/s and with return type. Call all from the main. 3. Write the program to show: single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance. 4. Write a program to show the polymorphism: constructor overloading, method overloading, method overriding.

			E%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.		
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3	Object properties Language features to be covered:	Object, constructor, finalize and garbage collection. Use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts. Concept of mutable and immutable string. Basics of I/O operations – keyboard input using Buffered Reader & Scanner classes.	International Standards : AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	6	1. Write a program to demonstrate the use of this, this(). 2. Write a program to demonstrate for the following: object as a parameter of method, object type as return type of a method. 3. Consider a class Visit, on creation of each object value of a counter variable is incremented by 1 and shows the value each time. Use the static variable and write the program. 4. Write a program to show the use of command argument passing. 5. Write a program to take input of first name, last name. Then print as full name. 6. Write a program to take user inputs for int, float, double, String using Scanner class. Then print all. 7. Take a string input and show
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					use of different string methods.
4	Reusability properties	Super class & subclasses including multilevel hierarchy. Process of constructor calling in inheritance, use of super and final keywords with super() method. Dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages.	International Standards: https://ocw.mit.edu/ans7870/6/6.005/s16/classes/09-immutability/ https://ocw.mit.edu/course/s/6-088-introduction-to-c-	6	1. Write a program to show the use of super and super(). 2. "Super class gets constructed before subclasses". write a program to support this in multilevel and hierarchical inheritance. 3. Create an abstract class named "Shape" with an abstract method

		Member access for packages.	memory-management-and-c-object-oriented-programming-january-iap-2010/67b1aec3f2867734ec0fb33034c8b5c8_MIT6_088IAP10_lec05.pdf AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.		"calculateArea()." Implement two subclasses, "Circle" and "Rectangle," which extend the "Shape" class and provide their implementations for the "calculateArea()" method. 4. Create an abstract class named "Vehicle" with instance variables for "model" and "year." Include an abstract method named "start()" and a non-abstract method "displayDetails()" that prints the model and year. Implement two subclasses, "Car" and "Motorcycle," each with its own version of the "start()" method. 5. Create an abstract class "Bank" with an abstract method "calculateInterest()." Implement two subclasses, "SavingsAccount" and "LoanAccount," each with its own implementation of the "calculateInterest()" method. 6. Create an interface named "Drawable" with a method "draw()." Implement two classes, "Circle" and "Rectangle," each
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					implementing the "Drawable" interface with its own version of the "draw()" method. 7. Create an interface "Resizable" with a method "resize()." Implement a class "ResizableCircle" that implements the "Resizable" interface and provides its own implementation of the "resize()" method. 8. Create an interface "Logger" with methods "logInfo()" and "logError()." Implement an abstract class "FileLogger" that implements the "Logger" interface and provides its own implementation for any one methods. 9. Define a package p1 containing a class Access. That class contains four int variables: pub as public, pri as private, pro as protected, and def as default. Now define another package p2 containing two classes SubAccess (sub class of Access) and NonSubAccess. Further define method display in both
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					classes to demonstrate the accessibility of all variables..
5	Exception handling Multithreading	Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally creation of user defined exception classes. Basics of multithreading. Main thread, thread life cycle, creation of multiple threads, thread priorities.	International Standards: https://drive.google.com/file/d/1kbRGE396sOPdObA4w-N81ElKU_bdGgEs/view?usp=sharing AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita	4	1. Consider a method div that takes two arguments of int type to perform division. Use try, catch, finally so that the program will not be terminated due to any exception for all scenario (values passes through div). 2. Consider a method div that takes two arguments of int type to perform division. Use throw, throws within div and handle the exception in main so that the program will not be terminated due to any exception for all scenario (values passes through div). 3. Design a user defined exception that is generated when a given mobile number is not satisfied for any one of the following conditions: 10 digit, does not contain only numeric. Take user input as a string.

			projects, GitHub platform. NetBeans and Eclipse IDE will be used.		4. Write a program to show the working of multiple threads using Thread class, and Runnable interface.
6	Applet and swing Programming	Basics of applet programming, applet life cycle. Difference between application & applet programming.	AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	4	1. Design an applet program to design different shapes. 2. Develop an applet program to demonstrate lifecycle of applet. 3. Design a swing application to show the use of Listener. 4. Design a swing application of basic calculator.

TEXT BOOK:

1. [Schildt, H. \(2014\). Java: the complete reference. McGraw-Hill Education Group.](#)

REFERENCE BOOKS:

1. Horton, I. (2004). Beginning Java™, John Wiley & Sons.



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Essential Studies for Professionals-IV
Subject Code: ESP401

Credit: 0.5

Lecture Hours: 48

Pre-requisite: Basic Social Science from primary to high school, NCERTs

COURSE OBJECTIVES:

1. Will be able to enhance their aptitude & analytical skill with multiple tricky approaches.
2. Will be able to prepare for various competitive examinations.

COURSE OUTCOMES:

- CO 1:** Ability to remember the basics of the subject.
- CO 2:** Understanding various concepts so that a student knows about his surroundings.
- CO 3:** Enhance students' analytical skill in order to improve quick decision-making skill.
- CO 4:** Analyze multiple statements in order to come to a conclusion for a given problem statement.
- CO 5:** Evaluate analytical skill and sound knowledge in analogies to enhance student's interview facing skill.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Constitution of India	Central Legislative System of India, State Legislative System of India, Constitutional Amendments.	National Exams: 1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 4. Intelligence Bureau ACIO	10	<u>Assignment:</u> 1. Evolution of the Indian Parliament: A Historical Overview 2. Discuss the powers, responsibilities, and challenges faced by the Speaker of the Lok Sabha in maintaining order and impartiality. <u>Discussion:</u> Anti-defection Law: Impact on Indian Politics <u>Debate:</u> The Efficacy of Parliamentary Sessions: Quality vs. Quantity ** All the assignments are in line of GS

			https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		Paper I of UPSC CSE Mains Examination
2	History	Islam and Early Muslim Invaders, Delhi Sultanate, Rise of the Mughals (Till Akbar)	National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf , pg 20-21) 3. Combined Graduate Level	12	1. <u>Islam and Early Muslim Invaders:</u> Assignment:___"Cultural and Social Changes in India with the Advent of Islam: A Comparative Analysis." 2. <u>Delhi Sultanate:</u> Discussion: "From Slave Dynasty to Tughlaq Dynasty: Analyzing Military Tactics and Strategies." 3. <u>Rise of the Mughals:</u> Debate: "Babur's Conquest: Was it Driven by Ambition or Necessity?"

			conducted by SSC https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 4. Intelligence Bureau ACIO https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/2707970_2019.pdf), pg 1		** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.
3	Geography	Rivers of India, Multipurpose River Valley Projects, Thermal Power Projects.	National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-	12	1. <u>Rivers of India</u> Assignment: Major rivers of India.creating a detailed itinerary, documenting key

			010223.pdf), pg 25-26 2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf) , pg 20-21 3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement) , pg 1 2. Miscellaneous Services		geographical features, historical landmarks, and ecological zones along the river. 2. Multipurpose River Valley Projects Essay writing on “Pros and Cons of a constructing multipurpose river valley project in-terms of ecological, social impacts.” 3. Thermal Power Projects.. Debate on Future of Thermal Power: ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.
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			Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		
3	Geography	Rivers of India, Multipurpose River Valley Projects, Thermal Power Projects.	National Exams: 5. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 6. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 7. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 8. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)	12	1. <u>Rivers of India</u> Assignment: Major rivers of India. creating a detailed itinerary, documenting key geographical features, historical landmarks, and ecological zones along the river. 2. <u>Multipurpose River Valley Projects</u> Essay writing on “Pros and Cons of a constructing multipurpose river valley project in-terms of ecological, social impacts.” 3. <u>Thermal Power Projects..</u> Debate on Future of Thermal Power: ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.

			State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		
4	Economics	Tax System of India, Balance of Payment, Industrial Reforms, NITI Aayog and its relationship with 5 year plan, Sustainable Development Goals	National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. Combined Graduate Level conducted by SSC https://ssc.nic.in/SSCFileServer/PortalManagement/Uploa	9	1. <u>Tax System of India</u> Assignment on “how different tax policies impact various socio-economic groups and propose measures to enhance fairness and inclusivity”. 2. <u>Balance of Payment</u> Debate on “Impact of trade policies on the balance of payments” 3. <u>Industrial Reforms</u> Brainstorming session on “Digital Industry Transformation”

			dedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		4. <u>NITI Aayog and its relationship with 5 year plan</u> Policy Debate: NITI Aayog vs. Five-Year Plans 5. <u>Sustainable Development Goals</u> Building of Sustainable Business plan aligned with one or more SDGs. They should consider environmental, social, and economic aspects, outlining how their business would contribute positively to the goals.
5	Current affairs and Static GK	National News, International News, MOU's and agreements, Summits and Conclaves, Obituaries, Awards and Events, Sports, Important Days, Banking and Economic Awareness	National Exams: 1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services	5	1. Discussion on National and International affairs 2. Discussion on MOU's and agreements, Summits and Conclaves 3. Discussion on recent Awards and Events, Sports.

			(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23 4. IBPS Probationary officer(https://www.ibps.in/wp-content/uploads/Detailed-Advt.-CRP-PO-XII.pdf) , Pg 7. 5. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304_2023.pdf) pg. 20-22 6. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)		4. Discussion on Economic Awareness
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			State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/2707970_2019.pdf), pg 1		
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TEXT BOOK:

1. [Indian Constitution- M. Laxmikant](#)

REFERENCE BOOKS:

1. Current Affairs Magazine of IEM-UEM
2. Lucent GK
3. Indian Economy-Ramesh Singh
4. History of Modern India- Bipan Chandra
5. Geography of India- Majid Hussain



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Skill Development for Professionals-IV

Subject Code: SDP482

Credit: 0.5

Lecture Hours: 48

Pre-requisite: Basic & fundamental knowledge of mathematics up to class 10th standard, Logical & Analytical skill.

COURSE OBJECTIVES:

1. To improve verbal ability skill and communicative skill of the students.
2. To enhance the analytical skill and problem solving skill of the students.
3. To make them prepare for various public and private sector exams & placement drives.

COURSE OUTCOMES:

- CO 1:** It will improve verbal ability skill among students.
- CO 2:** Students will communicate effectively & appropriately in real life situation.
- CO 3:** Apply the rules and solve the problems.
- CO 4:** Analyze the given set of data and reach conclusion.
- CO 5:** Evaluate the table and problem statement and solve the problem statements.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Quantitative Aptitude	<u>Permutation & Combination:</u> Numbers, Alphabets, Linear arrangement, Circular arrangement, Repetition, Selection based <u>Probability:</u> Coins, Dices, Drawing of balls, Cards, Numbers, Miscellaneous. <u>Mensuration</u> – Rectangle, Square, Triangle, Rhombus, Parallelogram, Cylinder, Cone, Sphere, Hemisphere <u>Geometry</u> -. Lines, Angles, Triangles, Quadrilateral and circles.	International Exams 1. GRE https://www.ets.org/pdfs/gre/gre-math-review.pdf) 2. GMAT https://downloads.mba.com/downloads/gmat-handbook.pdf) National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf)	12	1. Permutation & Combination a. How to arrange different numbers in different sequences. b. Questions based on Alphabet arrangements. c. Problems based on linear and circular arrangements. d. Problems based on garlands and Necklaces. e. Problems based on selection of things and persons. 2. Probability a. Problems based on different numbers of coin tossed. b. Problems based on rolling dices. c. Problems based on forming of

			ult/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023EA65E4FB1C2CE473396B4FD7E5F69CDDE.PDF), pg 22-23 4. IBPS Probationary officer(https://www.ibps.in/wp-content/uploads/Detailed-Advt.-CRP-PO-XII.pdf) , Pg 7. 5. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22 6. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) 7. XAT (https://xat.org.in/xat-syllabus/	committees based on selection. d. Problems based on drawing of cards 3. Mensuration. a. Problems based on 2D and 3D shapes. b. Finding area based on mixed shapes. c. Finding the volume based on different shapes. d. Problems based on Prism Pyramid. 4. Geometry: a. Problems based on Lines and Angles. Problems based on complementary, supplementary, corresponding, alternative angles. c. Problems based on acute, right, obtuse, scalene, equilateral, isosceles triangles. d. Basis problems based on Quadrilaterals. e. Basic Problems based on chords and
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			) 8. GATE (https://gate2024.iisc.ac.in/papers-and-syllabus/) 9. CAT https://iimcat.ac.in/per/a01/public/756/ASM/WebPortal/1/index.html?756@@1@@1 State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/2707970_2019.pdf), pg 1		tangents. ** All the assignments are in line of GSPaper I of UPSC CSE Mains Examination
2	Logical Reasoning	1) Calendar 2) Analogy & Classification 3) Dice & Cube, Puzzles and Sitting Arrangement	National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-english-010223.pdf), pg 25-26 2. UPSC Combined Defence	12	1. Calendar a. Problems based basic structure of a calendar and a concept of an odd day. b. Problems based on leap year in centuries. Problems based on exact day and

		Services(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf , pg 20-21) 3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22 4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf State Level Exams: 1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf),	comparison of day. d. Finding the day when another day is given or not given. 2. Analogy & Classification a. Problems based on letter or word based analogy. b. Problems based on Number based analogy. c. Problems based on Mixed analogy. d. Problems based on image analogy. 3. Dice & Cube a. Problems based on standard dice and ordinary dice. b. Problems based on single dice. c. Problems based on two or more dices.
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			<i>pg 1</i>		
3	Objective English-2	1) Application of Adverbs 2) Active Passive Voice 3) Direct and Indirect Speech 4) Reading Comprehension 5) Technical Report Writing	International Exams 1. GRE https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37) National Exams: 1. UPSC Civil Services Exam https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. Combined Graduate Level conducted by SSC https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304	12	1. <u>Application of Adverbs</u> Practice set based on Spotting the Error. 2. <u>Active Passive Voice</u> Practice set based on conversion of active sentences to passive and vice-versa 3. <u>Direct and Indirect Speech</u> Practice set based on conversion of direct speech to indirect speech and vice-versa 4. <u>Reading Comprehension</u> Reading unseen passages and answering questions based on the same 2. <u>Technical Report Writing</u> Need to submit assignment with one report written on each type of technical report namely White paper,

			2023.pdf) pg. 20-22 4. Intelligence Bureau ACIO https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS) https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		Case Studies, Technical Proposals, SDK Documentation
4	Data Interpretation level-II		International Exams 1. GRE https://www.ets.org/gre/test-takers/general-test/prepare/content/quantitative-reasoning.html#accordion-eb7b696bc8-item-f763480e0e) National Exams:	12	1. Problems based on mixed diagrams. 2. Problems based on Profit and loss. 3. Problems based on Simple and compound interest 4. Problems based on time series.

			1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22 4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430		
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			_Syllabus.pdf&param2=advertisement), pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		
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TEXT BOOK:

1. [Objective General English- S.P Bakshi](#)

REFERENCE BOOKS:

1. Quantitative Aptitude-R.S Agarwal
2. English Grammar and Competition-S.C Gupta
2. Fast Track Objective Arithmetic- Rajesh Verma
3. Advance Maths- Rakesh Yadav
4. Verbal and Non-Verbal Reasoning- R.S Agarwal
5. A new approach to Reasoning- BS Sijwali



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Analog and Digital Communication Lab
Subject Code: PCCEC491
Credit: 1
Lecture Hours: 30

Pre-requisite: Signals and Systems, Mathematics, Basic electronics.

Coursera link: <https://www.coursera.org/learn/wireless-communications>

Linked link: <https://www.linkedin.com/learning/iot-foundations-low-power-wireless-networking>

NPTEL link: https://onlinecourses.nptel.ac.in/noc22_ee05/preview

COURSE OBJECTIVE:

1. To learn about Analog Modulation
2. To learn about Digital Modulation
3. To learn about Waveform Coding Techniques
4. To learn about Transmitter/Receiver

COURSE OUTCOMES:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
2. Investigate pulsed modulation system, baseband transmission and analyze their system performance.
3. Analyze different digital modulation schemes and can compute the bit error performance trade off issues, equalization, carrier recovery

Module number	Topic	Sub-Topics	Lecture Hours
1	Signal generator	Low frequency message and high frequency carrier signal generation using suitable oscillator.	3
2	Analog modulation-I	Construct a modulator and demodulator based amplitude modulation (AM) system and test an analog filter to evaluate the effects of noise on audio signals.	3
3	Analog modulation-II	Construct a modulator of frequency modulation (FM) system and tuning a certain station of FM band to test the performance of filter.	3
4	Transmitter and receiver design	A proper antenna design technique to transmit a certain band of AM signal and to receive it at certain receiver.	3
5	Digital Modulation-I	Construction of baseband modulation technique to obtain digital signal from an audio input and transmit it at suitable band of transmission.	3
6	Digital Modulation-II	Construction of a practical higher order modulation (like, QAM-256) to minimize the error and to enhance the data rate of communication system.	6

7	AI based detection technique	AI based channel estimation and demodulation technique for both analog and digital communication technique using MATLAB or Python code.	3
8	Project work	Assignment I and Assignment-II	6

Module No.	Topic	Laboratory Assignment
1	Signal generator	Low frequency message and high frequency carrier signal generation using suitable oscillator.
2	Analog modulation-I	1. Measurement of Modulation Index of An Amplitude Modulated Signal using Transistor/ IC 1496. 2. Construction of Modulation and Demodulation technique of Single Side Band Suppressed Carrier (SSB-SC). 3. Design, Simulation and implementation of AM and demodulation using MATLAB.
3	Analog modulation-II	1. Construction of Modulation and Demodulation technique of Frequency Modulation. 2. Design, Simulation and implementation of FM and demodulation using MATLAB.

4	Transmitter and receiver design	1. Detailed study of intermediate frequency, radio frequency and audio frequency response of super-heterodyne receiver . 2. Frequency Division Multiplexing and Demultiplexing Through Optical Fiber Cable. 3. Analog Communication through Optical Fiber Cable. 4. Introduction to Satellite Communication.
5	Digital Modulation-I	1. Construction of Modulation and Demodulation of Phase Shift Keying (PSK) using Digital switch IC. 2. Construction of Amplitude Shift Keying (ASK) using Transistor 3. Construction of Modulation and Demodulation of Frequency Shift Keying (FSK) using IC-8038 4 Study of Modulation and Demodulation of ASK, FSK, PSK using MATLAB.
6	Digital Modulation-II	Construction of a practical higher order modulation (like, QAM-256) to minimize the error and to enhance the data rate of communication system.
7	AI based detection technique	AI based channel estimation and demodulation technique for both analog and digital communication technique using MATLAB or Python code.
8	Project work	Assignment I and Assignment-II



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Subject Name: Artificial Intelligence & Machine Learning Laboratory
Subject Code: PCCECE493
Credit: 2
Lab Hours: 36

Prerequisites: Data Structure & Algorithms,
Python programming using the libraries: Numpy, Pandas, Matplotlib

Course Objective:

Objective 1. The students will understand the basics concepts of Artificial Intelligence and Machine Learning models, including Deep Learning models.

Objective 2. They will also learn and will be able to apply different Artificial Intelligence and Machine Learning models (including Deep Learning) to various datasets.

Course Outcome:

CO 1: Students will be able to understand the foundational concepts for building on their knowledge in the domain, including Intelligent Agents, Nature of Agents, Learning Agents.

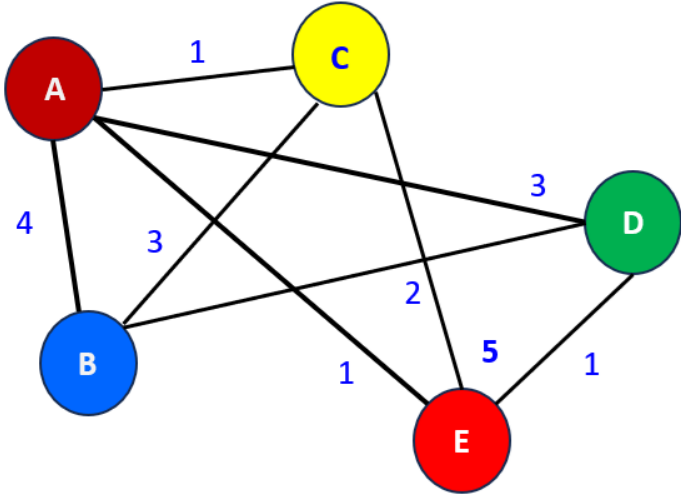
CO 2: Students will know the concept of Machine Intelligence through Learning from Data sets, as opposed to Pre-determined and pre-programmed Logic and search algorithms.

CO 3: The student will be able to understand and apply, depending on the individual cases, the different models for Supervised and Unsupervised Learning methodologies.

CO 4: Students will know the shortcomings of classical Machine Learning models and how Deep Learning model (includes Backpropagation with Gradient Descent) has been able to

overcome those to a significant extent. Students will be able to use Deep Learning models, e.g to analyze and classify images, and for Sequential and Time Series Data. Also will be

able to use Generative-AI for different applications in various domains.

Assignment Number	Topic	Sub-Topic	Mapping with Industry and International Academia
1	Lab Assignment on Classical AI (Uniform Cost Search)		

Corresponding Adjacency Matrix

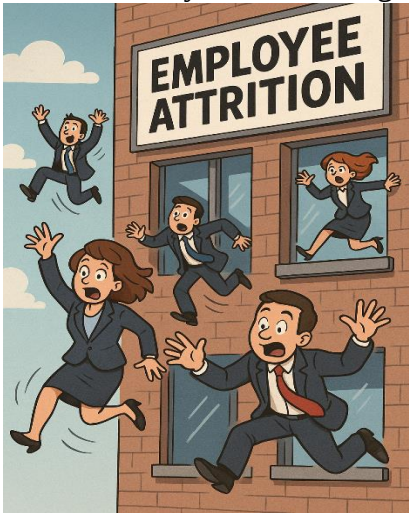
	A	B	C	D	E
A to all other	[0, 4, 1, 3, 1]				
B to all other	[4, 0, 3, 2, 0]				
C to all other	[1, 3, 0, 0, 5]				
D to all other	[3, 2, 0, 0, 1]				
E to all other	[1, 0, 5, 1, 0]				

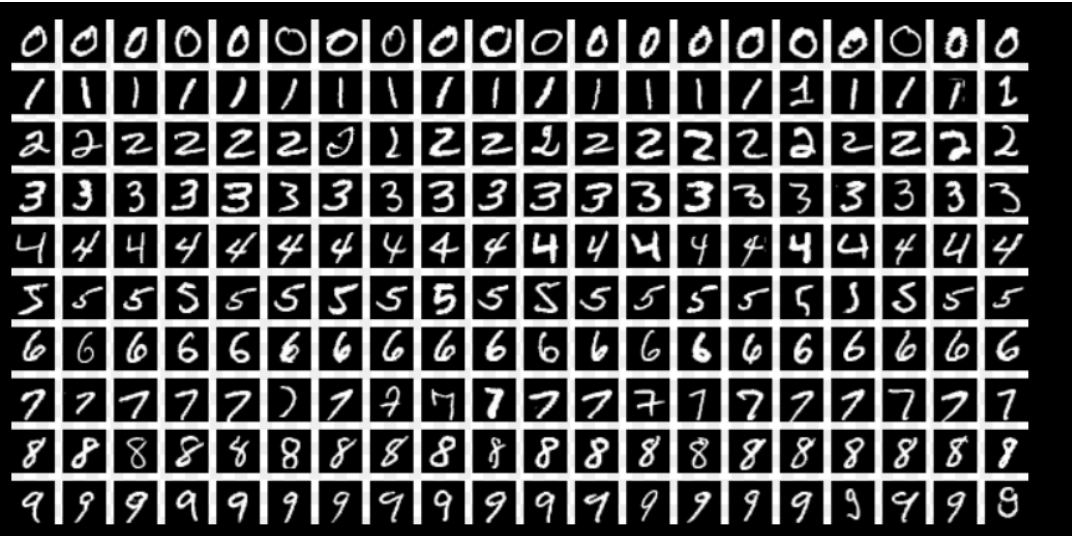
Implement Uniform Cost Search algorithm using C programming language to find the optimal path between A to D.

How to read the adjacency Matrix?

A to all other nodes reads like [0,4,1,3,1]. This means that the edge connecting A to B has cost 4, the edge connecting A to C has cost 1, the edge connecting A to D costs 3 and the edge connecting A to E costs 1. Likewise, you can read the adjacency matrix and tally with the graph. BTW the first entry 0 implies that there is no connection from A to A and hence there is no self-loop. Value 0 always mean no connectivity. B has no connectivity with E and hence 5th entry corresponding to B is 0.

2	Lab Assignment on Regression	This lab assignment will teach students the power of Linear Regression in understanding factors influencing the pricing of cars and to model the price of cars which could prove to be an effective way to understand and appreciate the importance of car price prediction for better market penetration.  Students shall also get introduced to various performance metrics like R Square, Adjusted R-Square, RMSE etc. and many other important concepts like that of multi-collinearity.	AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/UG_Emerging.pdf International Academia: https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-1-introduction-and-scope/ Basic Programs using Python from: https://onlinecourses.swayam2.ac.in/aic20_sp33/preview https://www.coursera.org/learn/introduction-tensorflow Industry Mapping: Python, TensorFlow Keras, PyTorch
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		Industry Application: Core application area is the Car industry. Techniques that will be learnt spin around dynamic pricing strategies which are even applicable for other industries like that of the airline. Also, the predictions about the price shall help in	
3	Lab Assignment on Classification	Analyzing Employee Attrition- Employee attrition refers to the gradual reduction in an organization's workforce due to employees leaving voluntarily or involuntarily and not being replaced immediately. Attrition is a natural part of business operations, but high or unplanned attrition can significantly affect an organization's performance, morale, and financial stability. Hence, in a business organization, employee attrition is a major threat. Performing some kind of Predictive Analytics is thus of great importance.  Industry Application: This lab assignment is of much use as a part of HR Analytics.	

4	Lab Assignment on Dimensionality Reduction	AI: Use t-SNE to reduce the MNIST dataset down to two dimensions and plot the result. You can use a scatterplot using 10 different colors to represent each image's target class. You can replace each dot in the scatterplot with the corresponding instance's class (and even plot scaled-down versions of the digit images themselves (if you plot all digits, it will be too cluttered, so, you should either draw a random sample or plot an instance only that has already been plotted at a close distance). You should get a nice visualization with clusters of digits. Try using other dimensionality reduction algorithms such as PCA, LLE, or UMAP and compare the resulting visualizations.  Industry Application: As a part of the Data-Centric AI approach innovated and initiated by Prof Andrew Ng of Stanford University, data pre-processing techniques is a must learn skill without which implementing ML/DL algorithms is an impossibility. Taking a cue from the above-mentioned point, dimensionality reduction techniques form one of the basic building pillars for Data analytics. Can you think of any other applications of dimensionality reduction techniques? It has been and actually used in multiple industry-based projects.	
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5	Lab Assignment on Clustering	On Sustainability and Air-Pollution Detection: Using some suitable dataset, students will be asked to perform clustering using various algorithms like K-Means, DB Scan etc. The ideas will help students to perform and understand the need for controlling Air-pollution which comes under Sustainability study.	AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/UG_Emerging.pdf
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International Academia:
<https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-1-introduction-and-scope/>

Basic Programs using Python from:
https://onlinecourses.swayam2.ac.in/ai-c20_sp33/preview
<https://www.coursera.org/learn/introduction-tensorflow>

Industry Mapping:
Python, TensorFlow Keras, PyTorch

		Industry Application: Immensely used in Sustainability domain which is one of the hot topics in present day research.	
6	Lab Assignment on Reinforcement Learning	The Lab Assignment on REINFORCEMENT LEARNING (RL) is given in the document in Google Drive, which can be accessed by the following link: https://drive.google.com/file/d/1zCJBtZRCjxfisif2W2YhW3iJO6iwYRfQU/view?usp=sharing The industrial and other real-world applications of REINFORCEMENT LEARNING (RL) are given in the following URLs: https://www.oreilly.com/radar/practical-applications-of-reinforcement-learning-in-industry/ https://neptune.ai/blog/reinforcement-learning-applications#:~:text=Some%20of%20the%20autonomous%20driving,by%20learning%20automatic%20parking%20policies.	

NOTE:

DATASETS for each lab module assignment are uploaded to the during the AI & ML Lab (PCCEC493) Google Classroom. Students are to download the relevant datasets for performing the respective lab assignments.

TEXTBOOKS:

1. ‘Artificial Intelligence with Python’ – by Prateek Joshi (Publisher: Packt, UK)
2. ‘Data Science and Machine Learning Using Python’ - by Reema Thareja ((2nd Ed, November 2025, McGraw Hill India)
3. ‘Hands-On Machine Learning with Scikit-Learn and PyTorch’ (Part-I: Machine Learning; Part-II: Deep Learning) - by Aurelien Geron, (O’Reilly, SPD India, December, 2025)

REFERENCE BOOKS:

4. ‘Python for Data Analysis’ – by Wes McKinney, (O’Reilly, 3rd edition, 2024)
5. ‘An Introduction to Statistical Learning – with Applications in Python’ by Gareth James, Daniela Witten, Trevor Hastie, Robert



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Tibshirani (Springer, 2023)

Subject Name: Digital Electronics Lab

Subject Code: PECEC492

Credit: 1

Total Lab Hours: 34

List of Experiments

Exp. No.	Experiment Title	Key Activities
1	Verification of Truth Tables of Basic Logic Gates	Breadboard implementation & VHDL/Verilog simulation of NOT, AND, OR, NAND, NOR, XOR.
2	Realization of various logic expression Using Universal Gates (NAND/NOR)	Deriving Boolean expression using only NAND/NOR gates (Breadboard + HDL).
3	Design and Verification of Full Adder and Full Subtractor	Realization using basic gates on a breadboard; HDL coding and waveform verification.
4	Implementation of a 4-bit Parallel Adder	IC-based implementation of Ripple Carry and Carry Look Ahead Adders; HDL model creation.
5	Study and Implementation of Multiplexer and De-Multiplexer	Design 4:1 MUX & 1:4 DEMUX using gates/ICs; HDL behavioral and structural modelling.
6	Realization of Boolean Expressions Using Multiplexer, Demultiplexer and decoder	Realize a given Boolean logic function using ICs; HDL behavioral and structural modelling
7	Study and Implementation of Flip-Flops (SR, JK, D, T)	Realization using ICs on a breadboard; HDL modelling with excitation table.

8	Design of Synchronous and Asynchronous Counters	Design Mod-10/8 counter on breadboard; HDL implementation and timing simulation.
9	Study and Implementation of Shift Registers	Design SISO and SIPO registers; HDL modelling and waveform analysis.
10	AI-Based Optimization Techniques in Digital System Design	Use AI (e.g., genetic algorithms) to optimize Boolean logic; compare with K-map and analyze HDL performance.

Course Outcomes (COs)

Upon successful completion of this course, students will be able to:

CO Code	Course Outcome
CO1	Understand and verify the operation of basic logic gates and combinational circuits using breadboard and HDL.
CO2	Design, implement, and simulate combinational circuits such as adders, subtractors, MUX/DEMUX.
CO3	Analyze and realize sequential circuits including flip-flops, counters, and shift registers on hardware and through HDL modeling.
CO4	Apply AI-based techniques for fault detection and optimization in digital circuits.