Government College of Engineering, Karad

(An Autonomous Institute of Govt. of Maharashtra)

Department of Information Technology

M. Tech. (Computer Science and Engineering)
Curriculum Structure

Academic Year: 2025-26 (Revised)

Institute Vision
To emerge as a technical Institute of national repute driven by excellence in imparting value-based education and innovation in research to face the Global needs of profession.
Institute Mission
To create professionally competent engineers driven with the sense of responsibility towards nature and society.
Department Vision
To provide value based high quality IT education by empowering every student to be an innovative and employable IT professional.
Department Mission
To offer graduate program in Information Technology for making students excellent IT professionals and encouraging them for higher studies, research and social responsibility.

Programme Educational Objectives (PEO):

PEO1	To make students eligible to undertake research problem.
PEO2	To build competency among students to take up jobs that require technical expertise and problem-solving ability.
PEO3	To inculcate readiness among students for self-learning.
PEO4	To build competency among students in applying technology to solve real-life socioeconomic problems.

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Programme Outcomes (PO):

The post-graduate students will demonstrate:

PO 1	An ability to independently carry out research /investigation and development work to solve practical problems
PO 2	An ability to write and present a substantial technical report/document
PO 3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
PO 4	Apply knowledge of artificial intelligence domain to identify, formulate and solve complex engineering problems
PO 5	Design, develop and deploy software using emerging IT technologies
PO 6	Ability to life-long self-learning and holistic development in the field of technology

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SCHEME OF INSTRUCTION & SYLLABI

Scheme of Instruction for First Year of M. Tech. (PG) Degree in Computer Science and Engineering

Semester – I (W.E.F. AY. 2025-26)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	EXAM SCHEME			
									MSE	ISE	ESE	TOTAL
1	PCC	CS2101	Mathematical foundations of Computer Science	3	-	-	3	3	20	20	60	100
2	PCC	**CS2110**	**Advanced Data Structures and Algorithms**	3	-	-	3	3	20	20	60	100
3	PEC	**CS21*3**	**Program Elective I**	3	-	-	3	3	20	20	60	100
4	PEC	**CS21*4**	**Program Elective II**	3	-	-	3	3	20	20	60	100
5	MDC	**RM2105**	**Research Methodology**	2	-	-	2	2	20	20	60	100
6	PCC	**CS2111**	**Laboratory 1(Advanced Data Structures and Algorithms)**	-	-	4	4	2	-	25	25	50
7	PEC	**CS2112**	**Laboratory 2 (Based on Elective I & II)**	-	-	4	4	2	-	50	-	50
8	OEC	OE21*8	Open Elective	3	-	-	3	3	20	20	60	100
9	MNC	AU21*9	Audit Course I	2	-	-	2	Audit	-	-	-	-
			Total	19	-	8	27	21	120	195	385	700

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE- In Semester Evaluation

ESE- End Semester Examination (For Laboratory End Semester performance)

*- Program Elective- I and II, Audit Course I, Open Elective list is provided at the end of structure.

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SCHEME OF INSTRUCTION & SYLLABI

Scheme of Instruction for First Year of M. Tech. (PG) Degree in Computer Science and Engineering

Semester – II (W.E.F. AY. 2025-26)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Credits	EXAM SCHEME			
									MSE	ISE	ESE	TOTAL
1	PCC	**CS2210**	**Advanced Computer Networks**	3	-	-	3	3	20	20	60	100
2	PCC	**CS2211**	**Soft Computing**	3	-	-	3	3	20	20	60	100
3	PEC	**CS22*3**	**Program Elective III**	3	-	-	3	3	20	20	60	100
4	PEC	**CS22*4**	**Program Elective IV**	3	-	-	3	3	20	20	60	100
5	PEC	**CS22*5**	**Program Elective V**	3	-	-	3	3	20	20	60	100
6	PCC	**CS2212**	**Laboratory 3 (Based on cores)**	-	-	4	4	2	-	25	25	50
7	PCC	**CS2216**	**Laboratory 4 (Based on Elective III & IV)**	-	-	4	4	2	-	50	-	50
8	P/S/IT	CS2208	Seminar	-	-	4	4	2	-	100	-	100
9	MNC	AU22*9	Audit Course II	2	-	-	2	Audit	-	-	-	-
			Total	17	-	12	29	21	100	225	325	700

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE- In Semester Evaluation

ESE- End Semester Examination (For Laboratory End Semester performance)

*- Program Elective- III, IV and V, Audit Course II list is provided at the end of structure.

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Scheme of Instruction for Second Year of M. Tech. (PG) Degree in Computer Science and Engineering

Semester – III (W.E.F. AY. 2025-26)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Credits	EXAM SCHEME			
									MSE	ISE	ESE	TOTAL
1	P/S/IT	CS2301	Dissertation Phase-I	-	-	14	14	07	-	100	100	200
2	MOOC	CS2302	MOOCs / OPEN COURSE (8-12 weeks)	-	-	-	-	03	-	-	100	100
			Total	00	00	14	14	10	-	100	200	300

Note:

1. CS2302 will be decided by respective Guide in Consultation with Program Coordinator. Course is mandatory for student and candidate dissertation phase I will be considered incomplete without this Mandatory MOOC Course.
2. In Case, the courses offered online are not completely relevant with the topic of dissertation then any course suggested by NASSCOM on recent technologies can be opted by candidate.

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE- In Semester Evaluation

ESE- End Semester Examination (For Laboratory End Semester performance)

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Scheme of Instruction for Second Year of M. Tech. (PG) Degree in Computer Science and Engineering

Semester – IV (W.E.F. AY. 2025-26)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Credits	EXAM SCHEME			
									MSE	ISE	ESE	TOTAL
1	P/S/IT	CS2401	Dissertation phase-II	-	-	32	32	16	-	100	200	300
			Total	-	-	32	32	16	-	100	200	300

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE- In Semester Evaluation

ESE- End Semester Examination (For Laboratory End Semester performance)

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SCHEME OF INSTRUCTION & SYLLABI

Scheme of Instruction for First and Second Year of M. Tech. (PG) Degree in Computer Science and Engineering

List of Electives

Program Elective I	Program Elective II	Program Elective III	Program Elective IV	Program Elective V
Semester - I	**Semester - I**	**Semester - II**	**Semester - II**	**Semester – II**
CS2143: Advanced Machine Learning	**CS2144: Data Engineering**	**CS2243: Big Data Analytics**	**CS2214:** Human Computer Interaction	**CS2245: Deep Learning**
CS2153: Cloud Computing and Applications	**CS2124:** Advanced Distributed Systems	**CS2253: Block Chain Technology**	CS2224: GPU Computing	**CS2255: Gen AI and Explainable AI**
CS2133: Introduction to Intelligent Systems	**CS2134:** Internet of Things	**CS2263: Computer Vision**	**CS2244: Cryptography and Cyber Security**	**CS2235:** Optimization Techniques

Audit Course I	Audit Course II	Open Elective
Semester – I	**Semester – II**	**Semester - I**
AU2119: Research Paper Writing	**AU2219:** Constitution of India	**OE2118:** Business Analytics
AU2129: Disaster Management	**AU2229:** Pedagogy Studies	**OE2128:** Industrial Safety
AU2139: Sanskrit for Technical Knowledge	**AU2239:** Stress Management by Yoga	**OE2138:** Operations Research
AU2149: Value Education	**AU2249:** Personality Development through Life Enlightenment Skills	**OE2148:** Cost Management of Engineering Projects
		OE2158: Composite Materials
		OE2168: Waste to Energy

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First Year (Sem-I) M. Tech. Computer Science & Engineering				
CS2101: Mathematical Foundations of Computer Science				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Interpret the basic notions of discrete and continuous probability.
CO2	Analyze the methods of statistical inference.
CO3	Perform correct and meaningful statistical analyses of simple to moderate complexity.

	Course Contents	CO	Hours
Unit 1	**Random Variables:** Discrete random variables: Random variables and their event spaces, Analysis of program MAX, Discrete random vectors, Independent random variables Continuous random variables: The exponential distribution, Reliability and failure rate, Functions of a random variables, Order statistics, Distribution of sums	**CO1**	**(06)**
Unit 2	**Probability:** Probability mass, Density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities.	**CO1**	**(06)**
Unit 3	**Markov Chains:** Discrete-Time Markov Chains: Introduction, Computation of n-step transition probabilities, State classification and limiting probabilities, Distribution of time between state changes, Markov modulated Bernoulli process, Irreducible finite chains with aperiodic states, The M/G/1 queuing system, Discrete time birth-death processes Continuous-Time Markov Chains: The birth- death process, Non-birth-death process, Markov chains with absorbing states.	**CO2**	**(08)**
Unit 4	**Stochastic Processes:** Introduction, Classification of stochastic processes, The Bernoulli process, The poison process, Renewal process, Availability analysis, Random analysis	**CO2**	**(07)**
Unit 5	**Regression and Analysis of Variance:** Introduction, Least-squares curve fitting, The coefficients of determination, Confidence intervals in linear regression, Trend detection and slope estimation, Correlation analysis, Analysis of variance.	**CO3**	**(07)**
Unit 6	**Statistical Inference:** Introduction, Parameter estimation, Hypothesis testing.	**CO3**	**(06)**

Text Books

1. John Vince, "Foundation Mathematics for Computer Science", Springer Cham, 2015. (Unit: 1,2,3,4,5,6)
2. K. Trivedi, "Probability and Statistics with Reliability, Queuing, and Computer Science Applications", Wiley Publication.

Reference Books

1. M. Mitzenmacher, E. Upfal, "Probability and Computing: Randomized Algorithms and Probabilistic Analysis", Cambridge University Press; 2nd Edition, 2017.
2. Alan Tucker, "Applied Combinatorics", Wiley, Wiley; 6th Edition, 2016.
3. T.Veerarajan, "Probability, Statistics and Random Process", Tata Mc-Graw Hill Co., 3rd Edition, 2016.
4. Norman L.Biggs, "Discrete Mathematics", 2nd edition, Oxford University Press, 2017.

Useful Links

1. https://nptel.ac.in/courses/111106102/ Prof. Soumen Maity, IISER, Pune.
2. https://nptel.ac.in/courses/122104017/ Prof. S. K. Ray, IIT, Kanpur.

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Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	1	2
CO 2	3	3	3	2	2	2
CO 3	3	3	3	2	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – I) M. Tech. Computer Science and Engineering				
CS2110: Advanced Data structures and Algorithms				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
CO2	Develop algorithms for text processing applications
CO3	Design and analyze programming problem statements
CO4	Comprehend and analyse algorithms using NP Completeness.

	Course Contents	CO	Hours
Unit 1	**Introduction:** Algorithms, Programs, Correctness, Efficiency. The major challenges. A quick recap of the basics. Asymptotic notation, Big O, Theta, Omega, little o, Recurrence relations, Master theorem. Algorithmic upper bounds, lower bounds, Need for Randomizing Data Structures and Algorithms, Skip Lists, Operations on Skip Lists, Probabilistic Analysis of Skip Lists.	**CO1**	**(07)**
Unit 2	**Divide and Conquer:** Simple examples of Divide and Conquer Technique. Analysis. Sorting Algorithms, Lower Bounds. Median in Linear time. Maximum Sub-array and Closest Pair of points. Decrease and Conquer variants	**CO1**	**(07)**
Unit 3	**Greedy Techniques:** Minimum Spanning Tree problem, Prims and Kruskals algorithms. Improving Kruskals algorithm using Union-Find data structure (log*(n) analysis). Splay Trees amortized analysis, Shortest Paths in Graphs, quick recall of BFS as shortest paths for unweighted graphs, Dijkstra's algorithm. (**Self Study:** Improving Dijsktra's algorithm with Fibonacci heaps)	**CO2**	**(07)**
Unit 4	**Dynamic Programming:** Bellman Ford Algorithm. Network Flows problem, Ford Fulkerson Method, Maxflow-MinCut Theorem, Edmonds-Karp implementation of Ford Fulkerson. Longest increasing subsequence, Knapsack with and without repetition, Independent set in trees.	**CO3**	**(07)**
Unit 5	**Text Processing:** String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence, Problem (LCS), Applying Dynamic Programming to the LCS Problem	**CO3**	**(06)**
Unit 6	**NP Completeness and Reductions:** Classes P, NP, co-NP. NP-Completeness and Reducibility, Approximation Algorithms. Set Cover log(n) approximation, 2-approximation for TSP,2-approximation for Vertex Cover. Parameterized Algorithms	**CO4**	**(06)**

Text Books

1. T. H. Cormen, C. E. Lieserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, MIT Pres. (Unit: 1,2,3,4,5,6)

Reference Books

1. S. Dasgupta, C. Papadimitrou, U Vazirani, "Algorithms", Mc Graw Hill
2. J. Klienberg and E. Tardos, "Algorithm Design", Pearson Education Limited
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2nd Edition, Pearson, 2004

Useful Links

1. https://nptel.ac.in/courses/106103069/ IIT Guwahati.
2. https://nptel.ac.in/courses/106104019/ IIT, Kanpur
3. https://nptel.ac.in/courses/106101060/ IIT, Bombay

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	3	2
CO 2	3	2	3	2	3	2
CO 3	3	2	3	2	3	2
CO 4	3	2	3	2	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – I) M. Tech. All (CM/SE/HPE/DE/PE/EPS/CSE)				
RM2105: Research Methodology				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs./week		MSE	20
Tutorials	--		ISE	20
Total Credits	02		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): The student will be able to:

1.	Understand basic concepts of various research areas, identify and define appropriate research topics concerned to Engineering and related areas.
2.	Prepare a research proposal to investigate the problem and achieve results/outcomes from the project.
3.	Develop skill of writing/publishing a research paper/topic in conferences and reputed journals.
4.	Illustrate need of information about Intellectual Property Right, Patent rights.

	Course Contents	Hours
Unit 1	**Introduction:** Meaning and objectives of research, Types of research, Research approaches, Research process, Research problem, Selection of research problem, defining research problem, Literature review, Meta-analysis, Effect sizes, Integrating research findings, identification of Research gaps, Errors in research.	**(04)**
Unit 2	**Data Collection and Analysis:** Primary data collection through observations and interviews, Questionnaire surveys, Secondary data collection, Data processing, Measures of central tendency and dispersion, mean, median, mode, range, variance, standard deviation, inter-quartile range, histogram.	**(04)**
Unit 3	**Research Design:** Meaning, need, and features of good design, Dependent, independent, and extraneous variables, Experimental and control groups, Treatments, Experiment, Research designs in exploratory studies, Research designs in descriptive studies, Experimental research designs **Sampling:** Need for sampling, Population, Normal distribution, Steps in sampling, sample size, errors in sampling, measurement techniques.	**(05)**
Unit 4	**Hypothesis Testing**: Null and alternative hypothesis, Level of significance, Type I and type II error, Two-tailed and one-tailed tests, Procedure of hypothesis testing, Preparation of ANOVA Table and calculation of F-ratio.	**(05)**
Unit 5	**Effective Technical Writing:** Research proposal, Technical Paper writing, Review paper, Report writing, Referencing **Research and publication Ethics:** Plagiarism, Citation, Journal indexing, Open access publishing. SCI journals, research ethics, principals and practice.	**(05)**
Unit 6	**IPR Patent Rights:** Patents, Trade and Copyright, Process of patenting, Licensing and transfer of technology, Geographical indications. New developments in IPR	**(05)**

Text Books

1.	C.R. Kothari, "Research Methodology Methods and Techniques, Second revised edition, New Age International Publisher, 2006 (Units 1 to 4)
2.	Montgomery, Douglas C. & Runger, George C. "Applied Statistics & Probability", 2007 (Unit 2 &3)
3.	S. K. Yadav, "Research and Publication Ethics", 1st edition, Springer publication, 2024 (Unit 5, 6)
4.	Paneer Selvam – Research Methodology

Reference Books

1.	Ranjit Kumar, (2006), "Research Methodology- A Step-By-Step Guide for Beginners", Pearson Education, Delhi
2.	Trochim, William M.K., "Research Methods", Biztantra, Dream tech Press, New Delhi, 2nd Edition, 2003
3.	Kalyan. C. Kanakala, "Fundamentals of Intellectual Property", Asia Law House, ISBN: 9789381849514, 1st edition, 2012
4.	Krishnaswamy, K. N., Sivakumar, Appa Iyer and Mathi Rajan, M. "Management Research Methodology:Integration of Principles, Methods and Techniques", Pearson Education, New Delhi, 2006
5.	Donald R. Cooper, Pamela S. Schindler, "Business Research Methods", Tata McGraw-Hill Co. Ltd., 8th Edition,2006

Useful Links

1.	https://www.explorable.com/research-methodology
2.	http://www.socscidiss.bham.ac.uk/methodologies.html
3.	http://www.humanities.manchester.ac.uk/studyskills/methodology.html
4.	http://www.palgrave.com/choosing-appropriate-research-methodologies

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	3	2	2	2	3
CO 3	3	3	2	1	1	3
CO 4	3	3	2	2	2	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	4	10
Understand	5	4	10
Apply	5	4	10
Analyse	5	4	10
Evaluate	-	4	10
Create	-	-	10
TOTAL	20	20	60

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Government College of Engineering, Karad					
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CS2111: Laboratory 1 (Advanced Data Structure and Algorithms)					
Laboratory Scheme:			**Examination Scheme:**		
Practical	04 Hrs/week		ISE	25	
Total Credits	02		ESE	25	

Course Outcomes (CO): Students will be able to	
CO1	Apply algorithmic approaches to solve the real-world problems.
CO2	Analyze the complexity of algorithms
CO3	Demonstrate Sorting Algorithms.
CO4	Implement various String Matching Algorithms with their performance comparisons.

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Operations on Skip Lists	**CO1**
Experiment 2	Sorting Algorithms	**CO1**
Experiment 3	Prims algorithm	**CO1**
Experiment 4	Kruskals algorithm	**CO1**
Experiment 5	Dijkstra's algorithm	**CO1**
Experiment 6	Bellman Ford Algorithm	**CO3**
Experiment 7	Maxflow- MinCut Theorem	**CO3**
Experiment 8	Edmonds-Karp implementation of Ford Fulkerson	**CO3**
Experiment 9	Knapsack with and without repetition	**CO3**
Experiment 10	Brute-Force Pattern Matching	**CO4**
Experiment 11	Boyer-Moore Algorithm	**CO4**
Experiment 12	Knuth Morris Pratt String Matching Algorithms	**CO4**
Experiment 13	Huffman Coding Algorithm	**CO4**
Experiment 14	Travelling Salesman Problem	**CO4**
Experiment 15	Parameterized Algorithm	**CO4**
List of Submission:		
	Minimum number of Experiments : 14	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	3	3	3	2	2
CO 3	2	2	2	2	3	2
CO 4	3	3	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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CS2112: Laboratory 2 (Based on Elective I & II)				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	50
Total Credits	02		ESE	-
Prerequisite :				

Course Outcomes (CO): Students will be able to	
CO1	Apply Transformer-based models (BERT, GPT) for natural language processing (NLP) applications like sentiment classification.
CO2	Implement a cloud-based disaster recovery system.
CO3	Design and implement batch data processing to load structured data (CSV, JSON) into relational databases and perform SQL-based data aggregation.
CO4	Analyze SHAP (Shapley Additive Explanations) and LIME (Local Interpretable Model-Agnostic Explanations) for model interpretability and explainability.

Course Contents		CO
Implementation of following concepts		
CS2143: Program Elective-I: Advanced Machine Learning		
Experiment 1	Implement Bayesian Linear Regression and Support Vector Machines (SVM) for classification.	**CO1**
Experiment 2	Train a CNN (ResNet, VGG, or EfficientNet) for image classification and object detection.	**CO1**
Experiment 3	Fine-tune a Transformer model (BERT/GPT) for sentiment classification.	**CO2**
Experiment 4	Train a Generative Adversarial Network (GAN) for image synthesis.	**CO2**
Experiment 5	Train an RL agent using Deep Q-Learning to play an Atari game.	**CO2**
Experiment 6	Apply SHAP & LIME for model interpretability and fairness evaluation.	**CO2**
CS2153: Program Elective-I: Cloud Computing and Applications		
Experiment 1	Explore different cloud deployment and service models (IaaS, PaaS, SaaS) on a cloud platform.	**CO2**
Experiment 2	Simulate VM migration and load balancing using CloudSim.	**CO3**
Experiment 3	Implement a cloud-based disaster recovery system.	**CO4**
Experiment 4	Implement security mechanisms in the cloud.	**CO4**
Experiment 5	Deploy a microservices-based application using Docker & Kubernetes.	**CO4**
Experiment 6	Compare AWS, Azure, and IBM Cloud for hosting a web application.	**CO2**
CS2133: Program Elective-I: Introduction to Intelligent Systems		
Experiment 1	Develop an artificial neural network using Python.	**CO3**
Experiment 2	Write a program for Fuzzy Logic using Python.	**CO1**
Experiment 3	Write a Python program to solve 8 queens problem	**CO4**
Experiment 4	Write a Python program to solve any problem using depth first search	**CO3**
Experiment 5	Write a Python program to solve any problem using best first search	**CO2**
Experiment 6	Write a Python program to solve traveling salesman problem.	**CO4**
CS2144: Program Elective-II : Data Engineering		
Experiment 1	Build a simple ETL (Extract, Transform, Load) pipeline using Python (using libraries like pandas, sqlalchemy, and pyspark) to load data into a relational database	**CO1**
Experiment 2	Create a batch process to extract data from a file (CSV, JSON), load it into a database, and perform an SQL query to aggregate and analyze the data.	**CO2**
Experiment 3	Build a simple real-time data pipeline using Apache Kafka or AWS Kinesis to ingest streaming data and process it in near real-time.	**CO3**
Experiment 4	Set up a MongoDB database, insert documents, and perform basic queries like filtering, updating, and deleting. Compare NoSQL data modeling (document-	**CO2**

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	based) vs relational data modeling	
Experiment 5	Design a document-based schema for an online shop using MongoDB. Insert sample data, and then perform aggregate operations to analyze sales.	**CO2**
Experiment 6	Set up a simple data lake in AWS S3 or Google Cloud Storage. Ingest structured (CSV) and unstructured (log files, images) data into the data lake and query using tools like AWS Athena or Google BigQuery	**CO4**
CS2124: Program Elective-II: Advanced Distributed Systems		
Experiment 1	Implementation of multi-threaded client/server processes	**CO1**
Experiment 2	Write a program to demonstrate process/code migration.	**CO2**
Experiment 3	Implementation of a distributed application using EJB.	**CO3**
Experiment 4	Create CORBA based server-client application.	**CO2**
Experiment 5	Implementation of an Election algorithm.	**CO4**
Experiment 6	Implementation of Banker"s Algorithm for avoiding Deadlock	**CO3**
CS2134: Program Elective-II: Internet of Things		
Experiment 1	Experiment based on IR sensor. Write an application tom detect obstacle and notify user using LED	**CO3**
Experiment 2	Experiment based on FIRE sensor. Write an application to detect Fire andnotify users using LED.	**CO2**
Experiment 3	Create a simple web interface using IoT kit to control the connected LEDs remotely through the interface	**CO4**
Experiment 4	Study and implement clustering and configuring devices using MPI library	**CO2**
Experiment 5	Study of different types of sensors, actuators	**CO3**
Experiment 6	Experiment based on IoT kit to control the operation of elevator operations	**CO4**
List of Submission:		
	Minimum number of Experiments : 12	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	3	2
CO 4	3	2	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad					
First Year (Sem – I) M. Tech. Computer Science & Engineering					
CS2143: Program Elective-I: Advanced Machine Learning					
Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	03		ESE	60	
			Duration of ESE	02 Hrs 30 Min	

Course Outcomes (CO): Students will be able to

CO1	Apply advanced supervised and unsupervised learning techniques.
CO2	Implement deep learning architectures for real-world tasks.
CO3	Develop probabilistic models and reinforcement learning solutions.
CO4	Utilize scalable ML, federated learning, and emerging AI trends.

	Course Contents	CO	Hours
Unit 1	**Advanced Supervised & Unsupervised Learning:** Advanced Regression & Classification: Bayesian Linear Regression, Elastic Net Regression, Multi-class and Multi-label Classification, Support Vector Machines with Kernel Tricks Clustering & Dimensionality Reduction: K-Means Variants, Hierarchical Clustering, PCA, Kernel PCA, Matrix Factorization	**CO1**	**(08)**
Unit 2	**Neural Networks & Deep Learning:** Neural Networks & Feature Learning: Deep Feedforward Networks, Dropout, Batch Normalization, Feature Learning and Transfer Learning. Convolutional Neural Networks (CNNs) & Applications: Architectures (ResNet, VGG, EfficientNet), Object Detection, Image Processing Recurrent Neural Networks (RNNs) & Attention Mechanisms: LSTM, GRU, Transformers (BERT, GPT)	**CO2**	**(08)**
Unit 3	**Generative & Probabilistic Models:** Generative Models: Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs). Graphical & Bayesian Models: Bayesian Networks, Markov Models, Probabilistic Graphical Models (PGMs)	**CO2**	**(07)**
Unit 4	**Reinforcement Learning & Decision-Making:** Reinforcement Learning Basics: MDPs, Bellman Equations, Q-learning. Deep Reinforcement Learning: Policy Gradient Methods, Actor-Critic Models, Deep Q Networks (DQN), (Self Study Multi-Agent Reinforcement Learning)	**CO3**	**(08)**
Unit 5	**Scalable & Distributed Machine Learning:** Online & Incremental Learning: Adaptive Models, Concept Drift Handling, Big Data & Distributed Training: Apache Spark ML, TensorFlow Distributed Training. Federated Learning & Edge AI: Privacy-Preserving ML, Decentralized Learning	**CO3**	**(07)**
Unit 6	**Emerging Trends & Applications** Explainable AI (XAI) & Trustworthy ML: SHAP, LIME, AI Fairness & Bias Mitigation Machine Learning for IoT & Smart Systems: TinyML, AutoML for Embedded AI. Quantum Machine Learning & Future Directions	**CO4**	**(06)**

Text Books

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 2nd Edition, MIT Press, 2023 (Units: 1, 3, 4)
2. Mohamed Elgendy , "Deep Learning for Vision Systems", Manning Publications, 2020 (Units: 2, 3, 4)
3. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 3rd Edition, O'Reilly Media, 2022 (Units: 5, 6)

Reference Books

1. Ethem Alpaydin , "Introduction to Machine Learning", MIT Press, 2010.
2. Richard S. Sutton, Andrew G. Barto , "Reinforcement Learning: An Introduction", MIT Press, 2nd Edition, 2018.
3. Christopher M. Bishop , "Pattern Recognition and Machine Learning", Springer, 2006.

Useful Links

1. https://nptel.ac.in/courses/106105152/ IIT Kharagpur

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2.	https://www.coursera.org/learn/machine-learning
3.	https://www.coursera.org/specializations/deep-learning

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	2	2
CO 4	3	2	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – I) M. Tech. Computer Science & Engineering				
CS2153: Program Elective-I: Cloud Computing and Applications				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Apply virtual machine migration and load balancing strategies to optimize resource utilization.
CO2	Design cloud architectures, including federated clouds, to meet specific application requirements.
CO3	Utilize containerization technologies like Docker and Kubernetes for efficient application deployment.
CO4	Analyze real-world case studies of cloud computing systems from major providers, evaluating their design and impact.

	Course Contents	CO	Hours
Unit 1	**Fundamentals of Cloud Computing** Fundamental concepts and Models, Characteristics of cloud computing, Cloud deployment models: Public, Private, Hybrid clouds, Cloud delivery models: IaaS, PaaS, SaaS, Cloud benefits, challenges, and risks rate.	**CO1**	**(07)**
Unit 2	**Enabling Technologies and System Models for Cloud Computing** Data-center architectures for cloud computing, virtualization technology, Virtual machine migration and load balancing, CloudSim: Simulation tools for cloud computing, Scalability, performance, and QoS in cloud computing.	**CO2**	**(07)**
Unit 3	**Cloud Computing Service Models and Architectures:** Infrastructure/Platform/Software-as-a-service models, Cloud architectures, including federated clouds, Cloud economics and capacity planning, Disaster recovery in cloud computing.	**CO2**	**(07)**
Unit 4	**Security, Privacy, and Risk Management in Cloud:** Security and privacy issues in cloud computing, Identity and access management, Cloud vendor management and selection, Security mechanisms and protocols, VMWare ESX Memory Management.	**CO3**	**(07)**
Unit 5	**Cloud Application Development and DevOps** Cloud-based application architecture, Micro services and containerization (e.g., Docker, Kubernetes) DevOps practices in the cloud, Server less computing and edge computing, Quantum computing and its implications for the cloud	**CO1, CO3**	**(06)**
Unit 6	**Case Studies and Emerging Trends:** In-depth case studies of cloud computing systems, Emerging trends in cloud technology, Edge computing and its applications, (case study of cloud systems from Amazon, Microsoft, and IBM).	**CO4**	**(06)**

Text Books

1. Thomas Erl_ Zaigham Mahmood_ Ricardo Puttini , "Cloud Computing Concepts, Technology & Architecture", Prentice Hall, 2013.(Unit: 1,2,3,4,5,6)
2. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy - An Enterprise Perspective on Risks and Compliance", O'Reilly Media, 2009

Reference Books

1. Guthrie, Forbes_Liebowitz, Matt_Atwell, Josh_Marshall, Nick_Lowe, Scott - Mastering VMware vSphere-John Wiley & Sons, 2013
2. Kevin Jackson - OpenStack Cloud Computing Cookbook-Packt Publishing, 2012
3. Nigel Poulton - Docker Deep Dive-Independently published (2018-02-11)
4. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski - Cloud Computing Principles and Paradigms (Wiley

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	Series on Parallel and Distributed Computing)-Wiley, 2011.
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs89/preview
2.	https://www.geeksforgeeks.org/what-is-cloudsim/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	3	2
CO 2	3	3	3	3	3	2
CO 3	3	2	3	3	3	3
CO 4	3	3	3	2	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
CS2133: Program Elective-I: Introduction to Intelligent Systems				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Demonstrate knowledge of the fundamental principles of intelligent systems.
CO2	Analyse and compare the relative merits of a variety of AI problem solving techniques

	Course Contents	CO	Hours
Unit 1	**Biological foundations to intelligent systems I:** Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks	**CO1**	**(09)**
Unit 2	**Biological foundations to intelligent systems II:** Fuzzy logic, knowledge, Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.	**CO1**	**(06)**
Unit 3	**Search Methods:** Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimization and search such as stochastic annealing and genetic algorithm.	**CO1**	**(07)**
Unit 4	**Knowledge representation and logical inference:** Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.	**CO2**	**(07)**
Unit 5	**Reasoning under uncertainty and Learning** Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning	**CO2**	**(06)**
Unit 6	**Recent trends in Fuzzy logic, Knowledge Representation**	**CO2**	**(05)**

Text Books

1. Luger G.F., Stubblefield W.A., "Artificial Intelligence: Structures and strategies for Complex Problem Solving", Addison Wesley, 6th Edition, 2008. (Unit: 1,2,3)
2. Russell S., Norvig P., "Artificial Intelligence: A Modern Approach", Prentice-Hall, 3rd Edition, 2009. (Unit: 1,2,3,4,5,6)
3. Martin T. Hagan, Howard B. Demuth, and Mark Beale, "Neural Network Design", PWS Publishing Company, Boston, 1996

Reference Books

1. Grosan, Crina, Abraham, Ajith, "Intelligent Systems: A Modern Approach", Springer.
2. Geoff Hulten, "Building Intelligent Systems: A Guide to Machine Learning Engineering", Apress.
3. Luger G.F., Stubblefield W.A,"Artificial Intelligence: Structures and strategies for Complex Problem Solving" Addison Wesley, 6th Edition.
4. Timothy S.Ross, "Fuzzy Logic with engineering applications", Weily India Pvt. Ltd., 2011

Useful Links

1. https://nptel.ac.in/courses/106105077/ IIT, Kharagpur
2. https://nptel.ac.in/courses/108104049/ IIT, Kanpur

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
CS2144: Program Elective-II: Data Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the role of data engineers and construct batch and streaming data pipelines using SQL, NoSQL, and cloud storage solutions.
CO2	Apply ETL/ELT processes for data ingestion, transformation, and integration from APIs, logs, and web sources using Apache Airflow.
CO3	Utilize HDFS, Apache Spark, and Kafka to perform distributed computing and real-time data processing.
CO4	Implement cloud-native data pipelines, serverless architectures, and CI/CD workflows for scalable data engineering solutions.

	Course Contents	CO	Hours
Unit 1	**Introduction to Data Engineering** Role of a Data Engineer vs. Data Scientist, Data Pipelines: Definition and Components, Overview of Data Architecture: Batch vs. Streaming Data, Basics of SQL & NoSQL Databases.	**CO1**	**(06)**
Unit 2	**Data Storage and Management** Relational Databases (PostgreSQL, MySQL), NoSQL Databases (MongoDB, Cassandra), Data Warehousing Concepts (OLAP, Data Lakes), Cloud Storage (AWS S3, Google Cloud Storage, Azure Blob).	**CO1**	**(07)**
Unit 3	**Data Ingestion and ETL Pipelines** ETL vs. ELT: Extract, Transform, Load Process, Data Ingestion from APIs, Logs, and Files, Web Scraping and Automated Data Collection, Data Transformation using Apache Airflow.	**CO2**	**(07)**
Unit 4	**Big Data Processing** Distributed Computing and Storage (HDFS, Apache Spark), Batch Processing vs. Stream Processing, Introduction to Apache Kafka for Real-Time Data, Data Processing with Spark (PySpark).	**CO3**	**(07)**
Unit 5	**Cloud Data Engineering** Cloud-based Data Pipelines (AWS Glue, GCP Dataflow), Serverless Data Processing (AWS Lambda, Azure Functions), Kubernetes and Docker for Data Engineering, CI/CD Pipelines for Data Engineering.	**CO4**	**(07)**
Unit 6	**Advanced Topics and Trends** Data Governance, Security, and Compliance, Data Modeling & Performance Optimization, Data Versioning and Monitoring, Future of Data Engineering (DataOps, MLOps).	**CO4**	**(06)**

Text Books

1. Joe Reis & Matt Housley, "Fundamentals of Data Engineering", O'Reilly Media, 2022. Unit (1, 3, 5, 6)
2. Martin Kleppmann, "Designing Data-Intensive Applications", O'Reilly Media, 2017. Unit (2, 4, 5)
3. Ralph Kimball, "The Data Warehouse Toolkit", Wiley, 2013. Unit (2, 6)

Reference Books

1. Holden Karau, "Big Data Processing with Apache Spark", O'Reilly Media, 2019.
2. Gareth Eagar, "Data Engineering on AWS", Packt Publishing, 2023

Useful Links

1. https://onlinecourses.nptel.ac.in/noc19_cs60/ Prof. Raghunathan Rengasamy & Prof. Shankar Narasimhan IIT Madras
2. https://onlinecourses.nptel.ac.in/noc21_cs06/ Prof. Pabitra Mitra IIT Kharagpur Madras

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3.	https://onlinecourses.swayam2.ac.in/ntr24_ed70/ Teachers Training and Research, Kolkata	Prof. Chandan Chakraborty	National Institute of Technical

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	3	2	3	2
CO 2	3	2	3	3	3	2
CO 3	3	2	3	3	3	2
CO 4	3	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
CS2124: Program Elective-II: Advanced Distributed Systems				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Design trends in distributed systems.
CO2	Evaluate the concepts of network virtualization.
CO3	Compile remote method invocation and objects

	Course Contents	CO	Hours
Unit 1	**Introduction:** Distributed data processing, Definition DDBS, Advantages and disadvantages of DDBS, Problem areas, Overview of database and computer network concepts. Distributed database management system architecture: Transparencies in a distributed DBMS, Distributed DBMS architecture, Global directory issues.	**CO1**	**(08)**
Unit 2	**Distributed database design:** Alternative design strategies, Distributed design issues, Fragmentation, Data allocation, Semantics data control: View management; Data security, Semantic Integrity Control, Query processing issues: Objectives of query processing; Characterization of query processors, Layers of query processing, Query decomposition, Localization of distributed data.	**CO1**	**(08)**
Unit 3	**Distributed query optimization:** Factors governing query optimization, Centralized query optimization, Ordering of fragment queries, Distributed query optimization algorithms Transaction management: The transaction concept, Goals of transaction management; Characteristics of transactions, Taxonomy of transaction models Concurrency control: Concurrency control in centralized database systems, Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management.	**CO2**	**(08)**
Unit 4	**Reliability:** Reliability issues in DDBSs, Types of failures, Reliability techniques, Commit protocols, Recovery protocols	**CO2**	**(08)**
Unit 5	**Parallel database systems:** Parallel architectures, parallel query processing and optimization, load balancing	**CO3**	**(04)**
Unit 6	**Advanced topics:** Mobile Databases, Distributed Object Management, Multi-databases	**CO3**	**(04)**

Text Books

1. M.T. Ozsu, P. Valduriez, "Principles of Distributed Database Systems", Prentice-Hall. (Unit: 1,2,3,4,5,6)
2. D. Bell, J. Grimson, "Distributed Database Systems", Addison-Wesley

Reference Books

1. Andrew S. Tanenbaum, "Distributed Systems: Principles and Paradigms", Pearson Prentice Hall, 2nd Edition.
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", Pearson Publication, 4th Edition.
3. Pradeep K. Sinha "Distributed Operating Systems", Prentice Hall of India Private Limited
4. Thomas Erl, "Service Oriented Architecture : Concepts, Technology and Design" Prentice Hall
5. G. Coulouris, J. Dollimore, T. Kindberg, "Distributed Systems: Concepts and Design",Addison Wesley; 4th Edition

Useful Links

1. https://nptel.ac.in/courses/106106168/ IIT, Patna
2. https://nptel.ac.in/courses/106106107/ IIT, Madras

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
CS2134: Program Elective-II: Internet of Things				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Describe requirements from emerging Smart applications, communication systems, protocols and middleware.
CO2	Compare and analyze communication and network protocols used in IoT
CO3	Assess and evaluate mechanisms and algorithms for time synchronization, security and localization in WSNs and IoT.
CO4	Impart knowledge of hardware, operating systems, distributed systems, networking, security and databases required for IoT technology

	Course Contents	CO	Hours
Unit 1	**Introduction and Applications:** Smart transportation, smart cities, smart Living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software, Interoperability, Big Data and Big Data Mining, Privacy and Security.	**CO1**	**(08)**
Unit 2	**IoT Reference Architecture:** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints hardware, Data representation and visualization, Interaction and remote control.	**CO1**	**(07)**
Unit 3	**Industrial Automation:** Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things. Commercial Building Automation- Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.	**CO2**	**(07)**
Unit 4	**Hardware Platform for IoT:** Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, Routing: Transport Protocols, Network Security, Middleware, Databases.	**CO2**	**(08)**
Unit 5	**IOT Physical Devices & Endpoints:** What is an IOT Device, Exemplary Device Board, Linux on Raspberry, Interface and Programming & IOT Device.	**CO3**	**(05)**
Unit 6	**Recent trends in IoT with case studies:** Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT.	**CO4**	**(05)**

Text Books

1. Mandler B., Barja J., Campista Mitre, M.E., Cagá_ová, D. Chaouchi, H. Zeadally, S. Badra, M. Giordano, S. Fazio, M. Somov, A. Vieriu, R.-L., "Internet of Things. IoT Infrastructures", Springer International Publishing, Second International Summit, IoT 360° 2015, Rome, Italy, October 27-29, 2015. Revised Selected Papers, Part I. (Unit : 1,2,3)
2. Kyung, C.-M., Yasuura, H. Liu, Y. Lin, Y.-L., "Smart Sensors and Systems", Springer. International Publishing,2017. (Unit: 4,5,6)

Reference Books

1. Hersent Olivier, Boswarthick David , Elloumi Omar , "The Internet of Things: Key Applications and Protocols", Wiley-Blackwell, 2nd Edition ,2012

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Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc22_cs53/preview Mr. Sudip Misra IIT, Kharagpur

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	2	2
CO 4	3	2	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
OE2118: Open Elective: Business Analytics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Organize the knowledge of data analytics.
CO2	Demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO3	Demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
CO4	Formulate the ability to translate data into clear, actionable insights.

	Course Contents	CO	Hours
Unit 1	**Business analytics:** Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.	**CO1**	**(09)**
Unit 2	**Trendiness and Regression Analysis:** Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology	**CO1**	**(08)**
Unit 3	**Organization Structures of Business analytics:** Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization	**CO2**	**(09)**
Unit 4	**Forecasting Techniques:** Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	**CO3**	**(10)**
Unit 5	**Decision Analysis:** Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	**CO3**	**(08)**
Unit 6	**Recent trends:** Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	**CO4**	**(04)**

Text Books

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications", Pearson FT Press, 2014. (Unit : 1,2,3,4)
2. James Evans, "Business Analytics", persons Education, 2nd Edition, 2015. (Unit:5,6)

Reference Books

1. Jeffrey D. Camm , James J. Cochran , Michael J. Fry , Jeffrey W. Ohlmann , David R. Anderson, "Business Analytics", South-Western College Pub; 3rd edition,2018.

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2.	S. Christian Albright, Wayne L. Winston, "Business Analytics: Data Analysis & Decision Making" ,South-Western College Pub; 6th edition, 2016
Useful Links	
1.	https://nptel.ac.in/courses/110105089/ IIT Kharagpur

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	3	2
CO 4	3	2	3	3	3	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
OE2128: Open Elective: Industrial Safety				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Plan and use of industrial safety techniques and fundamentals of industrial safety.
CO2	Appraise the periodic and preventive maintenance concepts.

	Course Contents	CO	Hours
Unit 1	**Industrial safety:** Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety colour codes. Fire prevention and firefighting, equipment and methods.	**CO1**	**(08)**
Unit 2	**Fundamentals of maintenance engineering:** Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement.	**CO1**	**(08)**
Unit 3	**Wear and Corrosion and their prevention:** Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications: Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication Side feed lubrication, Ring lubrication, Definition, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.	**CO1**	**(10)**
Unit 4	**Fault tracing:** Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment"s like, Any one machine tool, Pump, Air compressor. Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.	**CO2**	**(10)**
Unit 5	**Periodic and preventive maintenance:** Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.	**CO2**	**(10)**
Unit 6	**Steps/procedure for periodic and preventive maintenance** of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	**CO2**	**(04)**

Text Books

1. Lester Coridon Morrow Lindley R. Higgins, "Maintenance engineering handbook", McGraw- Hill, 3rd Edition. (Unit: 1,2,34,5,6)
2. H.P. Garg," Industrial Maintenance", S. Chand and Co; 3rd Edition,1987.

Reference Books

1. Audels, "Pump-hydraulic Compressors", Mcgrew Hill Publication.
2. Winterkorn, "Hans Foundation Engineering Handbook", Chapman & Hall London.

Useful Links

1. https://nptel.ac.in/courses/110105094/ IIT Kharagpur

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2.	https://nptel.ac.in/courses/112107143/ IIT Roorkee

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	3	2	3	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
First Year (Sem-I) M. Tech. Computer Science & Engineering					
OE2138: Open Elective: Operations Research					
Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	03		ESE	60	
			Duration of ESE	02 Hrs 30 Min	

Course Outcomes (CO): Students will be able to

CO1	Apply the dynamic programming to solve problems of discreet and continuous variables.
CO2	Illustrate the concept of non-linear programming.
CO3	Formulate the sensitivity analysis.
CO4	Model the real-world problem and simulate it.

	Course Contents	CO	Hours
Unit 1	**Optimization Techniques:** Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.	**CO1**	**(09)**
Unit 2	**Formulation of a LPP:** Graphical solution revised simplex method, duality theory, dual simplex method, sensitivity analysis, parametric programming.	**CO1**	**(08)**
Unit 3	**Nonlinear programming problem:** Kuhn-Tucker conditions min cost flow problem, max flow problem, CPM/PERT	**CO2**	**(06)**
Unit 4	**Scheduling and sequencing:** Single server and multiple server models, deterministic inventory models, Probabilistic inventory control models, Geometric Programming.	**CO2**	**(09)**
Unit 5	**Competitive Models:** Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks,	**CO3**	**(08)**
Unit 6	**Graph Theory:** Elementary Graph Theory, Game Theory Simulation.	**CO4**	**(04)**

Text Books

1. H.A. Taha, "Operations Research, An Introduction", PHI, 2008. (Unit : 1,2,3,4,5,6)
2. H.M. Wagner, "Principles of Operations Research", PHI, Delhi.

Reference Books

1. J. C. Pant, "Introduction to Optimisation: Operations Research", Jain Brothers, Delhi, 2008.
2. Hitler Libermann "Operations Research",McGraw Hill Pub., 2009.
3. Pannerselvam, "Operations Research",,Prentice Hall of India, 2010.
4. Harvey M Wagner, "Principles of Operations Research", Prentice Hall of India, 2010.

Useful Links

1. https://nptel.ac.in/courses/110106062/ IIT Madras
2. https://nptel.ac.in/courses/112106134/ IIT Madras

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	3	3	2
CO 2	3	2	2	3	2	2
CO 3	2	3	3	2	2	2
CO 4	3	3	3	3	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

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Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
First Year (Sem-I) M. Tech. Computer Science & Engineering					
OE2148: Open Elective: Cost Management of Engineering Projects					
Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	03		ESE	60	
			Duration of ESE	02 Hrs 30 Min	

Course Outcomes (CO): Students will be able to

CO1	Develop the knowledge cost management process and project.
CO2	Organize Quantitative techniques for cost management.

	Course Contents	CO	Hours
Unit 1	**Introduction and Overview of the Strategic Cost Management Process:** Cost concepts in decision-making, Relevant cost, Differential cost, Incremental cost and Opportunity cost, Objectives of a Costing System, Inventory valuation, Creation of a Database for operational control, Provision of data for Decision-Making	**CO1**	**(09)**
Unit 2	**Project:** Meaning, Different types, why to manage, cost overruns centers, various stages of project Execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents	**CO1**	**(09)**
Unit 3	**Project Team:** Role of each member, Importance Project site, Data required with significance, Project contracts, Types and contents. Project execution Project cost control. Bar charts and Network diagram.	**CO1**	**(08)**
Unit 4	**Project commissioning:** Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing, Distinction between Marginal Costing and Absorption Costing, Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector	**CO2**	**(10)**
Unit 5	**Planning and Management:** Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control, Flexible Budgets, Performance budgets, Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.	**CO2**	**(08)**
Unit 6	**Quantitative techniques for cost management:** Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.	**CO2**	**(04)**

Text Books

1. "Cost Accounting A Managerial Emphasis", Prentice Hall of India, New Delhi. (Unit : 1,2,3,4,5,6)
2. Charles T. Horngren and George Foster, "Management & Cost Accounting".

Reference Books

1. Robert S Kaplan Anthony A. Alkinson,"Management & Cost Accounting".
2. Ashish K. Bhattacharya, "Principles & Practices of Cost Accounting",A. H. Wheeler publisher.
3. N.D. Vohra, "Quantitative Techniques in Management", Tata McGraw Hill Book Co. Ltd.

Useful Links

1. https://nptel.ac.in/courses/105104161/8 IIT Kanpur

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	3	2	3	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
First Year (Sem-I) M. Tech. Computer Science & Engineering					
OE2158: Open Elective: Composite Materials					
Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	03		ESE	60	
			Duration of ESE	02 Hrs 30 Min	

Course Outcomes (CO): Students will be able to

CO1	Interpret the manufacturing of metal matrix composites.
CO2	Appraise the basics of Manufacturing of polymer matrix composites.

	Course Contents	CO	Hours
Unit 1	**Introduction:** Definition, Classification and characteristics of Composite materials, Advantages and application of composites, Functional requirements of reinforcement and matrix, Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	**CO1**	**(09)**
Unit 2	**Reinforcements:** Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures, Isostrain and Isostress conditions.	**CO1**	**(08)**
Unit 3	**Manufacturing of Metal Matrix Composites:** Casting: Solid State diffusion technique, Cladding: Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites, Liquid Metal Infiltration, Liquid phase sintering, Manufacturing of Carbon, Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	**CO1**	**(10)**
Unit 4	**Manufacturing of Polymer Matrix Composites:** Preparation of Molding compounds and prepregs, hand layup method, Autoclave method, Filament winding method, Compression molding , Reaction injection molding, Properties and applications	**CO2**	**(07)**
Unit 5	**Strength:** Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure, Laminate first play failure- insight strength,	**CO2**	**(09)**
Unit 6	Laminate strength-ply discount truncated maximum strain criterion, strength design using caplet plots, Stress concentrations.	**CO2**	**(04)**

Text Books

1. R.W.Cahn," Material Science and Technology – Vol 13" Composites by VCH, West Germany. (Unit : 1,2,3,4,5,6)
2. WD Callister, Jr., Adapted by R. Balasubramaniam, "Materials Science and Engineering, An introduction". John Wiley & Sons, NY, Indian edition, 2007.

Reference Books

1. Lubin." Hand Book of Composite Materials".
2. K.K.Chawla. "Composite Materials".
3. Deborah D.L. Chung "Composite Materials Science and Applications".
4. Danial Gay, Suong V. Hoa, and Stephen W. Tasi." Composite Materials Design and Applications".

Useful Links

1. https://nptel.ac.in/courses/101104010/ IIT Kanpur
2. https://nptel.ac.in/courses/112104229/ IIT Kanpur

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	3	2	3	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
OE2168: Open Elective: Waste to Energy				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Sketch the use of waste to energy concepts.
CO2	Aware about Biomass, Biogas and its applications

	Course Contents	CO	Hours
Unit 1	**Introduction to Energy from Waste:** Classification of waste as fuel, Agro based, Forest residue, Industrial waste, MSW, Conversion devices, Incinerators, gasifiers, digesters	**CO1**	**(07)**
Unit 2	**Biomass Pyrolysis:** Types, slow fast, Manufacture of charcoal, Methods, Yields and application, Manufacture of pyrolytic oils and gases, yields and applications	**CO1**	**(08)**
Unit 3	**Biomass Gasification:** Gasifiers , Fixed bed system, Downdraft and updraft gasifiers, Fluidized bed gasifiers, Design, construction and operation, Gasifier burner arrangement for thermal heating, Gasifier engine arrangement and electrical power , Equilibrium and kinetic consideration in gasifier operation.	**CO1**	**(09)**
Unit 4	**Biomass Combustion:** Biomass stoves, Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.	**CO2**	**(08)**
Unit 5	**Biogas:** Properties of biogas (Calorific value and composition), Biogas plant technology and status, Bio energy system, Design and constructional features, Biomass resources and their classification, Biomass conversion processes, Thermochemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion , anaerobic digestion , Types of biogas Plants	**CO2**	**(12)**
Unit 6	**Applications:** Alcohol production from biomass, Bio diesel production and Urban waste to energy conversion, Biomass energy programme in India.	**CO2**	**(04)**

Text Books

1. Desai, Ashok V , "Non-Conventional Energy", Wiley Eastern Ltd., 1990 . (Unit : 1,2,3,4,5,6)
2. Khandelwal, K. C. and Mahdi, S. S., "Biogas Technology - A Practical Hand Book", Vol. I & II, Tata McGraw Hill Publishing Co. Ltd..

Reference Books

1. Challal, D. S Food, "Feed and Fuel from Biomass", IBH Publishing Co. Pvt. Ltd., 1991.
2. C. Y. WereKo-Brobby and E. B. Hagan," Biomass Conversion and Technology", John Wiley & Sons, 1996.

Useful Links

1. https://nptel.ac.in/courses/103107125/ IIT Roorkee.

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Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
First Year (Sem-I) M. Tech. Computer Science & Engineering					
AU2119: Audit Course – 1: Research Paper Writing					
Teaching Scheme			**Examination Scheme**		
Lectures	02 Hrs/week		MSE	-	
Tutorials	00 Hrs/week		ISE	-	
Total Credits	Audit		ESE	-	

Course Outcomes (CO): Students will be able to

CO1	Improve writing skills and level of readability.
CO2	Discriminate what to write in each section.
CO3	Upgrade the skills needed when writing a title.

	Course Contents	CO	Hours
Unit 1	**Planning and Preparation:** Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	**CO1**	**(04)**
Unit 2	**Clarifying Who Did What:** Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	**CO1**	**(04)**
Unit 3	**Review of the Literature:** Methods, Results, Discussion, Conclusions, The Final Check.	**CO2**	**(04)**
Unit 4	**Key skills are needed when writing a Title:** key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature	**CO2**	**(04)**
Unit 5	**Skills are needed when writing the Methods:** skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	**CO3**	**(04)**
Unit 6	**Useful phrases:** how to ensure paper is as good as it could possibly be the first- time submission	**CO3**	**(04)**

Text Books

1. Goldbort R, "Writing for Science", Yale University Press, 2006. (Unit : 1,2,3,4,5,6)
2. Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.

Reference Books

1. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM, Highman's book, 1998.
2. Adrian Wallwork, "English for Writing Research Papers", Springer New York Dordrecht Heidelberg London, 2011.

Useful Links

1. https://nptel.ac.in/courses/109106094/34 IIT Madras

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	3	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

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Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
AU2129: Audit Course – 1: Disaster Management				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to	
CO1	Illustrate key concepts in disaster risk reduction and humanitarian response.
CO2	Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

	Course Contents	CO	Hours
Unit 1	**Introduction:** Disaster: Definition, Factors and Significance, Difference Between Hazard And Disaster, Natural and Manmade Disasters: Difference, Nature, Types And Magnitude.	**CO1**	**(04)**
Unit 2	**Repercussions of Disasters And Hazards:** Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides and Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts	**CO1**	**(04)**
Unit 3	**Disaster Prone Areas in India Study of Seismic Zones:** Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases and Epidemics	**CO2**	**(04)**
Unit 4	**Disaster Preparedness and Management Preparedness:** Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and Community Preparedness.	**CO2**	**(04)**
Unit 5	**Risk Assessment Disaster Risk:** Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Cooperation in Risk Assessment and Warning, People"s Participation in Risk Assessment. Strategies for Survival.	**CO3**	**(04)**
Unit 6	**Disaster Mitigation Meaning:** Concept And Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.	**CO3**	**(04)**

Text Books

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book company. (Unit : 1,2,3,4,5,6)
2. Sahni, Pardeep Et.Al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

Reference Books

1. Goel S. L., "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

Useful Links

1. https://nptel.ac.in/courses/105104183 IIT Kanpur

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Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	1	2
CO 2	3	3	3	2	1	3
CO 3	3	2	3	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
AU2139: Audit Course – I: Sanskrit for Technical Knowledge				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to	
CO1	Demonstrate the basic Sanskrit language.
CO2	Acquire the knowledge of ancient Sanskrit literature about science & technology.
CO3	Being a logical language that will help to develop logic in students Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

	Course Contents	CO	Hours
Unit 1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.	**CO1**	**(04)**
Unit 2	Order, Introduction of roots.	**CO1**	**(04)**
Unit 3	Technical information about Sanskrit Literature.	**CO2**	**(04)**
Unit 4	Technical concepts of Engineering-Electrical.	**CO2**	**(04)**
Unit 5	Technical concepts of Engineering - Mechanical, Architecture.	**CO3**	**(04)**
Unit 6	Technical concepts of Engineering – Mathematics.	**CO3**	**(04)**

Text Books	
1.	Dr.Vishwas, "Abhyaspustakam", Samskrita-Bharti Publication, New Delhi.
2.	Prathama Deeksha-Vempati Kutumbshastri, "Teach Yourself Sanskrit", Rashtriya Sanskrit Sansthanam, New Delhi Publication.
Reference Books	
1.	Suresh Soni, "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi.
Useful Links	
1.	https://nptel.ac.in/courses/109105135/ IIT Kharagpur

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	3	2	1	2
CO 2	2	1	3	2	1	3
CO 3	2	1	3	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-I) M. Tech. Computer Science & Engineering				
AU2149: Audit Course – I: Value Education				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to

CO1	Acquire the knowledge of self-development.
CO2	Learn the importance of Human values.
CO3	Developing the overall personality.

	Course Contents	CO	Hours
Unit 1	**Values and self-development:** Social values and individual attitudes. Work ethics, Indian vision of humanism, Moral and non- moral valuation. Standards and principles, Value judgments.	**CO1**	**(04)**
Unit 2	**Importance of cultivation of values:** Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline.	**CO1**	**(04)**
Unit 3	**Personality and Behavior Development:** Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance.	**CO2**	**(04)**
Unit 4	**True friendship:** Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.	**CO2**	**(04)**
Unit 5	**Character and Competence:** Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility.	**CO3**	**(04)**
Unit 6	**Role of Women**: All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively.	**CO3**	**(04)**

Text Books

1. Chakroborty, S.K., "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

Reference Books

1. Saxena A, "Human Values And Professonal Ethics", Vayu Education Of India, 2012

Useful Links

1. https://nptel.ac.in/courses/109104068/-IIT Kanpur

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	3	2	1	2
CO 2	3	1	3	2	1	3
CO 3	3	1	2	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

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Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2210: Advanced Computer Networks				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamentals of wireless sensor networks.
CO2	Identify their applications of wireless sensor networks in critical real-time scenarios.
CO3	Explain the various protocols at different layers and compare them with traditional networking protocols.
CO4	Analyse the key issues in sensor networks and evaluate the challenges associated with managing them.

	Course Contents	CO	Hours
Unit 1	**Networking:** Internet and Intranet, Protocol layer and their services, Network Applications like Web, HTTP, FTP and Electronic Mail in the Internet, Domain Name System, Transport-Layer Services, Multiplexing and Demultiplexing, UDP, TCP, TCP Congestion Control, Network Layer, Virtual Circuit and Datagram Networks, Need of Router, The Internet Protocol (IP), Routing Algorithms, Routing in the Internet.	**CO1**	**(07)**
Unit 2	**Network Virtualization:** Need for Virtualization, The Virtual Enterprise, Transport Virtualization-VNs, Central Services Access: Virtual Network Perimeter, A Virtualization Technologies primer: theory, Network Device Virtualization, Data-Path Virtualization, Control-Plane Virtualization, Routing Protocols.	**CO1**	**(07)**
Unit 3	**Wireless Sensor networks:** Need and application of sensor networks, sensor networks design considerations, empirical energy consumption, sensing and communication range, design issues, localization scheme, clustering of SNs, Routing layer, Sensor networks in controlled environment and actuators, regularly placed sensors, network issues, RFID as passive sensors.	**CO2**	**(07)**
Unit 4	**Adhoc Networking:** Introduction, application of MANET, challenges, Routing in Ad hoc networks, topology & position based approaches, Routing protocols: topology based, position based, Broadcasting, Multicasting, & Geocasting, Wireless LAN, Transmission techniques, MAC protocol issues, Wireless PANs, The Bluetooth technology.	**CO2**	**(07)**
Unit 5	**VANET:** Introduction: Challenges and Requirements, Mobility models in VANET, Layered architecture for VANETs, DSRC /WAVE standard (IEEE 802.11p), IEEE 802.11p protocol Stack (PHY & MAC), Delay Tolerant Network, Introduction to Opportunistic Networking in Delay Tolerant Vehicular Ad Hoc Networks, Applications of VANET, Opportunities in VANET, ITS and VANET.	**CO3**	**(06)**
Unit 6	**Security:** Security attacks in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Link Layer security attacks: 802.11 MAC, WPA and variations, Network Security Attacks: Routing Protocol Attacks: attacks using falsifying route errors and broadcasting falsifying routes, spoofing attacks, Rushing attacks, (**Self Study:** Secure routing in Ad hoc wireless Networks)	**CO4**	**(06)**

Text Books

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson, 6th Edition, 2012. (Unit: 1,6)
2. Victor Moreno, Kumar Reddy, "Network Virtualization", Cisco Press, 2006. (Unit: 2)
3. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications",

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	World Scientific Publishing Company; 2nd Edition, 2011. (Unit: 3,4,5)
Reference Books	
1.	C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education, 2008.
2.	Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication, 2004.
3.	Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2003.
4.	William Stallings, "Wireless Communications and Networks ", Pearson Education, 2004
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs35/preview Prof. Neminath Hubballi, Prof. Sameer G Kulkarni, IIT Indore, IIT Gandhi nagar
2.	https://nptel.ac.in/courses/106106091 Prof. Hema A Murthy, IIT Madras

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	3	2	2	2
CO 2	3	2	3	3	3	2
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2211: Soft Computing				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): After completion of course, students will be able to

CO1	Identify and describe soft computing techniques and their roles in building intelligent machines
CO2	Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
CO3	Discuss evolutionary algorithms techniques and their applications.
CO4	Design genetic algorithms and multi-objective optimizations to combinatorial problems.

	Course Contents	CO	Hours
Unit 1	**Introduction to soft computing:** Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence, Soft computing characteristics, various types of soft computing techniques, applications of soft computing	**CO1**	**(06)**
Unit 2	**Fuzzy Logic:** Fuzzy set theory, Types of Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations and Composition, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic.	**CO2**	**(07)**
Unit 3	**Fuzzy rule base system:** Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making, fuzzy clustering, Applications of fuzzy logic.	**CO2**	**(07)**
Unit 4	**Evolutionary Algorithm:** Definition and Overview, Characteristics of Evolutionary Algorithms, Applications of Evolutionary Algorithms, Search Spaces and Fitness Landscapes, Objective Functions and Fitness Functions, Evolutionary Process, Particle Swarm Optimization, Swarm Intelligence and Social Behaviour, Applications of PSO.	**CO3**	**(07)**
Unit 5	**Genetic Modelling:** Introduction, Biological background, Search space, Genetic algorithms vs Traditional algorithms, Basic terminologies, Working principle, Simple GA, fitness function, reproduction.	**CO4**	**(07)**
Unit 6	**Genetic Operators**: Operators in Genetic Algorithms – Encoding, Selection, Cross-over, Mutation, Stopping condition in GA flow, Constraints in GA, Classification of GA, Genetic Programming, Advantages and limitations of GA, Application of GA	**CO4**	**(06)**

Text Books

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro:Fuzzy and Soft Computing", Prentice:Hall of India. (Unit: 1,2,3)
2. Sivanandam & Deepa, "Principles of Soft Computing", Wiley India. (Unit: 4,5,6)
3. Carlos A. Coello Coello , Gary B. Lamont , David A. Van Veldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems", Springer E-book. (Unit: 4)

Reference Books

1. S. Rajasekaram & G.A. Vijyalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI.
2. George J. Klir, Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall, 1995.

Useful Links

1. https://nptel.ac.in/courses/106105173/ IIT Kharagpur

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	2	2
CO 4	3	2	3	3	2	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	-	-
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	5	5	10
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – II) M. Tech. Information Technology				
CS2212: Laboratory 3 (Based on cores)				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs./week		ISE	25
Total Credits	02		ESE	25

Prerequisite:

Course Outcomes (CO): Students will be able to

CO1	Configure and implement different servers and protocols.
CO2	Design real world application using soft computing techniques.
CO3	Analyze network protocols, encapsulation, and decapsulation using packet capturing tools.
CO4	Develop and apply soft computing techniques, including fuzzy logic, genetic algorithms, and evolutionary computation, to solve optimization and decision-making problems.

Course Contents		CO
Implementation of following concepts		
Advanced Computer Networks		
Experiment 1	Understand the events involved in NetSim DES(Discrete Event Simulator) in simulating flow of One Packet from a wired node to wireless node.	**CO1**
Experiment 2	**Data traffic types and network performance measures.** • Analysing throughput and file transfer delay for elastic traffic. • Analysing throughput and delay for stream UDP traffic • Analysing TCP vs UDP Performance in error-Prone network conditions	**CO1**
Experiment 4	**Advanced Simulation events in NetSim for transmitting one packet**	**CO1**
Experiment 5	**Advanced Routing** • Understand VLAN operation in L2 and L3 switches. • Understanding Access and Trunk links VLANs. • Understand Public IP Address and NAT(Network Address Translation). • Basic networking commands Ping Route-Add/Delete/Print and ACL.	**CO1**
Experiment 6	**MANET** • Connectivity of randomly deployed 1-D ad hoc network	**CO 3**
Experiment 7	**IOT-WSN** • IoT Multi-Hop sensor Sink path • One Hop IoT Network over IEEE 802.15.4 • IoT Star Topology • 802.15.4 Superframe and effect of Superframe order on throughput	**CO3**
Soft Computing		
Experiment 7	Implement and compare different types of fuzzy membership functions and fuzzy set operations for real-world applications.	**CO4**
Experiment 8	Design and Optimization of a Fuzzy Inference System (FIS).	**CO4**
Experiment 9	Design a fuzzy rule-based system for a traffic light controller using fuzzy	**CO4**

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	logic.	
Experiment 10	Implement Particle Swarm Optimization (PSO) for function minimization.	**CO2**
Experiment 11	Solving a simple optimization problem using GA and apply various operations like selection, crossover, and mutation.	**CO2**
Experiment 12	Develop a Genetic Algorithm (GA) to solve a complex non-linear optimization problem.	**CO2**
List of Submission:		
	Minimum number of Experiments : 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	1	1	2	2	1
CO 2	3	2	2	1	2	2
CO 3	2	1	2	2	-	1
CO4	3	2	1	2	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad					
First Year (Sem-I) M. Tech. Computer Science & Engineering					
CS2216: Laboratory 4 (Based on Elective III & IV)					
Laboratory Scheme:			**Examination Scheme:**		
Practical	04 Hrs/week		ISE	50	
Total Credits	02		ESE	-	
Prerequisite :					
Course Outcomes (CO): Students will be able to					
CO1	Analyze and Implement Big Data Analytics Techniques				
CO2	Design and Evaluate User-Centric Interfaces				
CO3	Understand and Implement Blockchain-Based Solutions				
CO4	Apply GPU Computing and Computer Vision for High-Performance Applications				

	Course Contents	CO
Implementation of following concepts		
	CS2243:Program Elective-III: Big Data Analytics	
Experiment 1	Installation and configuration of Hadoop	**CO1**
Experiment 2	Implement application for counting frequency of words in a text file using MapReduce.	**CO1**
Experiment 3	Implementation of Matrix Multiplication using MapReduce	**CO2**
Experiment 4	NoSQL database operations using MongoDB.	**CO2**
Experiment 5	Implement application for counting number of words in a text file using Pig.	**CO2**
Experiment 6	Data Analysis with Spark	**CO2**
	CS2253:Program Elective-III: Block Chain Technology	
Experiment 1	Setting Up a Private Blockchain Network	**CO2**
Experiment 2	Implementing Cryptographic Hash Functions	**CO3**
Experiment 3	Writing and Deploying a Simple Smart Contract	**CO4**
Experiment 4	Implementing Public and Private Key Encryption	**CO4**
Experiment 5	Exploring Consensus Mechanisms	**CO4**
Experiment 6	Blockchain Application in Supply Chain	**CO2**
	CS2263:Program Elective-III: Computer Vision	
Experiment 1	Perform image transformations (scaling, rotation, translation) and Apply histogram equalization and filtering techniques (Gaussian, Median, Sobel).	**CO3**
Experiment 2	Implement edge detection using Canny and Sobel operators and Detect keypoints using Harris Corner and FAST algorithms.	**CO1**
Experiment 3	Extract features using SIFT and ORB. Perform feature matching using Brute Force and FLANN. Align images using homography estimation.	**CO4**
Experiment 4	Implement HOG-based object detection. Use Haar Cascades for face detection. Train a simple SVM/KNN classifier for object recognition.	**CO3**
Experiment 5	Train and test an object detection model using YOLO or SSD. Evaluate real-time detection performance on a video stream.	**CO2**
Experiment 6	Train a CNN for image classification using a dataset (e.g., CIFAR-10, MNIST). Fine-tune a pre-trained model (VGG, ResNet) using Transfer Learning.	**CO4**
	CS2214:Program Elective-IV: Human Computer Interaction	
Experiment 1	To understand the trouble of interacting with machines - Redesign interfaces of home appliances.	**CO1**
Experiment 2	Write a program to design a system based on user centred approach.	**CO2**
Experiment 3	Write a program to design web user interface based on Gestalt Theory.	**CO3**
Experiment 4	Create application for speech recognition.	**CO2**
Experiment 5	Create application using different web interfaces.	**CO2**

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Experiment 6	Create HCI Application using Gesture Recognition	**CO4**
CS2224:Program Elective-IV: GPU Computing		
Experiment 1	Installation of CUDA.	**CO1**
Experiment 2	Parallel GPU implementation of vector-vector operations.	**CO2**
Experiment 3	Parallel GPU implementation of vector-Matrix operations.	**CO3**
Experiment 4	Parallel computation of binomial coefficient matrix.	**CO2**
Experiment 5	Parallel GPU implementation of Matrix-Matrix operations.	**CO4**
Experiment 6	GPU Programming with Python.	**CO3**
CS2244:Program Elective-IV: Cryptography and Cybersecurity		
Experiment 1	Implement **AES (Advanced Encryption Standard)** and **DES (Data Encryption Standard)** using Python's cryptography library.	**CO3**
Experiment 2	Generate RSA key pairs and encrypt/decrypt messages.	**CO2**
Experiment 3	Implement Elliptic Curve Cryptography (ECC) for secure communication.	**CO4**
Experiment 4	Implement SHA-256, MD5, and SHA-3 hashing in Python	**CO2**
Experiment 5	Use John the Ripper or Hashcat to crack password hashes	**CO3**
Experiment 6	Perform a penetration test on a simulated system.	**CO4**
List of Submission:		
	Minimum number of Experiments : 12	

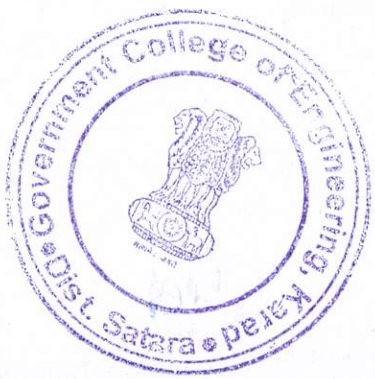
Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	2	3	3	2	2
CO 3	3	2	3	3	3	2
CO 4	3	2	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25



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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2208: Seminar				
Teaching Scheme			**Examination Scheme**	
Lectures	00 Hrs/week		ISE	100
Practicals	04 Hrs/week		ESE	-
Total Credits	02			

Course Outcomes (CO): Students will be able to

CO1	Explore the information about recent trends in relevant field.
CO2	Identify the research area in computer science and engineering.
CO3	Prepare and present research work.

Course Contents	CO	Hours

Seminar should be based on the literature survey on any topic relevant to computer science and engineering. It may be leading to selection of a suitable topic of dissertation. Each student has to prepare a write up of about 25 pages. The report typed on A4 sized sheets and bound in necessary format should be submitted after approved by the guide and endorsement of Head of Department. The student has to deliver a similar talk in front of the faculty of the department and the students. The assessment of the seminar will based on the quality of work, preparation and understanding of the candidate, depth of knowledge and presentation skills. The assessment of the seminar will be done by the panel of faculty members.

Students should deliver seminar individually. It should consist of a talk of 30 minutes on a topic preferably from the area in which a student intends to work for his project work in final year M. Tech or any upcoming technology not covered in syllabus.

Selection of Seminar Topic

1. Select a seminar topic relevant to Computer Science and Engineering. For selection topics refer Scopus Index Journal papers and innovative ideas.
2. Get the topic approved by the seminar guide well in advance.

Preparation

1. Research the topic well. Find relevant information related to topic.
2. The presentation slides should include list of key points, figures, charts and tables. There should not be running paragraphs.
3. The slides should be readable – Font size used should be at least 20.
4. The figures, tables etc. should be relevant to content and should not be for only namesake.
5. Figures should be very clear. Develop the habit of drawing your own figures using suitable software tools for better clarity.
6. For the presentation, adopt simple themes; avoid unnecessary animation and sound effects.
7. The presentation should be approved by the seminar guide for corrections if any.
8. A report of the seminar should contain the following and report should be prepared by using Latex.
    a. Title of the seminar.
    b. Abstract of the topic.
    c. Name and other details of student and the guide.
    d. List of references strictly in IEEE format.

Presentation

1. Keep a hand-out of presentation. This will help organize the talk better.
2. There should be proper self-introduction at the beginning.
3. Introduce the topic and highlight its significance.
4. Have good voice projection; deliver in modest pace; modulation of voice is desirable.
5. Keep eye contact with the audience.
6. Face the audience – Don't talk to the screen.
7. Familiarise with presentation aids.
8. Avoid repeated use of certain words/gestures.
9. Give a proper conclusion.

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Assessment Guideline:

- Student has to meet weekly to the guide and whereas guide has to keep track on the progress of the seminar and also has to maintain attendance report. This progress report can be used for awarding CA marks.
- The seminar to be delivered by students should be assessed by a panel of at least two senior faculties within the department.
- The assessment for the seminar should include but not limited to following points.
  1) Novelty of the topic
  2) Technical depth
  3) Organization of the topic
  4) Presentation skills
  5) Communication skills
  6) Question-Answer session

List of Submission:

	Seminar report should be prepared using Latex.

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	3	2	3	3	2	3
CO 3	3	3	3	2	2	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2243: Program Elective III: Big Data Analytics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamental concepts of Big Data, including its characteristics, and analytical significance.
CO2	Interpret Hadoop ecosystem components such as HDFS, MapReduce, YARN, Hive, and Pig for efficient data storage and processing.
CO3	Utilize NoSQL databases like MongoDB and Big Data tools such as Spark for handling, querying, and analyzing large datasets.
CO4	Analyse Big Data analytics techniques, including Text Mining, Web Analytics, and real-world case studies, for informed decision-making.

	Course Contents	CO	Hours
Unit 1	Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data,Typical data warehouse and Hadoop environment. Big Data Analytics: Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools, NoSQL, Hadoop.	**CO1**	**(07)**
Unit 2	**Hadoop:** Introducing hadoop, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System),Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator). Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.	**CO2**	**(07)**
Unit 3	**MongoDB:** MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.	**CO3**	**(06)**
Unit 4	**Hive:** Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). Introduction to Pig: Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive.	**CO2 CO3**	**(07)**
Unit 5	**Spark and Big Data Analytics:** Spark, Introduction to Data Analysis with Spark. 2 Text, Web Content and Link Analytics: Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph.	**CO3**	**(07)**
Unit 6	**Case study:** Exploring web pages categorization, computing the frequency of stock market change, predicting the sale price of blue books for bulldozers.	**CO4**	**(06)**

Text Books

1. Seema Acharya and Subhashini Chellappan "Big data and Analytics" Wiley India Publishers, 2nd Edition, 2019. (Unit-1,2,3,4,).
2. Rajkamal and Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning", McGraw Hill Publication, 2019. (Unit-5).
3. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013. (Unit 6)

Reference Books

1. Hadley Wickham, ggplot2: Elegant Graphics for Data Analysis, Springer, 2016.

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2.	Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016.	
Useful Links		
1.	https://onlinecourses.nptel.ac.in/noc20_cs92/preview	Prof. Rajiv Misra, IIT Patna
2.	https://archive.nptel.ac.in/courses/110/106/110106072/	Dr. Balaraman Ravindran ,IIT Madras
3.	https://onlinecourses.nptel.ac.in/noc21_cs45/preview	Prof. A Ramesh, IIT Roorkee

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	-	-	2	-
CO 2	-	2	3	-	2	-
CO 3	-	-	2	-	3	-
CO 4	-	-	2	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2253: Program Elective – III : Block Chain Technology				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamentals of blockchain technology and its components.
CO2	Explore different Blockchain subjects, platforms, and their unique features.
CO3	Analyse the impact of blockchain on various industries.
CO4	Gain hands-on experience with blockchain development tools and frameworks.

	Course Contents	CO	Hours
Unit 1	**Introduction to Blockchain Technology:** History and evolution of blockchain, Basic concepts: decentralization, consensus mechanisms, cryptography, Key components: blocks, chains, nodes, miners, Types of blockchains: public, private, consortium, Cryptographic Foundations, Cryptographic hash functions, Public and private keys, (**Self Study:** Digital signatures, Merkle trees.)	**CO1**	**(07)**
Unit 2	**Blockchain Platforms and Ecosystems:** Overview of major blockchain platforms: Bitcoin, Ethereum, Hyperledger, Corda, Comparative analysis of platform features, Blockchain as a Service (BaaS), Case studies of platform applications,	**CO2**	**(06)**
Unit 3	**Smart Contracts and Decentralized Applications (DApps):** Definition and characteristics of smart contracts, Ethereum Virtual Machine (EVM), Writing and deploying smart contracts using Solidity, Introduction to DApps and their architecture.	**CO3**	**(07)**
Unit 4	**Blockchain Development Tools and Frameworks:** Development environments: Truffle, Remix, Blockchain APIs and libraries, Setting up a private blockchain network, Testing and debugging blockchain applications, Consensus Mechanisms and Protocols, Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Practical Byzantine Fault Tolerance (PBFT).	**CO4**	**(07)**
Unit 5	**Blockchain Security and Privacy:** Common security threats in blockchain, Mitigating attacks: 51% attack, Sybil attack, replay attack, Privacy-enhancing technologies: zk-SNARKs, ring signatures, Regulatory and compliance considerations, Financial services: cryptocurrencies, cross-border payments, DeFi, Supply chain management, Healthcare, Government and public services, Emerging applications, (**Self Study:** NFTs, IoT integration)	**CO3**	**(07)**
Unit 6	**Future Trends and Challenges:** Scalability and interoperability, Quantum computing and blockchain, Advances in consensus algorithms, The future of blockchain regulation and governance, Recent Trends and Application	**CO1**	**(06)**

Text Books

1. Antonopoulos, Andreas M. "Mastering Bitcoin: Programming the Open Blockchain", 2nd Edition., O'Reilly Media, 2017. (Unit : 1,2,3,4,5,6)
2. Tapscott, Don, and Alex Tapscott. "Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World". Penguin, 2016.

Reference Books

1. Bashir, Imran. "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications", Packt Publishing, 2017.
2. Bahga, Arshdeep, and Vijay Madisetti. "Blockchain Applications: A Hands-On Approach", VPT, 2016.
3. Laurence, Tiana. "Blockchain for Dummies", Wiley, 2017.

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Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc22_cs44/preview Prof. Sandip Chakraborty, Prof. Shamik Sural, IIT Kharagpur
2.	https://nptel.ac.in/courses/106104220 Prof. Sandeep Shukla, IIT Kanpur

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	2	2	3	2	3	2
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – II) M. Tech. Computer Science and Engineering				
CS2263: Program Elective III: Computer Vision				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamental concepts of image representation,
CO2	Apply feature extraction and image registration methods,
CO3	Implement classical and deep learning-based object recognition techniques,
CO4	Analyze and apply 3D vision techniques,

	Course Contents	CO	Hours
Unit 1	**Fundamentals of Image Processing** Image Representation: Pixels, color spaces (RGB, HSV, Grayscale), histograms, Image Processing Techniques: Scaling, rotation, translation, filtering (Gaussian, Median, Sobel). Histogram Equalization & Image Enhancement, Introduction to OpenCV & Hands-on Implementation.	**CO1**	**(07)**
Unit 2	**Feature Extraction & Image Registration** Feature Detection: Edges (Canny), Corners (Harris, FAST), Keypoints (SIFT, ORB), Feature Matching Techniques: Brute Force, FLANN, RANSAC-based alignment, Image Registration & Homography Estimation.	**CO2**	**(06)**
Unit 3	**Object Recognition & Tracking** Classical Object Recognition Methods: HOG, Haar Cascades, SVM, K-NN, Modern Object Detection: YOLO, SSD (Basics & Real-time Object Detection).	**CO3**	**(06)**
Unit 4	**Deep Learning for Computer Vision** Introduction to Neural Networks for Vision, Convolutional Neural Networks (CNNs): Basics, architecture, and training, Popular CNN Architectures: LeNet, AlexNet, VGG, ResNet, Transfer Learning & Fine-tuning Pre-trained Models, Hands-on Implementation using TensorFlow/PyTorch.	**CO3**	**(07)**
Unit 5	**3D Vision & Depth Estimation** Stereo Vision & Epipolar Geometry, Depth Estimation & Disparity Mapping, 3D Reconstruction: Structure from Motion (SfM), Multi-view Stereo, Introduction to LiDAR & Depth Sensors (RGB-D), Point Cloud Processing & Mesh Reconstruction.	**CO4**	**(07)**
Unit 6	**Applications & Advanced Topics** Computer Vision in AR/VR & Robotics, Autonomous Vehicles & Scene Understanding. Self-supervised Learning & Generative Models (GANs, Diffusion Models), Ethical Considerations & Bias in Computer Vision, Explainability & Adversarial Attacks in Vision Models.	**CO4**	**(07)**

Text Books

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", 2nd Edition, 2022. (Unit 1,2,3,6)
2. Ian Goodfellow, Deep Learning (CNNs, Transfer Learning). (Unit: 4)
3. Hartley & Zisserman, Multiple View Geometry in Computer Vision (Stereo Vision, 3D Reconstruction) (Unit: 5)

Reference Books

1. Gonzalez & Woods, Digital Image Processing
2. D.A. Forsyth, Applied Machine Learning
3. Géron, Hands-On Machine Learning

Useful Links

1. https://nptel.ac.in/courses/108106189, Prof. A. N. Rajagopalan, IIT Madras

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2.	https://nptel.ac.in/courses/108103174,Prof. M. K. Bhuyan, IIT Guwahati

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	2	2	2	2	3	2
CO 3	3	3	3	3	2	2
CO 4	3	3	2	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	20
Analyse	5	5	20
Evaluate	5	5	10
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2214: Program Elective-IV: Human Computer Interaction				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Illustrate the structure of models and theories of human computer interaction and vision.
CO2	Design an interactive web interface on the basis of models studied

	Course Contents	CO	Hours
Unit 1	**Human: I/O channels:** Memory reasoning and problem solving; The computer: Devices: Memory processing and networks; Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms.	**CO1**	**(07)**
Unit 2	**Interactive Design basics:** Process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process, software life cycle, usability engineering, Prototyping in practice, design rationale. Design rules, principles, standards, guidelines, rules. Evaluation Techniques, Universal Design.	**CO1**	**(07)**
Unit 3	**Cognitive models:** Socio-Organizational issues and stake holder requirements, Communication and collaboration models, Hypertext, Multimedia and WWW.	**CO1**	**(07)**
Unit 4	**Mobile Ecosystem:** Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture, Mobile 2.0, Mobile, Design: Elements of Mobile Design, Tools.	**CO2**	**(07)**
Unit 5	**Designing Web Interfaces:** Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.	**CO2**	**(07)**
Unit 6	**Recent Trends:** Speech Recognition and Translation, Multimodal System	**CO2**	**(05)**

Text Books

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004. (Unit: 1,2,3)
2. Brian Fling, "Mobile Design and Development", 1st Edition, OReilly Media Inc., 2009. (Unit: 4)

Reference Books

1. Bill Scott, Theresa Neil, "Designing Web Interfaces",1st Edition, OReilly, 2009. (Unit:5,6)
2. Dix, "Human-Computer Interaction", Pearson Education India, 3rd Edition, 2004
3. Meena K, "Human Computer Interaction", Prentice Hall India Learning Private Limited, 2014

Useful Links

1. https://nptel.ac.in/courses/106106177/ IIT MADRAS
2. https://nptel.ac.in/courses/106103115/ IIT GUWAHATI

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	1	2	1	3
CO 2	3	1	3	2	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

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Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2224: Program Elective-IV: GPU Computing				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Interpret the concepts in parallel programming.
CO2	Implement the programs on GPUs, debugging and profiling parallel programs

	Course Contents	CO	Hours
Unit 1	**Introduction:** History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU and GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL, Open ACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps, Wave fronts, Thread blocks, Workgroups, Streaming multiprocessors, 1D, 2D, 3D thread mapping, Device properties, Simple Programs.	**CO1**	**(07)**
Unit 2	**Memory:** Memory hierarchy, DRAM, global, local, shared, private, local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi- dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories.	**CO2**	**(07)**
Unit 3	**Synchronization:** Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU Functions: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.	**CO3**	**(07)**
Unit 4	**Support:** Debugging GPU Programs. Profiling, Profile tools, Performance aspects Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based-Synchronization – Overlapping data transfer and kernel execution, pitfalls.	**CO4**	**(07)**
Unit 5	**Case Studies:** Image Processing, Graph algorithms, Simulations, Deep Learning	**CO3**	**(07)**
Unit 6	**Advanced topics:** Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing	**CO1**	**(05)**

Text Books

1.	David Kirk, Wen-mei Hwu, Morgan Kaufman, "Programming Massively Parallel Processors: A Hands-on Approach", 2010. (ISBN: 978-0123814722)

Reference Books

1.	Shane Cook, Morgan Kaufman, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", 2012. (ISBN: 978-0124159334)

Useful Links

1.	https://nptel.ac.in/courses/106102114/ IIT Delhi
2.	https://nptel.ac.in/courses/106104120/ IIT Kanpur

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Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	1	2	2	3
CO 2	3	2	3	2	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem – II) M. Tech. Computer Science and Engineering				
CS2244: Program Elective-IV: Cryptography and Cyber Security				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Illustrate the algorithms for text processing applications.
CO2	Identify suitable data structures and develop algorithms for computational geometry problems
CO3	Define the need of Cyber Security.
CO4	Demonstrate the knowledge of penetration testing, and social networking security

	Course Contents	CO	Hours
Unit 1	**Classical Encryption Techniques:** Symmetric Cipher Model, Substitution and Transposition Techniques, Cryptanalysis and Brute-Force Attack. Block Ciphers: Stream Ciphers and block Ciphers, Feistel Cipher structure, Data Encryption Standard (DES), Tripple DES, Number Theory: Testing for Primality, Chinese Reminder Theorem, Discrete Logarithms. Public Key Cryptography: RSA: RSA algorithm, ElGamal Cryptographic systems	**CO1**	**(06)**
Unit 2	**Data Integrity Algorithms:** Cryptographic Hash Functions: security requirements of Hash functions, MD5, Message Authentication Code (MAC):MACs Based on Hash Functions: HMAC, MACs Based on Block Ciphers: DAA and CMAC, Digital Signature: DSA (Digital Signature Algorithm), Elliptic Curve Digital Signature Algorithm (ECDSA), Digital Signature Standard (DSS)	**CO2**	**(06)**
Unit 3	**Introduction to cyber security:** Different types of cyber-crimes, Digital certificate and public key infrastructure, IT Act, Impact of cyber-crime on e-governance and e-commerce, Types of malware, Malicious code families, Basic static and dynamic analysis, Malware analysis techniques.	**CO3**	**(08)**
Unit 4	**Web application security:** Attacks, vulnerabilities and mitigation, Client-side security, Server-side security, Application security: HTTPS, HSTS etc., Security engineering: Passwords and their limitations, Attacks on passwords: CAPTCHA, OTP. Advanced security topics: Secure email systems: PGP, SMIME, DKIM, DMARC, DNSSec, SMTP STS etc., Privacy and security for online social networks.	**CO3**	**(08)**
Unit 5	**Ethical hacking and penetration testing:** Security Technologies: IDS, IPS, Ethical hacking, Penetration testing fundamentals: Reconnaissance, scanning, gaining access, maintaining access, Covering tracks. Concept of Cyberspace & Netizens, Comparisons between traditional criminal techniques and Cyber Crime, Public and Private Societies face challenges in addressing cybercrime.	**CO3**	**(06)**
Unit 6	**Nature and scope of computer crime:** Financial crime, cyber pornography, Forgery, Web Defacement, Data Diddling, Email frauds, Hacking, Tempering, Spamming, Phishing, Spoofing, Pharming, DoS Attacks, Viruses, Trojan, Worm, Malware, Spyware, Botnet	**CO4**	**(06)**

Text Books

1. Atul Kahate, Cryptography and Network Security, McGraw-Hill, Fourth edition, 2019 (Unit 1,2)
2. Hossein, "Handbook of Information Security, Threats, Vulnerabilities, Prevention, Detection, and Management", Wiley, Volume 3 edition, ISBN-13: 978-0470323069. (Unit 3,4,5,6)

Reference Books

1. William Stallings, Cryptography and Network Security, Pearson 7th Edition, 2017
2. V K Pachghare, Cryptography and Information Security, PHI 2nd Edition, 2015

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3.	Georgia Weidman, "Penetration testing: A Hands-On Introduction to Hacking", No Starch Press, 2014, ISBN-13: 978-1593275648
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc25_cs08/preview, IIT Kharagpur, Prof. Sandip Chakraborty Prof. Shamik Sural
2.	https://onlinecourses.nptel.ac.in/noc25_cs31/preview, IIIT Bangalore , Prof. Sandip Chakraborty, Prof. Shamik Sural

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	2	1	-	-
CO 2	-	1	2	3	-	-
CO 3	-	1	2	3	-	-
CO 4	-	-	2	3	-	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	20
Analyse	5	5	20
Evaluate	5	5	10
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2245: Program Elective - V: Deep Learning				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Understand the basics of associative memory and unsupervised learning networks.
CO2	Apply CNN and its variants for suitable applications.
CO3	Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
CO4	Evaluate autoencoders and generative models for suitable applications.

	Course Contents	CO	Hours
Unit 1	**Introduction:** Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.	**CO1**	**(07)**
Unit 2	**Associative Memory and Unsupervised Learning Networks:** Training Algorithms for Pattern Association, Autoassociative Memory Network, Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks, Temporal Associative Memory Network, Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks-Adaptive Resonance Theory Network.	**CO2**	**(07)**
Unit 3	**Third-Generation Neural Networks:** Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation, Motivation, Pooling, Variants of the basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Neuroscientific Basis, Applications: Computer Vision, Image Generation, Image Compression.	**CO3**	**(07)**
Unit 4	**Deep Feedforward Networks:** History of Deep Learning- A Probabilistic Theory of Deep Learning, Gradient Learning, Chain Rule and Backpropagation – Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout – batch normalization- VC Dimension and Neural Nets.	**CO4**	**(07)**
Unit 5	**Recurrent Neural Networks:** Recurrent Neural Networks: Introduction, Recursive Neural Networks, Bidirectional RNNs Deep Recurrent Networks, Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.	**CO3**	**(07)**
Unit 6	**Case Study:** Emotion Recognition using human face and body language, Natural Language Processing, Speech recognition, Transformers, and sequence Learning, Recent Trends and Application	**CO1**	**(05)**

Text Books

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016. (Unit : 1,2,3,4,5,6)
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

Reference Books

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly,2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media,2017.
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st

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	Edition, 2018.
4.	Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5.	Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc20_cs62/preview Prof. Prabir Kumar Biswas, IIT Kharagpur
2.	https://nptel.ac.in/courses/106106184 Prof. Sudarshan Iyengar, IIT Ropar

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	3	3	3	3	2
CO 3	3	2	3	3	3	2
CO 4	3	2	3	3	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2255: Program Elective V: Gen AI and Explainable AI				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Explain the architecture, training methods, and key generative models used in modern AI applications.
CO2	Analyze the principles of generative AI, including transformer-based models, GANs, VAEs, and diffusion models, and their role in text, image, and data generation.
CO3	Apply generative AI for text synthesis, image generation, and other real-world applications, considering ethical and societal implications.
CO4	Evaluate explainable AI (XAI) techniques to interpret tabular, image, and text-based AI models.

	Course Contents	CO	Hours
Unit 1	**Large Language Models:** Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies.	**CO1**	**(05)**
Unit 2	**Core Generative Models:** Generative Adversarial Networks (GANs), Architecture of GANs, Challenges, and Variants (DCGAN, StyleGAN), Applications of GANs: Image Generation, Style Transfer, Data Augmentation, Variational Autoencoders (VAEs): Encoding and Decoding Process, Applications of VAEs, Diffusion Models, Applications of Diffusion Models.	**CO2**	**(07)**
Unit 3	**Applications of Generative AI:** Image Generation and Manipulation: Creating photorealistic images, Image-to-image translation, inpainting, and super-resolution, Natural Language Processing: Text generation, translation, summarization, and dialogue systems, Large Language Models (LLMs) and their applications, Music and Audio Generation, Other Applications, Drug discovery, material design, and creative content generation	**CO2**	**(07)**
Unit 4	**Explainable AI:** Definition of Explainable AI, Who Needs Explainability, Challenges in Explainability, Evaluating Explainability, DARPA Uses Explainable AI to Build "Third-Wave AI", An Overview of Explainability, What Are Explanations, Interpretability and Explainability, Types of Explanations	**CO3**	**(07)**
Unit 5	**Explainability for Tabular and Image Data:** Permutation Feature Importance, Shapley Values, SHAP (SHapley Additive exPlanations), Explaining Tree-Based Models, From Decision Trees to Tree Ensembles, Partial Dependence Plots (PDPs), Individual Conditional Expectation Plots (ICEs), Accumulated Local Effects (ALE), Explainability for Image Data, Integrated Gradients (IG), How XRAI Works, Implementing XRAI, Grad-CAM, LIME, Guided Grad-CAM	**CO4**	**(07)**
Unit 6	**Explainability for Text Data:** Overview of Building Models with Text, Tokenization, Word Embeddings and Pretrained Embeddings, LIME, How LIME Works with Text, Gradient x Input, Intuition from Linear Models, From Linear to Nonlinear and Text Models, Grad L2-norm, Layer Integrated Gradients, A Variation on Integrated Gradients, Layer-Wise Relevance Propagation (LRP)	**CO4**	**(07)**

Text Books

1. A. Rehmani, "Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology", 2023. (Unit: 1,2,3)
2. M. Munn and D. Pitman, "Explainable AI for Practitioners", O'Reilly Media, 2022. (Unit:4,5,6)

Reference Books

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1.	I. Goodfellow, Y. Bengio, and A. Courville, "Deep Learning". MIT Press, 2016.
2.	C. C. Aggarwal, "Neural Networks and Deep Learning: A Textbook". Springer, 2018.
3.	D. Rothman, "Hands-On Explainable AI (XAI) with Python", Packt Publishing, 2020.
4.	W. Samek, G. Montavon, A. Vedaldi, L. K. Hansen, and K. R. Müller, Eds., "Explainable AI: Interpreting, Explaining and Visualizing Deep Learning". Springer Nature, 2019.
Useful Links	
1.	https://onlinecourses.swayam2.ac.in/imb24_mg116/preview Naveen Kumar Bhansali , Indian Institute of Management Bangalore (IIMB)
2.	https://onlinecourses.nptel.ac.in/noc24_cs132/preview Prof. Ponnurangam Kumaraguru, Prof. Balaraman Ravindran, Prof. Arun Rajkumar, IIIT Hyderabad, IIT Madras

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	2	2
CO 2	3	3	2	3	3	2
CO 3	3	2	3	3	2	2
CO 4	3	2	3	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
CS2235: Program Elective-V: Optimization Techniques				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Formulate optimization problems.
CO2	Apply the concept of optimality criteria for various types of optimization problems.
CO3	Solve various constrained and unconstrained problems in Single variable as well as multivariable.
CO4	Apply the methods of optimization in real life situation

	Course Contents	CO	Hours
Unit 1	**Optimization:** Engineering application of Optimization, Formulation of design problems as mathematical programming problems.	**CO1**	**(07)**
Unit 2	**Optimization Algorithms:** General Structure of Optimization Algorithms, Constraints, The Feasible Region	**CO2**	**(07)**
Unit 3	**Branches of Mathematical Programming:** Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.	**CO3**	**(07)**
Unit 4	**Optimization Algorithms** like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.	**CO4**	**(07)**
Unit 5	Real life Problems and their mathematical formulation as standard programming problems.	**CO3**	**(07)**
Unit 6	**Recent trends:** Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.	**CO1**	**(05)**

Text Books

1.	Laurence A.Wolsey, "Integer programming", Wiley publication, ISBN978-0-471-28366-9, 1998. (Unit : 1,2,3,4,5,6)
2.	Andreas Antoniou, Wu-Sheng Lu, "Practical Optimization Algorithms and Engineering Applications", Springer.

Reference Books

1.	Edwin K., P. Chong, Stanislaw h. Zak, "An Introduction to Optimization", 4th edition, Wiley pubulication.
2.	Dimitris Bertsimas, Robert Weismantel, "Optimization over integers", Dynamic Ideas, ISBN 978- 0-9759146-2-5, 2005
3.	John K. Karlof, "Integer programming: theory and practice", CRC Press, ISBN 978-0-8493-1914- 3, 2006.
4.	H. Paul Williams, "Logic and Integer Programming" Springer, ISBN 978-0-387-92279-9, 2009.
5.	Michael Jünger, Thomas M. Liebling, Denis Naddef, George Nemhauser, William R. Pulleyblank, Gerhard Reinelt, Giovanni Rinaldi, Laurence A. Wolsey, and eds., "50 Years of Integer Programming" 1958-2008: From the Early Years to the State-of-the- Art. Springer, ISBN 978-3- 540-68274-5, 2009.

Useful Links

1.	https://nptel.ac.in/courses/111105039/ IIT Kharagpur

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	-	1	3	1	2	-

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CO 4	-	2	-	1	3	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
AU2219: Audit Course – II: Constitution of India				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to

CO1	Formulate the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Rewrite the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Construct the passage of the Hindu Code Bill of 1956.

	Course Contents	CO	Hours
Unit 1	**History of Making of the Indian Constitution**: History, Drafting Committee, (Composition & Working)	**CO1**	**(04)**
Unit 2	**Philosophy of the Indian Constitution:** Preamble Salient Features	**CO2**	**(04)**
Unit 3	**Contours of Constitutional Rights & Duties:** Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.	**CO3**	**(04)**
Unit 4	**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	**CO4**	**(04)**
Unit 5	**Local Administration:** District''s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.	**CO3**	**(04)**
Unit 6	**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women	**CO1**	**(04)**

Text Books

1.	"The Constitution of India", Government Publication, 1950 (Bare Act).
2.	Dr. S. N. Busi, Dr. B. R. Ambedkar, "Framing of Indian Constitution", 1st Edition, 2015.

Reference Books

1.	M. P. Jain, "Indian Constitution Law", 7th Edition, Lexis Nexis, 2014.
2.	D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.

Useful Links

1.	https://nptel.ac.in/courses/103107084/Script.pdf
2.	https://nptel.ac.in/syllabus/109103022/ IIT Guwahati

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	1	2
CO 2	3	3	3	2	1	3
CO 3	3	3	3	2	1	2
CO 4	3	3	3	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
AU2229: Audit Course – II: Pedagogy Studies				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to

CO1	Appraise pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
CO2	Illustrate the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners.
CO3	Interpret how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

	Course Contents	CO	Hours
Unit 1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions., Overview of methodology and Searching.	**CO1**	**(04)**
Unit 2	**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education	**CO1**	**(04)**
Unit 3	**Evidence on the effectiveness of pedagogical practices:** Methodology for the in depth stage: quality assessment of included studies, How can eacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy	**CO2**	**(04)**
Unit 4	**Theory of change**: Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies	**CO2**	**(04)**
Unit 5	**Professional development:** Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes	**CO3**	**(04)**
Unit 6	**Research gaps and future directions:** Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact	**CO3**	**(04)**

Text Books

1. Ackers J, Hardman F, "Classroom interaction in Kenyan primary schools", Compare, 31 (2): 245-261, 2001.
2. Agrawal M, "Curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361-379, 2004.

Reference Books

1. Akyeampong K, "Teacher training in Ghana - does it count?" Multi-site teacher education research project (MUSTER) country report 1. London: DFID, 2003.
2. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013), "Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282
3. Alexander RJ, "Culture and pedagogy: International comparisons in primary education", Oxford and Boston: Blackwell.
4. Chavan M, "Read India: A mass scale, rapid, learning to read campaign".

Useful Links

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1.	www.pratham.org/images/resource%20working%20paper%202.pdf.

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	1	2
CO 2	2	3	2	2	2	3
CO 3	3	3	3	2	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
First Year (Sem-II) M. Tech. Computer Science & Engineering				
AU2239: Audit Course – II: Stress Management by Yoga				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	-
Total Credits	Audit		ESE	-

Course Outcomes (CO): Students will be able to

CO1	Develop healthy mind in a healthy body thus improving social health.
CO2	Improve efficiency

	Course Contents	CO	Hours
Unit 1	**Definitions of Eight parts of yog.** (Ashtanga)	**CO1**	**(04)**
Unit 2	**Yam and Niyam:** Do`s and Don'ts in life.i) Ahinsa, satya, astheya ii) Shaucha, santosh, tapa	**CO1**	**(04)**
Unit 3	**Yam and Niyam:** Do's and Don'ts in life. i) bramhacharya and aparigraha ii) swadhyay, ishwarpranidhan	**CO1**	**(04)**
Unit 4	**Asan and Pranayam:** Various yog poses and their benefits for mind & body	**CO2**	**(04)**
Unit 5	**Asan and Pranayam:** Regularization of breathing techniques and its effects-Types of pranayam	**CO2**	**(04)**
Unit 6	**Types of Pranayam**	**CO2**	**(04)**

Text Books

1.	"Yogic Asanas for Group Training-Part-I", Janardan Swami Yogabhyasi Mandal, Nagpur.

Reference Books

1.	Swami Vivekananda, "Rajayoga or conquering the Internal Nature", AdvaitaAshrama (Publication Department), Kolkata.

Useful Links

1.	https://nptel.ac.in/courses/109105113/ IIT KHARAGPUR
2.	https://nptel.ac.in/courses/109106059/6 IIT MADRAS

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	2	2	2	2
CO 2	3	2	3	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
First Year (Sem-II) M. Tech. Computer Science & Engineering					
AU2249: Audit Course – II: Personality Development through Life Enlightenment Skills					
Teaching Scheme			Examination Scheme		
Lectures	02 Hrs/week		MSE	-	
Tutorials	00 Hrs/week		ISE	-	
Total Credits	Audit		ESE	-	

Course Outcomes (CO): Students will be able to

CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	Relate the person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Appraise the Neetishatakam will help in developing versatile personality of students.

	Course Contents	CO	Hours
Unit 1	**Neetisatakam-Holistic development of personality:** Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	**CO1**	**(04)**
Unit 2	**Neetisatakam-Holistic development of personality:** Verses- 52,53,59 (don'ts) Verses- 71,73,75,78 (do's)	**CO1**	**(04)**
Unit 3	**Approach to day to day work and duties:** Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35,	**CO2**	**(04)**
Unit 4	**Approach to day to day work and duties:** Shrimad Bhagwad Geeta : Chapter 6-Verses 5,13,17,23, 35, Chapter 18-Verses 45, 46, 48.	**CO2**	**(04)**
Unit 5	**Statements of basic knowledge:** Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 Personality of Role model.	**CO3**	**(04)**
Unit 6	**Shrimad Bhagwad Geeta:** Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	**CO3**	**(04)**

Text Books

1. Swami Swarupananda , "Srimad Bhagavad Gita" , Advaita Ashram (Publication Department), Kolkata

Reference Books

1. P.Gopinath, Bhartrihari"s Three Satakam (Niti-sringar-vairagya), Rashtriya Sanskrit Sansthanam, New Delhi.

Useful Links

1. https://www.scribd.com/document/352547910/Bhagvad-Geeta-for-Common-Man-pdf

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	2	2	1	2
CO 2	3	3	2	2	1	3
CO 3	3	3	3	2	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem-III) M. Tech. Computer Science & Engineering				
CS2301: Dissertation Phase-I				
Teaching Scheme			**Examination Scheme**	
Lectures	14 Hrs/week		ISE	100
Tutorials	00 Hrs/week		ESE	100
Total Credits	07			

Course Outcomes (CO): Students will be able to	
CO1	Identify self-learning topics.
CO2	Explore the survey literature and contact resource persons for the selected topic of research.
CO3	Develop oral and written communication skills to present and defend their work in front of technically qualified audience

	Course Contents	**CO**	**Hours**

The Project Work should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. It should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following:

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Report and presentation

Guidelines for Dissertation Phase – I:

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department"s laboratories and centres OR in industry allotted through department"s T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include Springer/Science Direct. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.

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• Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the phase-I work.	
	List of Submission:
	Dissertation report should be prepared using Latex.

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	2	3	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem-III) M. Tech. Computer Science & Engineering				
CS2302: MOOCs / OPEN COURSE				
Teaching Scheme			**Examination Scheme**	
Lectures	--		MSE	-
Tutorials	--		ISE	-
Total Credits	03		ESE	100
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO): Students will be able to

CO1	Learn independently the modern tools and technology
CO2	Develop skills for solving problems for research project.
CO3	Identify the self-learning topics

Course Contents	CO	Hours
Online courses available on digital platform like MOOCs/ NPTEL/ SWAYAM etc during the academic semester will be reviewed and listed by departmental faculty board before start of every semester. Suitable course for registered candidate will be recommended by Guide and Programme Head considering skill sets and knowledge required for dissertation work of the individual candidate (from the list). It shall have minimum 8-12 weeks duration, peer graded assignment and examination to award grade by online course offering agency. The report of course completed with copy of Grade Report shall be submitted to the examination section. In case online course is not available, departmental committee will specially design syllabus for course under self-learning mode and guide will conduct end semester examination to award the grade.		

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	2	3	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem-IV) M. Tech. Computer Science & Engineering				
CS2401: Dissertation Phase-II				
Teaching Scheme			**Examination Scheme**	
Lectures	32 Hrs/week		ISE	100
Tutorials	00 Hrs/week		ESE	200
Total Credits	16			

Course Outcomes (CO): Students will be able to	
CO1	Demonstrate techno socio aspects for problem solutions
CO2	Test and validate designed system towards fault tolerance.
CO3	Produce research findings in terms of possible technical publications and IPRs.

Course Contents

It is a continuation of Project work started in semester III. Student has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution, results and discussion. The report must bring out the conclusions of the work and future scope for the study. . The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

The dissertation phase II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – II:

- During phase – II, student is expected to exert on detail design, development, verification and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress (Log Book).
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension of work.

	List of Submission:
	Dissertation report should be prepared using Latex.

Mapping of COs and POs

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	2	3	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

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HEAD
Department of Information Technology
Govt. College of Engineering, KARAD

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

HEAD
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