D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25 affiliated to

Savitribai Phule Pune University

Curriculum Structure and Syllabus

FY M.Tech Computer Engineering

(2025 Pattern)

(With effect from Academic Year 2025-26)

National Education Policy (NEP) based Curriculum

Preface

D Y Patil College of Engineering, Akurdi, Pune (DYPCOE) has been recognized for providing quality education in Maharashtra for the past 40 years. With a commitment to academic excellence and a vision for the future, DYPCOE is now boarding a new journey towards Autonomy, in line with the latest educational reforms. The Institute is dedicated to the effective implementation of the New Education Policy (NEP) 2020, as per the guidelines by the Government of Maharashtra. This initiative is aimed at fostering the holistic development of our students, ensuring they are well-equipped to meet the challenges of the 21st century.

The present syllabus details the FY M.Tech Computer Engineering syllabus, meticulously designed to align with the NEP 2020 and effective from the academic year 2025-26. The curriculum is structured to provide a robust foundation through Program Core courses and Program Elective Courses. It also integrates vocational skill enhancement courses. This comprehensive approach aims to cultivate well-rounded engineers who are adaptable to Internationalization.

One of the key highlights of this syllabus is its emphasis on Experiential Learning and hands-on experience. By integrating theoretical knowledge with practical laboratory sessions, we aim to enhance the learning process and foster a deeper understanding of core concepts. Additionally, the curriculum promotes research and innovation by encouraging students to engage in project-based learning.

The development of this curriculum has been a collaborative effort, and we owe a debt of gratitude to all those who have contributed to its creation. Our sincere thanks go to the Management, Steering Committee Members, Heads of Departments, and the Board of Studies chairpersons and members for their invaluable input and dedication. Their collective expertise and commitment have been instrumental in shaping this curriculum.

We are confident that this new curriculum will pave the way for our students to achieve academic excellence and holistic development, preparing them to thrive in an ever-evolving global landscape.

Dr. Mrs. P. Malathi
Principal

Abbreviations and Definitions

NEP: National Education Policy

PEO: Program Educational Objectives PO: Program Outcomes

CO: Course Outcomes

PCC: Program Core Course PEC:

Program Elective Course OE:

Open Elective

MDM: Multidisciplinary Minor Course

NC: Non Credit Course

VSEC: Vocational and Skill Enhancement Courses

CCE: Continuous Comprehensive Evolution

ESE: End Sem Examination

Cr: Credits

SL: Self Learning

L: Lecture

T: Tutorial

P: Practical

XX Program Code

ELC Experiential Learning Courses

HSM Humanities Social Science and Management Courses

VSC Vocational and Skill Enhancement Course

FPR Field Project

AEC Ability Enhancement Courses

MDC Multidisciplinary Courses

OJT On Job Training/Internship

PRJ Project

VEC Value Education Course

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

Department of Computer Engineering

First Year (FY) M Tech Computer Engineering, Semester I

Course Type	New Course Code	Course	Teaching Scheme				Evaluation Scheme					
								Theory Marks			Practical Marks	
			L	T	P	Cr	Exam	Max	Min for Pass		Max	Min for Pass
PCC1	CN226PC101	Algorithm Analysis and Operation Research	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC2	CN226PC102	Advanced Operating Systems	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC3	CN226PC103	Artificial Intelligence and Machine Learning	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC4	CN226PC104	Program Core Course Lab IV Laboratory Practice I	0	0	4	2	CCE				50	20
							ESE				50	20
PEC1	CN226PE105	Program Elective Course I	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
ELC1	RM226RM106	Research Methodology	3	0	0	3	CCE	50	20	40		
							ESE	50	20			
HSM1	HS226HM107	Human Rights I	0	0	2	1	CCE				100	40
		Total	**15**	**4**	**6**	**22**						
					Hrs							
L	Lecture	CCE: Continuous and Comprehensive Evaluation	**Theory**		**19**							
T	Tutorial		**Pract/Lab**		**6**							
P	Practical	ESE: End Semester Evaluation	**Total**		**25**			**wef 2025-26**				
Cr	Credits											

Course Type	Elective Course Code	Course
PEC1	CN226PE105A	Data Processing and Information Retrieval
	CN226PE105B	Soft Computing
	CN226PE105C	Network Design
	CN226PE105D	Distributed Computing and Middleware Technologies

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

Department of Computer Engineering

First Year (FY) M Tech in Computer Engineering, Semester II

Course Type	Course Code	Course	Teaching Scheme				Evaluation Scheme					
			L	T	P	Cr	Exam	Theory Marks			Practical Marks	
								Max	Min for Pass		Max	Min for Pass
PCC5	CN226PC208	Deep Learning and Applications	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC6	CN226PC209	Social Media Analytics	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC7	CN226PC210	Advanced Software Engineering	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
PCC8	CN226PC211	Program Core Course Lab VIII Laboratory Practice II	0	0	4	2	CCE				50	20
							ESE				50	20
PEC2	CN226PE212	Program Elective Course II	3	1	0	4	CCE	50	20	40		
							ESE	50	20			
ELC2	CN226RM213	Research Seminar	0	0	2	1	CCE				100	40
HSM2	HS226HM214	Human Rights II	0	0	2	1	CCE				100	40
FPR	CN226FP215	Industry Based Mini Project	0	0	4	2	CCE				50	20
							ESE				50	20
		Total	**12**	**4**	**12**	**22**						
					Hrs							
L	Lecture	CCE: Continuous and Comprehensive Evaluation	**Theory**		**16**							
T	Tutorial		**Pract/Lab**		**12**							
P	Practical	ESE: End Semester Evaluation	**Total**		**28**			**wef 2025-26**				
Cr	Credits											

Course Type	Elective Course Code	Course
PEC2	CN226PE112A	Network and Cyber Security
	CN226PE112B	Computer Vision
	CN226PE112C	Natural Language Processing
	CN226PE112D	Security in IoT

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PC101, Course Title: Algorithm Analysis and Operation Research

Category: Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max %	Min marks for Pass
3	1	0	4	CCE	50	20			
Total Hours				ESE	50	20	40	-	-
39	13	0	Total: 52			40			

Prerequisites: Course Code	
Course Objectives: Purposes of the course are	
• To understand Algorithm Analysis • To introduce students to use quantitative methods and techniques for effective analysis of decisions making • To understand the model formulation and applications that is used in solving business decision problems.	
Course Outcomes: After successful completion of the course units the student will be able to	
CO1	Apply the knowledge of advanced design and analysis techniques for the design and analysis of efficient algorithms
CO2	Apply knowledge to find solutions using multithreaded algorithms and matrix operations
CO3	Analysis of NP-Completeness and Approximation Algorithms to finding near-optimal solutions with polynomial time complexity
CO4	Analyse the characteristics of different types of decision-making environments to solve optimization problems and Develop dynamic and adaptive models using game theory
CO5	Evaluate the OR techniques for the optimal distribution of goods or resources from multiple sources to multiple destinations.

Syllabus

Unit I	Advanced Design and Analysis Techniques	8 hrs
Introduction, Dynamic Programming: Rod cutting, Matrix-chain multiplication, Elements of dynamic programming; Greedy Algorithms: An activity-selection problem, Elements of the greedy strategy, Huffman codes; Amortized Analysis: Aggregate analysis, The accounting method, The potential method, Dynamic tables		
Unit II	**Multithreaded Algorithms and Matrix Operations**	**8 hrs**
Multithreaded Algorithms: The basics of dynamic multithreading, Multithreaded matrix multiplication, Multithreaded merge sort; Matrix Operations: Solving systems of linear equations, Inverting matrices, Symmetric positive-definite matrices and least-squares approximation		
Unit III	**NP-Completeness and Approximation Algorithms**	**7 hrs**
NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-completeness proofs, NP-complete problems; Approximation Algorithms: The vertex-cover problem, The traveling-salesman problem, The set-covering problem, Randomization and linear programming, The subset-sum problem		
Unit IV	**Linear Programming, Duality in Linear Programming and Game Theory**	**8 hrs**
Introduction, Modeling with Linear Programming, Two variable LP model, Graphical LP solutions for both maximization and minimization models with various application examples, Duality theory: a fundamental insight. The essence of duality theory, Economic interpretation of duality, Primal dual relationship; Game Theory-Introduction, 2 person zero sum games, Maximi - Minimax principle, Principle of Dominance, Solution for mixed strategy problems, Graphical method for 2 x n and m x 2 games.		

Unit V	**The Transportation Problem and Assignment Problem**	**8 hrs**

Finding an initial feasible solution - North West corner method, Least cost method, Vogel's Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods
Assignment Problem: Hungarian method of Assignment problem, Maximization in Assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.

Tutorials Topics:

1) Assignment on Amortized Analysis: A Dynamically Resized Table-Actual Cost per operation, Aggregate Analysis, Accounting Analysis, Potential Analysis
2) Solving linear equation with matrix.
3) Give NP-Complete proof for travelling salesman (TSP) problem.
4) i) List down the steps to solve the LPP with the help of a graphical method. Solve the following LPP by graphical method.

Max $Z = 100\,x1 + 40\,x2$

Subject to

$5\,x1 + 2\,x2 \leq 1000$
$3\,x1 + 2\,x2 \leq 900$
$x1 + 2\,x2 \leq 500$
$x1, x2 \geq 0$

ii) List down the steps to solve game theory problem using arithmetic method. Find Solution of game theory problem using arithmetic method

Player A\Player B	B1	B2	B3
A1	10	5	-2
A2	13	12	15
A3	16	14	10

5) Discuss Hungarian Method of Solving an Assignment Problem with example.

Text Books

1. Thomas H Cormen, Charles E LeiseArson, Ronald Rivest, Cliffor Stein., Introduction to algorithms, 3rd edition, MIT Press, ISBN 978-0-262-03384-8.
2. Prem Kumar Gupta, D. S. Hira, Operations Research, S. Chand Publishers, New Delhi, 2004, ISBN: 978-81-219-0281-6

Reference Books

1.Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
2. Hamdy A. Taha "Operations Research" Pearson Education, 8th Edition, ISBN: 978-81-317-1104-0

e-Resourses

MOOC Course link :

a. https://onlinecourses.nptel.ac.in/noc20_cs10/preview ,
b. https://onlinecourses.nptel.ac.in/noc22_ma48/preview

Rubrics for Continuous Evaluation

Component	**Level**	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Total**	**Process Evaluation**
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PC102 Course Title: Advanced Operating SystemCategory:

Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
39	13	0	Total: 52	ESE	50	20			

Prerequisites: Operating System	
Course Objectives:	
• To understand concept of advanced operating system like Unix and its structure • To learn the concept of Process, Thread, Memory and file management • To understand Distributed Operating System Fundamentals • To acquaint with the concept of message passing • To become aware of Recourse Management concept	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Recognize and classify advanced operating systems
CO2	Classify and exemplify Process and Memory Management
CO3	Apply distributed Computing system fundamentals to develop applications
CO4	Design Advanced OS based Applications
CO5	Apply obtained knowledge from case studies on real life applications

Syllabus

Unit I	**Introduction:** Introduction to Advanced Operating system – Structure, processes, address spaces and threads, loading programs into processes, files, Architecture of UNIX Operating System, Concepts of Linux Programming- Files and the File system, Processes, Users and Groups, Permissions, Signals, Inter process Communication, low-level kernel, storage management	**7hrs**
Unit II	**Process Management and Memory Management**: Multithreaded Programming-Programming with threads, synchronization, thread safety. Thread implementations-strategies, simple thread implementations, Scheduling Strategy, Tactics Hardware support for virtual memory – forward mapped page tables, hashed page tables	**7hrs**
Unit III	**File Systems** :Basics of File systems, Crash resiliency, Directories and naming, multiple disks, Flash memory, File-Sharing Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic Transactions, Design Principles, Case studies: NTFS, WAFL, NFS, CIFS.	**7hrs**
Unit IV	**Distributed Computing systems fundamentals** Introduction to Distributed computing systems, Models, Popularity, Design issues of Distributed operating system, Distributed Shared Memory, General Architecture of DSM systems. Deadlock detection algorithm, distributed file servers. **Study of sample advanced OS** like Chorus, Mach, Amoeba and OSF distributed Environment, Solaris. Case Study : LLM-OS	**9hrs**
Unit V	**Message Passing and Resource Management** Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling Features of global scheduling algorithm, Task assignment approach, Load-Balancing and Load approach	**9hrs**

Tutorials:-	
1.Demonstrate functioning of forward mapped Page Table	**2hrs**
2.Differentiate between NTFS ,NFS and CIFS file systems	**2hrs**
3. Discuss various Deadlock Detection Algorithms in Distributed System	**2hrs**
4.Discuss various features of Global scheduling algorithm	**2hrs**
5. Mini Project on creation of Logging system and system backup for OS	**5hrs**

Text Books

1. Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, McGraw-Hill 1st July 2017
2.A.S. Tanenbaum, “Modern Operating Systems”, 5th edition, PHI.

Reference Books

1. Thomas W. Doeppner, “Operating Systems in Depth’, Wiley India edition.
2. P.K. Sinha, “Distributed Operating Systems concepts and design”, PHI
3.HagitAttiya, Jennifer Welch. Distributed Computing: Fundamentals, Simulations, and Advanced Topics
4. G. Coulouris, J. Dollimore, T. Kindberg, “Distributed Systems concepts and design”, 5th edition, 2011 Addison Wesley
5.Linux System Programming Robert Love O’Reilly
6.The Design of the UNIX Operating System Maurice J. Bach. PHI
7.SukumarGhosh, Distributed Systems: An Algorithmic Approach, Second Edition

E-contents:

1. https://nptel.ac.in/courses/106106107
2. https://nptel.ac.in/courses/106105172

Datasets:

1. https://www.kaggle.com/datasets/kartikbhatnagar18/operating-systems-in-use-20092021-time-series
2. https://github.com/topics/malware-dataset

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PC103, Course Title: Artificial Intelligence and Machine Learning

Category: Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20			
Total Hours				ESE	50	20	40	-	-
39	13	0	Total: 52			40			

Prerequisites: Data Structures and Algorithms

Course Objectives: Purposes of the course are

- To give a deep insight of Machine Learning and AI
- To demonstrate ML and AI tools to develop various ML and AI applications
- To explain learning theory and various case studies of Machine learning
- To Apprise the concepts of game playing and intelligent agents in AI
- To explain ML and AI applications and recent advancements

Course Outcomes: After successful completion of the course units the student will be able to

CO1	Understand and relate basic concepts of Artificial Learning
CO2	Evaluate the performance of application using Game playing and intelligent agent
CO3	Choose appropriate AI tool as per the requirement of an application
CO4	Compare between various machine learning algorithms and models and experiment with various case studies of Machine Learning
CO5	Relate and apply learning theory in machine learning applications

Syllabus

Unit I	Introduction to Artificial Intelligence	8 Hrs

Introduction to Artificial Intelligence, Future of AI, Brief Discussion of Major Topics (Expert System, Natural Language Processing, Speech and Pattern Recognition etc.) of AI. Problem definition as a State Space Search, Production System, Control Strategies, Problem Characteristics.

Unit II	Game playing and Intelligent agents	8 Hrs

Game playing, Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge

Architecture for Intelligent Agents, Agent communication, Negotiation and Bargaining, Argumentation among Agents, Trust and Reputation in Multi-agent systems.

Unit III	**AI applications and tools**	**7 Hrs**
Language Models, Information Retrieval and Extraction , Natural Language Processing, Machine Translation, Speech Recognition, Robot: Hardware, Perception, Planning ,Moving, Tools used for AI.		
Unit IV	**Introduction to Machine Learning and Case Studies on Advanced Machine Learning Techniques**	**9 Hrs**
What is AI, ML and Deep Learning? Types of learning: Supervised, Unsupervised and semi-supervised, reinforcement learning techniques, Models of Machine learning: Geometric model, Probabilistic Models, Logical Models, Grouping and grading models, Parametric and non-parametric models Case studies: Profiling the online storefronts of counterfeit merchandise, Detecting malicious websites in adversarial classification, Credit card fraud detection, Topic models of the underground Internet economy, Learning to rate vulnerabilities and predict exploits		
Unit V	**Learning Theory**	**7 Hrs**
1) Features: Feature Extraction, Feature Construction and Transformation, Feature Selection, Dimensionality Reduction: Subset selection, the Curse of dimensionality, Principle Components analysis, Factor analysis, Multidimensional scaling, Linear discriminant analysis, Bias/Variance tradeoff, Union and chernoff/Hoeffding bounds, VC dimension, Probably Approximately Correct (PAC) learning, Concept learning, the hypothesis space, Least general generalization, Internal disjunction, Paths through the hypothesis space, model Evaluation 2) and selection		
3) Tutorial: 4) Case study on Media Manipulation & Disinformation 2 hrs 5) Case study on multi-agent frameworks and their comparison 2 hrs 6) Study of Narrow AI 2 hrs 7) Explore practical applications of Machine learning in daily life 2 hrs 8) Mini Project: students should implement any one Mini project from the problem statements given below 9) 5 hrs 10) Chatbot for Customer Service 11) Object Detection with TensorFlow 12) Fraud Detection System 13) Signature Verification System Using CNN		
TEXT BOOKS: 1. Ethem Alpaydin, "Introduction to Machine Learning", 4th Edition, The MIT Press. 2. Yegnanarayana B, Artificial Neural Networks, Prentice-HallIndia Pvt.Ltd		
REFERENCE BOOKS: 1. Tom M. Mitchell, "Machine Learning", 1 st Edition, Tata McGraw-Hill Education. 2. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective",The MIT Press. 3. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 3rd edition, Pearson Education, 2015. 4. Richard E. Neapolitan, Xia Jiang, Artificial Intelligence - With an Introduction to Machine Learning, Chapman & Hall CRC, 2018. 5. M. Tim Jones, ―Artificial Intelligence: A Systems Approach (Computer Science)‖, Jones and Bartlett Publishers, Inc., First Edition, 2008.		
E-contents: **MOOCs courses link:** 1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview 2. https://onlinecourses.nptel.ac.in/noc23_cs18/preview 3. https://nptel.ac.in/courses/106105077		

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PE105A **Course Title: Data Processing and Information Retrieval**

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
39	13	0	Total: 52	ESE	50	20			

Prerequisites: Database Management Systems

Course Objectives: Purposes of the courses are

- To study the concept of Data Warehouse and big data
- To study concepts of pattern based data mining for decision making.
- To explore concept of text mining, web mining
- To understand classification and clustering methods
- To provide an insights of Information Retrieval concepts.

Course Outcomes: After successful completion of the course the student will be able to

CO1	Design on Data Warehouse, **Implement** OLAP operations using any tool
CO2	**Design** Big Data Model and Implement classification to provide analytical view for any real life application like traffic system, education sector, health sector etc.
CO3	**Implement** advanced data mining and clustering algorithms and **compare** their performance.
CO4	**Apply** web mining techniques for effective retrieval of data and **evaluate** on standard performance measures
CO5	**Design and Develop** solutions using information retrieval techniques for recommendation systems, Sentiment Analysis, Question Answering Systems etc.

Syllabus

Unit I	Data Warehouse Basics	8 hrs

Data Warehouse Concept, Data Warehousing architecture, Data Warehouse Models, Data Warehouse Modeling: Data Cube and OLAP- Data Cubes, Schemas, OLAP Operations in the Multidimensional Data Model, Typical OLAP Operations, A Starnet Query Model , A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Lakes

Unit II	Data Warehouse, Classification and Big Data	8 hrs

Data Warehouse Usage for Information Processing, From Online Analytical Processing to Multidimensional Data Mining, Efficient Data Cube Computation, Multi-dimensional data handling, retrieval using Tool.
Classification, Bayesian Belief Networks, Classification by Backpropagation, SVM, Classification Using Frequent Patterns, Other Classification Methods
Big data overview, state of the practice in Analytics- BI Vs Data Science, Current Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem, Data Analytic Life Cycle,

Unit III	Data Mining and Clustering	8 hrs
Data Mining concept, Data: Data, Information and Knowledge; Attribute Types: Nominal, Binary, Ordinal and Numeric attributes, Discrete versus Continuous Attributes, Data Pre-processing, data cleaning, data integration, data reduction, data transformation and Data Discretization, Pattern Mining Clustering, Probabilistic Model-Based Clustering, Clustering High-Dimensional Data, clustering graph and network data, clustering with constrains, Outlier Analysis, Performance Metrics – Accuracy, Precision, Recall, Sensitivity, Specificity, F1-Score, Cross validation		
Unit IV	**Web Mining**	**8 hrs**
Text mining: Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Feature vector, Bag of words, TF-IDF, Text Mining Approaches, Web mining, web search basics, web crawling and indexes, Search engines, Semantic web mining, Algorithm on mining		
Unit V	**Information Retrieval**	**7 hrs**
Boolean retrieval, Dictionary and Tolerant retrieval, Index Construction, Types of Indexing, Index compression, Statistical properties of terms in information retrieval: Heaps' law, Zipf's law, Dictionary compression, advances in IR		

Tutorial:

1. Consider multi-dimensional data for any domain, create different schema for the same
2. Implement classification with SVM/Backpropagation for dataset applicable any real life problem. Download dataset from Kaggle or similar platform
3. Implement clustering algorithm for any real life problem. Use suitable tool for implementation. Download dataset from Kaggle or similar platform
4. Implement any one recent algorithm in IR domain.
5. Evaluate on standard performance parameters in the area for the algorithm implemented in tutorial- 4.

Text Books :

1. Han, Jiawei Kamber, Micheline Pei and Jian, “Data Mining: Concepts and Techniques”, 3rd edition, 2012, Elsevier Publishers, ISBN:9780123814791, 9780123814807.
2. C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2009, -13: 9780521865715

Reference Books :

1. G. K. Gupta , “Introduction to Data mining with case studies", PHI, 3rd edition, 2014,
2. Matthew A. Russell, "Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More" , Shroff Publishers, 2nd Edition, ISBN: 9780596006068
3. Bing Liu, “Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data”, 2nd edition, 2011, ISBN 978-3-642-19459-7

e-Contents :

1. https://nlp.stanford.edu/IR-book/information-retrieval-book.html
2. NPTEL Course Big Data Computing https://archive.nptel.ac.in/courses/106/104/106104189/
3. NPTEL course on Data Mining https://onlinecourses.nptel.ac.in/noc21_cs06/preview

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

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M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PE105B Course Title: Soft Computing

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max %	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total: 52			40			

Prerequisites: Machine learning

Course Objectives: Purposes of the courses are

- To understand the soft computing techniques and algorithms for problem solving
- To be familiar with the various application areas of soft computing
- To develop intelligent systems using the hybrid systems
- To explore and solve problems using genetic Algorithms
- To learn various Bio Inspired optimization Algorithm

Course Outcomes: After successful completion of the course units the student will

CO1: **Compare** soft and hard computing techniques to identify suitable computing techniqueto solve the problem.
CO2: **Implement** fuzzy algorithms for various operations in different domain such ase-Commerce, automotive, Home appliances, Structural analysis and Design etc.
CO3: D**esign** Artificial Neural Network for implementation of the solution to real lifeProblems.
CO4: **Apply** Genetic Algorithm to provide effective solutions with optimization for theproblem
CO5: **Create** system with nature-inspired algorithms to provide optimal solution

Syllabus

Unit I	Introduction To Soft Computing	8 hrs
Introduction, historical Development of Soft Computing, characteristics of Soft Computing, Soft Computing Vs Hard Computing, major Areas of Soft Computing, Basic tools of Soft Computing, Applications of Soft Computing.		
Unit II	**Fuzzy Logic and Sets**	**10 hrs**
Introduction to Fuzzy Logic, Fuzzy Membership Functions, Fuzzy Sets and Operations, Properties ofFuzzy Sets, Fuzzy Relations, Fuzzy Propositions, Fuzzy Implications, Fuzzy Inferences, Fuzzy If-		

Then Rule, Fuzzy Algorithms, Fuzzification and Defuzzification, fuzzy computing problems. Fuzzy Logic Controller, Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy rule-based system, Fuzzy Decision Making, Fuzzy expert system, case study on fuzzy reasoning.

Unit III	**Neural Networks**	**7 hrs**

Neural Network Basics, Perceptron, Types of Activation Functions, Architecture of Neural Network, Unsupervised Learning Networks, Neuro-Fuzzy System, case study on neural network for the application

Unit IV	**Genetic Algorithm**	**7 hrs**

An Introduction to Genetic Algorithms, Genetic Algorithm and Search Space, Operators in Generic Algorithm, Classification of Genetic Algorithm, Holland Classifier System, case study on genetic algorithm.

Unit V	**Bio-Inspired Optimization Algorithms**	**7 hrs**

Biological Motivation, from natural to artificial, Swarm Intelligence, standard algorithm of AntColony Optimization, Particle Swarm Optimization, cuckoo search algorithm, bat algorithm

Tutorial:

1. Design fuzzy sets and its basic operations	**2 hrs**
2. Create application using Neural Network	**2hrs**
3. Provide solution for real life problem using Genetic Algorithm	**2 hrs**
4. Create optimization based application for any domain	**2 hrs**
5. Mini Project – Hybrid system with optimization	**5 hrs**

Text Books :

1. S.N. Sivanandam- “Principles of Soft Computing”, Wiley India- ISBN- 9788126527410
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley India, ISBN: 978-0- 470-74376-8

Reference Books :

1. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publications 1994.
2. Fuzzy Social Choice Theory - Michael B. Gibilisco. Annie M. Gowen Karen E. Albert John N. Mordeson Mark J. Wierman. Terry D. Clark.
3. Russell C. Eberhart , Yuhui Shi , James Kennedy, “ Swarm Intelligence: The Morgan KaufmannSeries in Evolutionary Computation”, 1st Edition, ISBN-13: 978-1558605954

e-Contents :

1. NPTEL Course on Introduction to Soft Computing https://archive.nptel.ac.in/courses/106/105/106105173/
2. NPTEL Course on Introduction to Artificial Neural Networks
3. https://nptel.ac.in/courses/117105084
4. Swayam course on Evolutionary Computation for Single and Multi-Objective Optimization
5. https://onlinecourses.nptel.ac.in/noc21_me43/preview

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PE105C Course Title: Network Design

Category: Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max %	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total: 52			40			

Prerequisites: Computer Networks	
Course Description:	
• To develop a comprehensive understanding of advances in computer Networks • To study design issues in networks. • To learn estimation of networking requirements. • To learn Enterprise level network design. • To understand various issues indexing the performance of the network.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Apply the knowledge to design computer networks
CO2	Analyze the performance of networks based on chosen metrics
CO3	Design routing schemes for optimized routing in networks
CO4	Illustrate appropriate and advanced techniques to build the computer network
CO5	To implement Quality of Service in next generation networks

Syllabus		
Unit I	**INTRODUCTION:** Overview of network analysis and design process, Network design issues, requirement analysis (user, application, device, network), Routing and forwarding, Routing algorithms, resource allocation, general principles of network design, network characteristics, performance metric in computer networks	**7hrs**
Unit II	**Physical and Logical network design**: Network Topologies, Physical addressing, switching, IP packet format, IP routing method, routing using masks, fragmentation of IP packet, IPv6 vs IPv4, advanced features of IP routers: filtering, IP QoS, NAT, routers	**7hrs**
Unit III	**Queuing Theory** Delay Models in Data Networks, Queuing Models- Little's Theorem, Application of Little's Theorem, and Queuing Systems: M/M/1, M/M/2, M/M/m, M/M/∞, M/M/m/m, M/M/m/q, M/M/1/N, D/D/1, M/G/1 System, M/G/1 Queues with Vacations, Priority Queuing.	**7hrs**
,		
Unit IV	**Modeling Network as Graph** Graph terminology, representation of networks, fundamental graph algorithms, shortest path, link prediction algorithms-Dijkstra's, Bellman's, Floyd's, Incremental shortest path algorithm. **Introduction to Network Testing tool wireshark** Network Testing,What is Wireshark, use cases of wireshark,feature of wireshark	**9hrs**
Unit V	**Methods of Ensuring Quality of Service** Introduction, applications and QoS, QoS mechanisms, Queue management algorithms, feedback, resource reservation, traffic engineering, IP QoS Next generation networks, cyber physical systems, smart mobiles, cards and device networks, smart devices and services **Real-time Experimentation using Wireshark** Capture HTTP Password using wireshark, capture files from HTTP Traffic using Wireshark	**9hrs**
Tutorials:-		
1.Demonstrate with example IP Routing Method and how to use masking for routing		**2hrs**
2.Describe functioning of Dijkstra's algorithm		**2hrs**
3.Descibe Queue management algorithm for implementing QoS		**2hrs**
4. Capture HTTP Password using wireshark		**2hrs**
5.Mini Project on Packet Tracing,IP Spoofing using Wireshark		**5hrs**

Text Books

1. Aaron Kershenbaum, "Telecommunications Network Design Algorithm", McGraw Hill education (India), Edition 2014, ISBN-10: 0070342288
2. James MCCAbe, "N/W analysis, Architecture and Design", Elsevier, 978-0-12-370480-1

Reference Books

1. Pablo Pavon Marino, "Optimization of Computer Networks : Modeling and algorithms – A hands on approach", Wiley Publication, ISBN: 9781119013358
2. Olifer, Victor Olifer, "Computer Networks, Principles, Technologies and Protocols for network design", Wiley India, ISBN: 13: 9788126509171.
3. Wireshark Network Analysis (Second Edition): The Official Wireshark Certified Network Analyst Study Guide 2nd Edition, Kindle Edition by Laura Chappell (Author), Gerald Combs (Foreword) Format: Kindle Edition
4. Practical Packet Analysis by Chris Sanders is a good overview for Wireshark

E-contents :

1. https://nptel.ac.in/courses/108105159
2. https://nptel.ac.in/courses/123105004

Datasets :

1. https://github.com/BNN-UPC/NetworkModelingDatasets
2. https://www.kaggle.com/datasets/ravikumargattu/network-traffic-dataset
3. https://www.kaggle.com/datasets/prmukesh/wireshark-dataset

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PE105D Course Title: Distributed Computing and Middleware Technologies

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max %	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total: 52			40			

Prerequisites: Operating System	
Course Objectives: Purposes of the course are ➢ To understand the basic concepts of Distributed System and Message Passing. ➢ To compare different Deadlock detection algorithms in DC ➢ To analyze middleware technologies. ➢ To study various middleware designs and patterns.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	**Apply** fundamental concepts of Distributed Systems and Message passing.
CO2	**Design** the solutions for Synchronization Problems in Distributed computing applications
CO3	**Apply** mutual exclusion and deadlock detection algorithms for large scale distributed applications
CO4	**Implement** distributed application using web services
CO5	**Use and Analyze** Enterprise and Open Telecom Platform(OTP)Middleware for application development

Syllabus

Unit I	Introduction	8 Hrs
Introduction: Evolution of Distributed Computing Systems, Characterization of Distributed Systems: Issues, Goals, and Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept, Middleware and Distributed System, Middleware organization **Message Passing and Communication** Inter process Communication, Layered Protocols, Inter-process communication (IPC): MPI, Remote Procedure Call (RPC), Remote Object Invocation, Remote Method Invocation (RMI) Message Oriented Communication, Stream Oriented Communication, Group Communication		
Unit II	**Synchronization and Mutual Exclusion**	**8 Hrs**
Synchronization: Clock Synchronization, Logical Clocks, Election Algorithms, **Mutual Exclusion**, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure, Assertion based Algorithms Lamport's algorithm, Token based Algorithms- Suzuki-Kasami's broadcast based algorithm		
Unit III	**Deadlocks and Distributed Database**	**8Hrs**
Deadlocks: Models of distributed deadlock, Chandy-Misra-Haas deadlock detection for AND model, Chandy-Misra-Haas deadlock detection for OR model, Deadlock resolution **Distributed Database :** Concept , Architecture		

Unit IV	Enterprise Middleware and Open Telecom Platform (OTP) Middleware	8 Hrs
Enterprise Middleware: Concept, EAI, Enterprise Bus (e.g. TIBCO) and Publish-Subscribe Models, Real-time requirements, Security aspects, Business Processes and Middleware Implementations, Message-Oriented Middleware in loosely-coupled systems. **OTP founding ideas**: Basic concepts of the Erlang language, Programming abstractions of the Erlang/OTP platform. server Behaviour and callbacks. The gen_server Behaviour. Erlang Term Storage(ETS) and Disk-based ETS (DETS)		
Unit V	**Web Services**	**7 Hrs**
Web Services: rationale and interoperability. SOAP Web Services: XML messaging, WSDL, general architecture. RESTful Web Services: resource-based approach, JAX-RS APIs. JSON. Service Oriented Architecture. Multi-tier structuring of web applications. Dynamic web content generation		

Tutorial:

1. List various distributed message passing mechanisms and Create a distributed name server (like DNS) RMI.
2. Elaborate the step by step approach to Develop a middleware component for retrieving Stock Market Exchange information.
3. Create a simple web service and write any distributed application to consume the web service
4. Discuss various algorithms used for Clock synchronization in Distributed System
5. Brief about the future trends in Enterprise Application Integration.
   and discuss key strategies in success for any EnterpriseApplication Integration.

Text Books:

1. Tanenbaum A.S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Prentice Hall,2007)
2. Cesarini, F., Vinoski, S. (2016). Designing for Scalability with Erlang/OTP: Implementing Robust, Fault-tolerant Systems. Japan: O'Reilly Media, Inc ,2016

Reference Books:

1.Distributed OS by Pradeep K. Sinha (PHI),1998
2.Ajay D. Kshemkalyani, and Mukesh Singhal "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press, 2008 (Reprint 2013).
3.Principles of Distributed Database Systems, Ozsu, Pearson Publication,2007.'

NPTEL Links:

https://onlinecourses.nptel.ac.in/noc21_cs87/preview

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226PC104 **Course Title: Laboratory Practice – I**

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
0	0	4	2	CCE	50	20	40	-	-
				ESE	50				
Total Hours									
0	0	52	Total: 52						

Prerequisites: Algorithms, DBMS, Machine Learning, Computer Networks

Course Objectives:

1. To implement Multi-threaded algorithms and perform analysis of the algorithm.
2. To apply Operations research knowledge for problem solving.
3. A-1 To create data warehouse for system and use data mining algorithmsB-1 To learn and apply Soft Computing Techniques to create
   C-1 To Provide insight of network testing using wireshark tool
   D-1 To implement mutual exclusion in distributed computing applications
4. A-2 To provide an insights of Information Retrieval concepts
   B-2 To apply Fuzzy, Neural Network, Genetic algorithm for creating hybrid system
   C-2 To Trace the functionality of network under different scenarios like IP spoofing , PacketTracing etc
   D-2 To apply deadlock detection algorithm in distributed environment

Course Outcomes: After successful completion of the course the student will be able to

Course Type	CO	Course Outcome
PCC1	CO1	Implement Multi-threaded matrix Multiplication algorithm and perform its analysis.
	CO2	Apply the knowledge of operations research to solve transformation.
	CO3	Apply the knowledge of operations research to solve game theory problems.
PEC 1 A	CO4	Create data warehouse for application and perform OLAP operations
	CO5	Implement clustering/classification algorithm for analyzing data
	CO6	Apply advanced algorithms of Information Retrieval for any software system
PEC 1 B	CO4	Use fuzzy logic in computation and implement various operations with fuzzy concept.
	CO5	Create a small hybrid system with optimization algorithm for any real life problems.
	CO6	Create solution for real life problems using nature inspired optimization algorithms.

PEC 1 C	CO4	Demonstrate implementation of Link state algorithm
	CO5	Demonstrate functioning of Network using Testing tools
	CO6	Apply network testing tools to judge the performance of the network
PEC 1 D	CO4	Apply Mutual exclusion to implement token based algorithm
	CO5	CO5 Solve the Distributed deadlock detection problem
	CO6	CO6 Create distributed application using web services

Syllabus

	Introduction	**6 hrs**
Laboratory Proficiency I (LP I) is companion course of theory courses (core and elective) in Semester I. It is recommended that given assignments of each course should be completed by the student. Course/ Laboratory instructor may modify the domain of mini project as per choice of students keeping similar complexity of work. Student has to submit a report/Journal in standard format approved by the Program Coordinator.		
	Guidelines for CCE	**7 hrs**
Continuous assessment of laboratory work is done based on performance of student. Each assignment/ mini project assessment is to be done based on parameters with appropriateweightages as defined by the program coordinator.		
	Guidelines for ESE	**6 hrs**
It is recommended that examination should be conducted as presentation by student based on one ofthe mini projects completed and the content understanding of laboratory work.		
	Suggested List of Assignments	
PCC1: Algorithms Analysis and Operation Research		

Assignment 1

Implement the multi-threaded matrix multiplication.

Compare the three implementations according to the following:

i. Number of threads created
ii. Execution time taken

Assignment 2

The Transportation Problem:

1) Obtain an initial basic feasible solution to the following transportation problem:

	D1	D2	D3	Supply
O1	9	8	5	25
O2	6	8	4	35
O3	7	6	9	40
Demand	30	25	45	

2) Milk in a milk shed area is collected on three routes A, B and C. There are four chilling centers P, Q, R and S where milk is kept before transporting it to a milk plant. Each route is able to supply on an average one thousand liters of milk per day. The supply of milk onroutes A, B and C are 150, 160 and 90 thousand liters respectively. Daily capacity in thousand liters of chilling centers is 140, 120, 90 and 50 respectively. The cost of transporting 1000 liters of milk from each route (source) to each chilling center (destination) differs according to the distance. These costs (in Rs.) are shown in the

following table:

Routes	Chilling Centers			
	P	Q	R	S
A	16	18	21	12
B	17	19	14	13
C	32	11	15	10

The problem is to determine how many thousand liters of milk is to be transported from each route on daily basis in order to minimize the total costof transportation.

Assignment 3

Game Theory: Solve the following pay-off matrix using Game Theory

		Player B				
	Strategies	I	II	III	IV	V
Player A	I	9	3	1	8	0
	II	6	5	4	6	7
	III	2	4	3	3	8
	IV	5	6	2	2	1

PEC 1 A:Data Processing and Information Retrieval

Assignment 1

Create any one of the following system and create data warehouse. Performvarious OLAP operations

a. Health care
b. Movie success prediction system
c. Speech emotion detection system
d. Signature verification system

Assignment 2

Implement any one clustering algorithm and any one classification algorithmon any standard dataset. Dataset available at Kaggle, KDD, data.gov, can be used

Assignment 3

Design and develop text based IR System using Boolean, vector space or probabilistic method of IR

PEC 1 B: Soft Computing

Assignment 1

Implement various operations on fuzzy sets. Create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.

Assignment 2

Create a small hybrid system for any of the below problems.

1. Stock market prediction
2. Object detection system
3. Face recognition system

Assignment 3

Create a small hybrid system with optimization algorithm for any real life problems

PEC 1 C: Network Design	
	Assignment 1 Implement Optimized Floyd Algorithm for the Shortest Path Problem. **Assignment 2** Examine Pre-captured Packets with wireshark tool to demonstrate functioning ofTCP protocol **Assignment 3** Capture and display real-time details of Network Traffic using wireshark Tool
PEC 1 D: Distributed Computing and Middleware Technologies	
	Assignment 1 Implement Token based Algorithm Suzuki-Kasami's broadcast based algorithmfor Mutual exclusion **Assignment 2** Implement Chandy-Misra-Haas Resource Model Algorithm for Deadlock Detection in a Distributed System **Assignment 3** Create ,Publish ,and Consume a SOAP based web service for any application.

Rubrics for Continuous Evaluation

Component	Level	Laboratory Practice -I	Total	Passing	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	1. Design with Advanced Engineering Materials 2. Mechanism Analysis and Synthesis 3. Advanced Mechanics of Solids	50	20	Refer CCE Guideline
ESE	Institute		50	20	External Oral Exam

M Tech in Computer Engineering | FY M Tech Semester I Course

Title: Research Methodology **Course Code: RM226RM106**

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
3	0	0	3	CCE	50	40	40	--	--
39	0	0	Total: 39	ESE	50	40			

Prerequisites: Basic understanding of statistics like central tendency, dispersions, Basic computing skills likes Microsoft Excel, Data analysis, critical thinking skills like reasoning etc

Course Objectives: Purposes of Course are:

1. To Provide a comprehensive understanding of research methods, techniques, and their applications in engineering and technology.
2. To Enable students to critically analyze and synthesize literature relevant to their research field.
3. To Equip students with the skills to design and conduct scientific research effectively using appropriate methodologies.
4. To Instill ethical standards, promoting integrity accountability and responsibilities in conducting and reporting research

Course Outcomes: After Successful completion of course units, students will

CO1	Effectively apply research processes and methodologies relevant to engineering research, facilitating the foundation of research activities, while developing the ability to conduct a thorough literature review to critically assess existing work and identify gaps for contributing to innovative research.
CO2	Design and execute a research study using quantitative and qualitative research methods to yield reliable and valid data ensuring robustness of research findings
CO3	Analyze data using statistical tools and software, interpreting results accurately to make informed decisions based on research results
CO4	Author research findings and present in both written and oral formats effectively to both scientific and lay audiences
CO5	Appraise the ethical standards of research, acknowledging the work of others appropriately and reporting results truthfully

Syllabus		
Unit I	**Basics of Research & Literature Review Techniques**	**10 hrs**
Definition of research, research methodology, concepts and significance of research in engineering, research ethics and responsibilities**,** case studies and real-life examples**,** Sources of Scientific literature, Methods for conducting and organizing literature reviews, Tools for managing references and citations like Mendeley, case studies and real-life examples		
Unit II	**Research Design**	**08 hrs**
Types of research design: Experimental, Correlational, Survey and Case Study, variables, sampling methods and techniques, formulating experimental and observational strategies, case studies and real-life examples		
Unit III	**Data Collection and Analysis**	**07 hrs**
Techniques for collecting primary and secondary data, quantitative analysis, descriptive and inferential statistics, qualitative analysis, content and thematic analysis, case studies and real-life examples		
Unit IV	**Statistical Tools and Software in Research**	**08 hrs**
Usage of Statistical software's like Minitab, MATLAB/Scilab in data analysis and interpretations, visualizing data and presenting statistical results in graphical, numerical format, case studies and real-life examples		
Unit V	**Research Reporting and Presentation**	**06 hrs**
Structure and components of research reports and papers, Ethical considerations in publishing, Skills for effective research presentation, case studies and real-life examples		

Tutorials:

All activities should be published in LinkedIn or YouTube and record responses.

1) Write a brief essay on the importance of research in their field of engineering

2) Create a flowchart of the research process for a hypothetical study

3) Group discussion on recent engineering innovations driven by research

4) Analyze a case study on ethical dilemmas in research and propose solutions.

5) Create a literature review by using Mendeley as per APA citations and references

6) Choose a research question and propose a suitable research design

7) Outline experimental protocol for given research question

8) Analyze a dataset using Minitab/Scilab/MATLAB and interpret the results

9) Prepare a check sheet for selection of type of graphs and its effectiveness

10) Review and critique a research paper for ethical compliance

References:

1. Kothari, C. R. (2019). Research methodology: Methods and techniques. New Age International.
2. Kumar, R. (2019). Research methodology: A step by step guide for beginners. Sage Publications.
3. Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques. New Age International.
4. Chawla, D., & Sondhi, N. (2021). Research methodology: Concepts and cases. Vikas Publishing House.
5. Prasad, R. K. (2020). Research methodology. Kitab Mahal.
6. Tripathi, P. C. (2018). Research methodology in social science. Sarup & Sons.
7. Thomas, G. (2022). Research methodology and scientific writing. Springer.

Research Papers:

1. Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. In Journal of Business Research (Vol. 104, pp. 333–339). Elsevier BV. https://doi.org/10.1016/j.jbusres.2019.07.039
2. Kolstoe, S. E., Durning, J., Yost, J., & Aleksandrova-Yankulovska, S. (2023). Ranking Research Methodology by Risk — a cross-sectional study to determine the opinion of research ethics committee members. In Systematic Reviews (Vol. 12, Issue 1). Springer Science and Business Media LLC. https://doi.org/10.1186/s13643-023-02295-1

NPTEL/SWAYAM

1) Research Methodology - https://www.youtube.com/watch?v=E2gGF1rburw
2) Issues in hypothesis testing part 1- https://www.youtube.com/watch?v=p2M_0e5bxTA
3) Issues in hypothesis testing part 2 - https://www.youtube.com/watch?v=KSwM5qo_yoQ

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carry 10 marks Question

Course Code: HS226HM107, Course Title: Human Rights I Category: Humanities Social Science and Management

	Teaching Scheme				Evaluation Scheme				
						Theory Marks		Practical Marks	
L (Hr)	T(Hr)	P(Hr)	SL	Cr	Exam	Max	Min marks for Passing	Max	Min marks for Passing
0	0	02	0	2	100	-	-	100	40
	Total Hours								
0	0	26	34	Total:60					

***SL-Self Learning Component must be completed**

Prerequisites: Not Required	
Course Objectives:	
1. To introduce the basic idea of human rights to the students. 2. To equip the student with an ability to distinguish between human rights, fundamental rights and also between individual rights and group rights. 3. To discusses human rights in the context of global political order.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Explain the historical evolution, meaning, scope, and significance of human rights and distinguish between human rights, fundamental rights, individual rights, and group rights.
CO2	Interpret the structure, provisions, and role of the United Nations in the promotion and protection of human rights at the global level.
CO3	Analyze the principles, preamble, and key provisions of the Universal Declaration of Human Rights in the context of global political order and national frameworks.
CO4	Examine the human rights issues of disadvantaged groups including women, children, refugees, migrant workers, and SC/ST communities in the Indian and international context.
CO5	Evaluate the human rights concerns and protection mechanisms related to vulnerable and marginalized groups such as stateless persons, sex workers, migrant workers, and HIV/AIDS victims.

Syllabus

Unit I	**Foundations and Evolution of Human Rights**	**5 hrs**
Brief History and Evolution of Human Rights, Meaning and Definition of Human Rights, Significance and Scope of Human Rights, Distinction between Human Rights, Fundamental Rights, and Legal Rights, Individual Rights and Group Rights		
Unit II	**United Nations and International Human Rights Framework**	**5 hrs**
Overview of the United Nations System, Human Rights under the UN Charter, Provisions of the UN Charter dealing with Human Rights, Role of UN Agencies in Protection of Human Rights		
Unit III	**Universal Declaration of Human Rights (UDHR)**	**5 hrs**

Technical Background of the Universal Declaration of Human Rights, Preamble of UDHR Key Articles and Principles, Significance of UDHR in Global Political Context, Impact of UDHR on National Constitutions		
Unit IV	**Human Rights of Disadvantaged Groups in India and Globally**	**5 hrs**
Rights of Stateless Persons, Rights of Sex Workers, Rights of Migrant Workers , Rights of HIV/AIDS Victims		
Unit V	**Human Rights of Vulnerable and Marginalized Groups**	**6 hrs**
Rights of Stateless Persons, Rights of Sex Workers, Rights of Migrant Workers, Rights of HIV/AIDS Victims, National and International Protection Mechanisms		

Reference Books

1. Baxi Upendra, 2002, The Future of Human Rights, New Delhi, Oxford University Press.
2. 2. Byrne Darren, 2003, Human Rights, Delhi, Pearson.
3. 3. Campbell Tom and Goldberg David et al., 1986, Human Rights, Oxford, Basil Blackwell.
4. 4. Coicaud J. M. and Doyle M. W. et al., 2004, The Globalization of Human Rights, Tokyo, United
5. Evans Tony, 2005, The Politics of Human Rights, London, Pluto Press.
6. Hawkesworth Mary and Kogan Maurice(eds.), 1992, Encyclopedia of Government and Politics- Vol. II, London, Routledge.
7. Narang A.S.(eds.), 2009, Human Rights in India, New Delhi, Indira Gandhi National Open University.
8. Narang A.S.(eds.), 2015, Human Rights: Evolution, Concepts and Concerns, New Delhi, Indira Gandhi National Open University.
9. Sastry T. S. N., 2011, Introduction to Human Rights and Duties, Pune, University of Pune Press.
10. Sastry T. S. N., 2012, Human Rights of Vulnerable and Disadvantaged Groups, Pune, University of Pune Press.
11. Sastry T. S. N., 2014, Human Rights and Duties in India: Law, Policy, Society and Enforcement Mechanism, Pune, University of Pune Press.

E Recourses:

1. Historical Development of Human Rights
2. https://youtu.be/3meTWtONgP8
3. Understanding Human Rights
4. https://youtu.be/NtNSPpafQHE
5. Human Rights Meaning, Definition and Scope
6. https://youtu.be/Q9jhx0jGsFg
7. Human Rights Discourse and Education in India
8. https://youtu.be/nYVGB9nheWU
9. Human Rights Education Responsibilities of state https://youtu.be/3oNPYaH4EdI

Marking Scheme for Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous Comprehensive (CCE)	Progressive Evaluation	Understanding Viva Voce	20	50	20
		Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	10		
		Attendance	10		
	End Evaluation	Performance	25	50	20
		Oral Examination	25		

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PC208, Course Title: Deep Learning Applications

Category: Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total:52			40			

Prerequisites: Machine Learning	
➢ **Course Objectives:** Purposes of the course are ➢ To understand the core concepts of deep neural networks. ➢ Comparing different deep learning models. ➢ To understand the basics of deep reinforcement learning models. ➢ To analyze Deep Neural Network Architectures. ➢ To solve real world problem using Reinforcement Learning	
Course Outcomes: After successful completion of the course units the student will	
CO1	Understand the methods and terminologies involved in deep neural network and Design Simple Deep Neural Network
CO2	Apply suitable CNN for real time application
CO3	Analyze Recurrent and Recursive Neural Network for performance
CO4	Design and Develop Deep learning application using deep generative models.
CO5	Construct and apply reinforcement learning algorithms

Syllabus

Unit I	Introduction to Neural Network and Deep Neural Network	8 hrs
Neural Networks -Functions in Neural networks, Activation function, Loss function, Function approximation Deep Neural networks-Shallow neural networks, Training Neural Networks –Backpropagation, Setup and initialization issues, Vanishing and Exploding gradient problem, Gradient Descent Strategies Concept of Transformers and Types, Applications of transformers in Deep Learning		
Unit II	**Convolutional Neural Network**	**8 hrs**
The Basic Structure of a Convolutional Network, Convolution and Pooling as infinitely strong prior, variants of convolution function, structured output, Datatypes ,Efficient convolution algorithms, Advanced CNN-Region based CNN, Fast RCNN, You Only Look Once(YOLO),Single shot detector(SSD)		
Unit III	**Sequence Modelling**	**8 hrs**
Recurrent Neural Networks – Modeling the Time Dimension,3D Volumetric Input, Why not Markov Models? General Recurrent Neural Networks, Long Short Term Memory, Domain Specific Applications. Varieties of Recursive Neural Networks, Applications of Recursive Neural Networks		
Unit IV	**Deep Generative Models and Autoencoders**	**8 hrs**
Introduction to deep generative model, Types of GAN, Applications of GAN networks, Training Generative Adversarial Network, Directed Generative Nets, Generative Stochastic Networks, Evaluating Generative Models. Autoencoders, Regularization in auto encoders, Denoising Autoencoders, Sparse auto encoders, Contractive Autoencoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation,		

Parameter sharing and tying, Injecting noCCA at input, Ensemble methods, Dropout, Greedy Layer wCCA Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization.		
Unit V	**Deep Reinforcement Learning**	**7 hrs**
Introduction of deep reinforcement learning, Basic Framework for Reinforcement Learning, Stateless Algorithms, Bootstrapping for Value function learning, Policy gradient Methods		
Tutorial: **1**.Apply Convolutional Neural approach for modelling handwritten images 2.Discuss the classification of the sensor time series sequences using LSTM 3.Use the variational auto encoders for reconstructing MNIST digits 4. Case Study on Reinforcement learning for Robotics and Game Playing 5. Elaborate the process of deep generative model for image generation using text.		
Text Books: 1. Deep Learning- Ian Good felllow, Yoshua Benjio, Aaron Courville, The MIT Press, 2016 2. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996		
Reference Books: 1. Josh Patterson and Adam Gibson," Deep Learning" 2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007 3. Fundamentals of Deep Learning, Nikhil Buduma, O'Reilly Publication ,2017		
SWAYAM/NPTEL/You Tube Links https://onlinecourses.nptel.ac.in/noc21_cs76/preview		

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PC209 Course Title: Social Media Analytics

Category: Program Core Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total:52			40			

Prerequisites: DBMS (310241,Data Science and Big data Analytics(310251)	
Course Objectives:	
1. To understand foundations of Social Media Analytics 2. To Visualize and understand the data mining aspects in social networks 3. To solve mining problems by different algorithms 4. To understand behavioural part of web applications for Analysis 5. To analyse the data available on any social media applications	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Understand the basics of Social Media Analytics.
CO2	Illustrate the significance of Data mining in Social media
CO3	Demonstrate the algorithms used for text mining
CO4	Apply network measures for social media data
CO5	Illustrate Behaviour Analytics techniques used for social media data

Syllabus

Unit I	**Introduction to Social Media Analytics**	**7hrs**
The foundation for analytics, Definition, Social media data sources, Defining social media data, data sources in social media channels, Estimated Data sources and Factual Data Sources, Public and Private data, data gathering in social media analytics, Benefits of social media analytics		
Unit II	**Social Networks and Visualizations**	**7 hrs**
Introduction, Basic Taxonomy of Visualization, Data mining in Social Media: Introduction, Motivations for Data mining in Social Media, Data mining methods for Social Media, Related Efforts The convergence of Visualization, Interaction and Analytics.		
Unit III	**Text Mining in Social Networks**	**8hrs**
Introduction, TEXT Pre-processing, Keyword search, TEXT Classification and clustering Algorithms, ,Hierarchical clustering, k-means clustering, Transfer Learning in heterogeneous Networks, Sampling of online social networks, Comparison of different algorithms used for mining, tools for text mining.		
Unit IV	**Network Measures**	**8hrs**
Centrality: Degree Centrality , Eigenvector Centrality, Katz Centrality , Page Rank, Betweenness Centrality, Closeness Centrality ,Group Centrality ,Transitivity and Reciprocity, Balance and Status, Similarity: Structural Equivalence, Regular Equivalence		
Unit V	**Individual and collective behaviour analytics and Social Media Mining**	**9hrs**

Individual Behavior: Individual Behavior Analysis, Individual Behavior Modeling, Individual Behavior Prediction Collective Behavior: Collective Behavior Analysis, Collective Behavior Modeling, Collective Behavior Prediction, Sample case study Mining Twitter: Overview, Exploring Twitter's API, Exploring Trending Topics,Mining Facebook: Overview, Exploring Facebook's Social Graph API's, Analyzing Social Graph Connections Graph Mining, different ways of misinformation management on Twitter ('X') and Facebook	
Tutorial:-	
1.Do the classification of social media data on Twitter and Facebook	**2 hrs**
2.Demonstrate with example Individual behavior analysis	**2hrs**
3.Demonstrate with example collective behavior analysis	**2hrs**
4.As a case study discuss Facebook's Social Graph API	**2hrs**
5.Mini Project on implementing sentiments analysis on Twitter	**5hrs**
Text Books	
1.Reza Zafarani Mohammad Ali Abbasi Huan Liu, Social Media Mining, Cambridge University Press, ISBN:10: 1107018854 2.Charu C. Aggarwal, Social Network Data Analytics, Springer, ISBN: 978-1-4419-8461-6	
Reference Books	
1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education, 978-0-07-176829-0, 2. Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN:10: 1449367615 Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, ISBN: 13: 978-1-55860-901-3 ISBN: 10: 1-55860- 901-6 3. Bing Liu, Web Data Mining : Exploring Hyperlinks, Contents and Usage Data, Springer, 2nd Edition, ISBN: 978-3-642-19459-7 **E-contents** : 3. https://nptel.ac.in/courses/106106146 4. https://nptel.ac.in/courses/109103184 **Datasets** : 1.https://www.kaggle.com/code/shadabhussain/social-media-analytics 2. https://www.kaggle.com/discussions/general/240449 3.https://data.world/datasets/social-media	

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PC210 **Course Title: Advanced Software Engineering**

Category: Program Core Course

Teaching Scheme				Evaluation Scheme			
L	T	P	Cr	Exam	Theory % Marks		
					Max	Min for Pass	
3	1	0	4	CCE	50	20	40
39	13	0	Total: **52**	ESE	50	20	

Prerequisites: Course Code

Course Objectives: Purposes of the course are

1. Apply software quality assurance and testing activities using modern software tools
2. Organize Agile Software Development, Extreme Programming and Software Development Rhythms.
3. To describe and determine the purpose and importance of project management from the perspectives of planning
4. Design and implementation of secure software.

Course Outcomes: After successful completion of the course units the student will

CO1	Compile and Compare the agile methodologies: extreme programming, scrum, and feature driven programming.
CO2	Produce appropriate System Design, object design of reusable Activities
CO3	Apply the process to be followed in the software development life-cycle models
CO4	Identify the appropriate design patterns to solve object oriented design problems
CO5	Contribute to efficient and Secure delivery of software solutions and implement improvements in the software development processes

Syllabus

Unit I	**Agile Software Development**	7hrs
Agile Methods, XP: Extreme Programming, DSDM, SCRUM, Feature-Driven Development, Modeling Misconceptions, Agile Modeling, Tools of Misconceptions, Updating Agile Models Extreme Programming: Introduction, Core XP Values, The Twelve XP Practices, About Extreme Programming, Planning XP Projects, Test First Coding, Making Pair Programming Work		
Unit II	**Object Oriented Software Engineering**	7 hrs
Overview of System Design, System Design Concepts, System Design activities, Managing System Design, Case study, Object Design- Overview of Object design, Reuse Concepts, Reuse Activities, Managing Reuse		
Unit III	**Software Process Management and Version Control**	**7 hrs**
Process Planning and Project Organizations Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning, line-of- business organizations, project organizations, evolution of organizations, process automation. Software Version Control -Introduction, Version control types, Software Version Control tools		
Unit IV	**Software Architecture and Design Patterns**	**9 Hrs**
Object-Oriented Paradigm, Data Flow Architectures, Data-Centered Software Architecture, Hierarchical Architecture, Interaction-Oriented Software Architectures, Distributed Architecture, Component-Based Software Architecture, Heterogeneous Architecture, Architecture of User Interfaces, Implicit asynchronous communication software architecture. Solving Design Problems using Design Patterns , Selecting a Design Pattern Design Patterns-1: Creational, Abstract Factory-Builder, Factory Method, Prototype Singleton Design Patterns-2: Structural Patterns: Adapter, Bridge, Composite Decorator, Façade, Flyweight, Proxy		
Unit V	**Software Quality assurance and Testing Methodologies**	**9hrs**

Software quality assurance Framework and Standards SQA Frame work: Introduction to Quality? Software Quality Assurance. Components of Software Quality Assurance. Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan.
Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner, Using Win runner, Mapping the GUI.
Threats to Software Security, Sources of Software Insecurity, The Benefits of Detecting Software Security

Tutorial:

1) List the four important attributes, which all software products have. Suggest four attributes, which may be significant.
2) Software engineering methods only became widely used when CASE technology became available to support them. Suggest five types of method support, which can be provided by CASE tools.
3) Justify high cost of system-testing for generic software products, which are sold to a very wide market.
4) Apart from the challenges of legacy systems, heterogeneity and rapid delivery, identify other problems and challenges that software engineering is likely to face in the 21st century.
5) Discuss the professional responsibilities of software engineers to produce maintainable code even if this is not explicitly requested by their employer.
6) Two major international banks with different customer information databases merge and decide that they need to provide assess to all customer information form all bank branches. Giving reasons for your answer, suggest the most appropriate strategy for providing assess to these systems and briefly discuss how the solution might be implemented.

Reference Books

3. Software Engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition McGraw Hill International Edition.
4. Software Architecture in Practice, 3rd Edition By Len Bass, Paul Clements, Rick Kazman Published Sep 25, 2012 by Addison-Wesley Professional
5. Applied Software Architecture, ChristineHofmeister, Robert Nord, Deli Soni, Addison-Wesley Professional; 1st edition (November 4, 1999) ,ISBN-10: 0201325713 , ISBN-13: 978- 0201325713
6. Object-Oriented Software Engineering: Conquering Complex and Changing Systems, Bernd Bruegge and Allen H. Dutoit, Pearson Education,2002. ISBN 0-13-489725-0
7. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable object-oriented software, Addison-Wesley, 1995
8. Software testing techniques – Boris Beizer, Dreamtech, second edition.

Reference Books

1. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
2. Software Engineering, Ian Sommerville, Ninth edition, Pearson education
3. Object-oriented Software Engineering: The Professional Developer's Guide, AddisonWesley, George Wilkie, 1993. ISBN-10: 0201627671
4. Software Testing- Yogesh Singh, Camebridge

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PE212A, Course Title: Network and Cyber Security

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory Marks			Practical Marks	
					Max	Min marks for Pass		Max	Min marks for Pass
3	1	0	4	CCE	50	20	40	-	-
Total Hours				ESE	50	20			
39	13	0	Total: **52**			40			

Prerequisites: -	
Course Objectives: Purposes of the course are	
➢ To give an overview of Network Security and security issues in TCP/IP suite ➢ To illuminate protocol and software vulnerabilities ➢ To explain IP Security and authentication in network security ➢ To give an insight into attacks and tools of network security ➢ To explain cyber security, Cyber Crime, law and Investigation	
Course Outcomes: After successful completion of the course units the student will be able to	
CO1	Illustrate network security and security issues in TCP/IP Suite
CO2	Compare and contrast Network Security Threats and various issues related to it
CO3	Identify suitable IP security and authentication protocol as per the network requirement
CO4	Analyze various networking attacks and tools
CO5	Understand basics of Cyber Security and evaluate the cyber security needs of an organization

Syllabus

Unit I	**Introduction**	**7 Hrs**
Overview of Network Security, Network Security Model, OSI Security Architecture. Security services, attacks, Security Issues in TCP/IP suite- Sniffing, spoofing, buffer overflow, ARP poisoning, ICMP Exploits, IP address spoofing, IP fragment attack, routing exploits, UDP exploits, TCP exploits.		
Unit II	**Network Security Threats and Issues**	**7 Hrs**
. Protocol Vulnerabilities: SYN Flooding, Session Hijacking, ARP Spoofing, Attack on DNS, Wireless LAN: Frame spoofing, Violating MAC; Software Vulnerabilities: Phishing Attack, Buffer Overflow, Cross-site Scripting, SQL Injection; Virus, Worm, Malware, Botnets; Eavesdropping, Password Snooping and IP Masquerade.		
Unit III	**IP Security and authentication**	**7 Hrs**
IP Security-AH and ESP, SSL/TLS, SSH, Web Security- HTTPS, DNS Security, Electronic Mail Security (PGP, S/MIME), Authentication requirements and functions, Hash Functions ,MD5 message Digest algorithm, Secure Hash Algorithm , Authentication protocols- Kerberos, X.509, Lightweight Directory Access Protocol (LDAP) , OAuth2 ,SAML,RADIUS		

Directory Access Protocol (LDAP) , OAuth2 ,SAML,RADIUS

Unit IV	**Attacks and tools**	**8 Hrs**

Intruders, Viruses, Worms, Trojan horses, DoS, Distributed Denial-Of-Service (DDoS),
Ping of death attack, Teardrop attack (aka Nestea), ARP cache poisoning, ARP poisoning commands, ACK scan, TCP port scanning, VLAN hopping, Wireless sniffing, OS fingerprinting ISN Sniffing, Passive OS detection, Honey nets, Honey pots, Ethical hacking process, Ethical hacking issues,
Hacking tools, Tools for MITM attack

Unit V	**Introduction to Cyber Security**	**10 Hrs**

Introduction, Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control and Cryptography. Web attack: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. Network Vulnerabilities: Overview of vulnerability scanning, Open Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe,
Vulnerability Examples, Network Sniffers and Injection tools
Cyber Crimes, Types of Cybercrime, Cyber Laws, Cyberspace and Criminal Behaviour, Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Realms of the Cyber world. Internet crime and Act, Recognizing and Defining Computer Crime, Contemporary
Crimes, Computers as Targets, Contaminants and Destruction of Data

Text Books

1. Cryptography and Network Security - Principles and Practice | Eighth Edition | By Pearson,2023
2. William Stallings, Computer Security: Principles and Practices, Pearson 6 Ed, ISBN 978-0-13-335469-0, 2017
3. Nina Godbole, Sunit Belapure, Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiely India Pvt.Ltd, ISBN- 978-81-265-2179-1, 2011

Reference Books

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd, Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt.Ltd, 2005
2. CK Shyamala et el., Cryptography and Security, Wiley India Pvt. Ltd, ISBN-978-81-265-2285-9. 4.
3. Berouz Forouzan, Cryptography and Network Security, TMH, 2 edition, ISBN -978-00-707-0208-0.

e-Contents:

MOOCs courses link :

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. https://onlinecourses.swayam2.ac.in/cec22_cs15/preview

Tutorial :

1) Case study on cyber-attacks in real time environment **2hrs**

2) Study assignment on IDS **2hrs**

3) Demonstrate Linux networking security recovery commands. & Study Tools viz; FTK & The Sleuth Kit **2hrs**

4) Study assignment on Cyber Stalking types & their cases respectively **2hrs**

5) Mini Project: students should implement any one Mini project from the problem statementsgiven below **5hrs**

a. Password Strength Tester

b. Credit Card Encryption and Decryption

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PE212B Course Title: Computer Vision

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min marks for Pass		Max	Min for Pass
3	1	0	4	CCE	50	20			
Total Hours					50	20	40	-	-
39	13	0	Total: 52	ESE		40			

Prerequisites: Basic Mathematics**,** Data structures , Image processing ,Introduction to machine learning	
Course Objectives:	
6. To provide the Computer vision fundamentals 7. To explain mathematical transforms necessary for image processing 8. To explain the image enhancement techniques 9. To review the fundamental concepts of video processing 10. To explain the machine learning models for computer vision	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Apply the fundamental concepts in computer vision
CO2	Apply mathematical modelling methods for image processing tasks
CO3	Analyse image segmentation and edge detection techniques over real time images
CO4	Analyse the video processing techniques over audio and video frames
CO5	Select a computer vision technique for a real world problem

Syllabus

Unit I	**Introduction to Computer Vision**	**7 hrs**
Image Formation and Digital Image Representations, Image Enhancement, Image Sampling and Rotation, Image Pre-processing: Image Filtering, Grayscale Conversion ,Noise Reduction, Normalization		
Unit II	**Feature Extraction**	**8 hrs**
Introduction, Feature detection - Lines and corners detection. Identification of basic geometrical structures, Edge Detection ,Object Detection and Recognition , Principal Component Analysis		
Unit III	**Segmentation and Classification**	**8 hrs**
Grouping, super pixels ,Unsupervised and Supervised segmentation methods : Thresholding, Clustering, Support Vector Machine ,Convolutional Neural Networks and image classification		
Unit IV	**Image Compression**	**8 hrs**
Introduction, Need for image compression, Redundancy in images, Classification of image compression schemes, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression- Discrete Cosine Transform (DCT), Image compression standards, Video Compression Standards.		
Unit V	**Video Processing and Machine Learning for Computer Vision**	**8 hrs**
Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models. Video indexing, summarization and retrieval. Audio and Video semantic analysis. Deep Neural Networks Perceptron, Neural Network, Perceptron Training, Gradient Descent, Back propagation, Autoregressive models, Variational Auto encoders (VAEs), Normalizing flow models. Deep Learning Architecture for Computer Vision.		
Tutorial: 7) Assignment to Perform analysis on under water imaging		

8) Assignment to perform survey on super resolution and hyper spectral imaging techniques
9) Assignment to perform shadow removal in video images
10) Write an assignment on medical image processing
11) Mini Project based on remote sensing or any other domain

Text Books

1. Computer Vision-A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B.K.P.Horn, McGraw-Hill.2e
2. R. Gonzalez, R.E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education, India,2014

Reference Books

3. M. Tekalp, "Digital Video Processing", Prentice-Hall 2nd edition 2015
4. Forsyth, David A., and Jean Ponce. Computer Vision: a Modern Approach. Upper Saddle River, NJ: Prentice Hall, 2003. ISBN: 0130851981 Engineering Chemistry, Wiley India Pvt. Ltd.
5. Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/) 2nd edition 2022
6. Deep Learning, Goodfellow and Yoshua Bengio, Aaron Courville, 2016, MIT press. http://www.deeplearningbook.org/

e-contents:

1.NPTELcourse: https://onlinecourses.nptel.ac.in/noc21_ee79/preview
2. NPTELcourse: https://onlinecourses.nptel.ac.in/noc21_cs93/preview
3. NPTELcourse: https://onlinecourses.nptel.ac.in/noc23_ee39/preview

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PE212C , Course Title: Natural Language Processing

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme			
L	T	P	Cr	Exam	Theory % Marks		
					Max	Min for Pass	
3	1	0	4	CCE	50	20	40
39	13	0	Total: **52**	ESE	50	20	

Prerequisites: Theory of Computation ,Machine Learning, Discrete Mathematics

Course Objectives:

1. To be familiar with fundamental concepts and techniques of natural language processing.
2. To acquire the knowledge of various word level analysis in NLP.
3. To develop the various language modeling techniques for NLP.
4. To acquire the knowledge of various parsing and lexical semantics.
5. To use appropriate tools and techniques for processing natural languages and develop knowledge deep learning for NLP.

Course Outcomes: After successful completion of the course the student will be able to

CO1	Describe the fundamental concepts and techniques underlying approaches for NLP modules while demonstrating the concepts of morphology, syntax, and semantics in natural language.
CO2	Illustrate various language modeling and parts of speech techniques.
CO3	Illustrate various parsing and lexical semantics.
CO4	Construct and apply the use of NLP tools and techniques for text-based processing of natural languages.
CO5	Develop various approach for speech recognition including feature extraction, acoustic modeling and language modeling using deep learning.

Syllabus		
Unit I	**Foundations of NLP**	**6 hrs**
Generic NLP system, Levels of NLP, Knowledge in language processing, Classical Problems in NLP. Ambiguity in Natural language, Stages in NLP, Challenges of NLP, Applications of NLP, Empirical Laws, Morphology analysis Survey of English Morphology, Inflectional morphology & Derivational morphology, Lemmatization Regular expression, finite automata, finite state transducers (FST) Morphological parsing with FST , Lexicon free FST Porter stemmer		
Unit II	**Language Model and Part-of-Speech** :	**6 hrs**
Text Normalization Minimum Edit Distance N-gram Language Models Simple n-gram models, Estimation parameters and smoothing,Evaluatinglanguagemodels,WordEmbeddings/VectorSemantics:Bag-of-words,TFIDF,word2vec,doc2vec,Contextualized representations (BERT),GloVe, Fast Text, ELMO, CoVe, RoBERTa, CBOW, Skip-Gram Smoothing Huge Language Models Perplexity's Relation to Entropy Part-of Speech Tagging HMM for Part-of-Speech Tagging Viterbi algorithm		
Unit III	**Parsing and Lexical Semantics**	**5 hrs**
Introduction to Parsing Linguistic Constituents and Constituency tests - Partial or Shallow Parsing Dependency Parsing Word Senses Relations Between Senses Word Net: A Database of Lexical Relations, Methods for Word Sense Disambiguation.		
Unit IV	**NLP Tools and Techniques**	**4 hrs**
Prominent NLP Libraries: Natural Language Tool Kit (NLTK), spaCy, Text Blob, Gensim etc. Linguistic Resources: Lexical Knowledge Networks, WordNets, Indian Language WordNet (IndoWordnet), VerbNets, PropBank, Treebanks, Universal Dependency Treebanks Lesk Algorithm Walker's algorithm.		
Unit V	**Deep learning architectures for NLP :**	**5 hrs**
RNNs as Language Models - Stacked and Bidirectional RNN architectures LSTM Self Attention Networks: Transformers, Transformers as Language Models. Self-attention - cross- attention-Masked attention-Positional encoding Masked Language Modeling : Bidirectional Encoder Representations of Transformers (BERT) BERT, GPT-2 GPT 3 **Applications of NLP: Sentiment analysis, Question and Answering**		
Text Books		
1. Dan Jurafsky, James H. Martin "Speech and Language Processing", Draft of 3rd Edition, Prentice Hall 2022 2. UdayKamath, John Liu, James Whitaker "Deep Learning for NLP and Speech Recognition", 1st Edition, Springer 2019.		
Reference Books		
1. Ben Gold, Nelson Morgan, Dan Ellis "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", 2 nd Edition, John Wiley & Sons, 2011. **2.** Manning, Christopher D., and nrichSchütze , "Foundations of Statistical Natural Language Processing", Cambridge, MA: MIT Press **3.** Jacob Benesty, M. M. Sondhi,Yiteng Huang "Springer Handbook of Speech Processing" , 1st Edition, Springer, 2008		
E-contents : 1 https://nptel.ac.in/courses/106101007 2 https://nptel.ac.in/courses/106106211 3 http://web.stanford.edu/class/cs224n/		

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

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M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PE112D **Course Title: Security in IoT**

Category: Program Elective Course

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
4	0	0	3	CCE	50	20	40	-	-
Total Hours									
39	0	0	Total: 52	ESE	50	20			

Prerequisites: IoT , Networking and Cyber Security	
Course Objectives:	
1. To explain the basics of IoT 2. To explain IoT technologies 3. To explain the security requirements in IoT 4. To review the IoT security protocols 5. To explain the cloud security for IoT	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Identify and describe the variety of IoT system architectures, challenges specific to IoT systems
CO2	Illustrate the smart objects and the technologies to connect them to network
CO3	Identify the need of security in IoT applications
CO4	Ability to apply IoT technologies on security
CO5	Ability to identify appropriate security and privacy solutions for real-world applications

Syllabus

Unit I	**Introduction to IoT**	**8 hrs**
Components of IoT Infrastructure, Basic elements of general IoT Architecture, Characteristics of IoT, benefits and challenges of IoT, Applications of IoT, Challenges in Designing IOT Applications		
Unit II	**IoT Enabling Technologies**	**7 hrs**
IoT Development Boards: Arduino, Add-on ESP module, Node MCU, Raspberry Pi; Sensors and Actuators: Temperature Sensor, PIR Sensor, Ultrasonic sensor; Communication Technologies: Bluetooth, ZigBee, WSN, Cellular; Protocols, IoT Cloud Platforms		
Unit III	**Vulnerabilities and Security requirements in IoT**	**8 hrs**
Vulnerabilities, Attacks Specific to IoT, Insufficient Authentication/Authorization, Insecure Access Control, Threats to Access Control Security Requirements in IoT Architecture, Security in Enabling Technologies, Security Concerns in IoT Applications. Security Architecture in the Internet of Things , Introduction to Edge Computing using AI		
Unit IV	**IoT Security**	**8 hrs**
Impact of the Internet of Things (IoT) on Mobile Networks, IoT Networking Protocols, Secure IoT Layers, Back-end Security -Secure Resource Management, Secure IoT Databases, The secure IoT system implementation lifecycle		
Unit V	**Privacy Preservation and Cloud Security in IoT**	**8 hrs**
Introduction to web security, Privacy requirements, Threat analysis, Trust, Identity establishment, Access control, Message integrity, Cloud services and IoT, Cloud IoT security controls, IoT cloud security architecture, cloud enabled IoT computing		

Text Books

1. Raj Kamal," Internet of Things: Architecture & design Principle", McGraw Hill Education 2017
2. Vijay MadCCAtti, ArshdeepBahga , "Internet of Things: A Hands-On- Approach " Second edition 2014, ISBN: 978 0996025515.

Reference Books

3. "Securing the Internet of Things", Shancang Li, Li Da Xu Syngress,Elsevier, 2017
4. "Security and Privacy in Internet of Things (IoTs)Models, Algorithms, and Implementations", Edited by Fei Hu, CRC Press, 2016

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

M Tech in Computer Engineering | FY M Tech Semester II

Course Code: CN226PC211 Course Title: Laboratory Practice II

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
0	0	4	2	CCE	-				
				ESE	-			50	20
Total Hours									
0	0	52	Total: 52					50	20

Prerequisites:

Course Objectives:

Deep Learning

- To use Convolutional neural network for recognition of image data
- Apply recurrent neural network algorithms for audio and video processing.

Computer Vision

- Hands-on programming with images using fundamental algorithms.
- Computer vision techniques to implement real-world applications

Network and Cyber Security

- To explain various attack Cybercrime and forensics
- To give an insights into To learn various vulnerabilities, threats and attacksNLP
- To comprehend the basic ideas and methods of natural language processing (NLP)
- To be familiar with various application of natural Language Processing.IoT

Security

- To introduce the IoT technology and IoT devices
- To introduce the implementation of IoT applications

Course Outcomes: After successful completion of the course the student will be able to

Course Type	CO	Course Outcome
PCC2	CO1	Apply Convolutional Neural Network approach for image processing.
	CO2	Use Recurrent Neural Network for speech data processing.
	CO3	Implement image reconstruction using autoencoders.
PEC 2 A	CO4	Design network security solutions
	CO5	Select appropriate tools to thwart network attacks
	CO6	Design network security solutions
PEC 2 B	CO4	Ability to apply image handling techniques
	CO5	Ability to apply edge detection techniques

	CO6	Apply knowledge of computer vision to real life applications
PEC 2 C	CO4	Implement and evaluate different word embedding techniques in NLP.
	CO5	Develop a semantic language processor that tags semantic content usingWordNet.
	CO6	Design and develop a comprehensive understanding on NLP transformers
PEC 2 D	CO4	Understand IoT software's and components
	CO5	Elaborate the need for Security in IoT.
	CO6	Design and analyze IoT security applications

Syllabus

	Introduction	
Laboratory Proficiency II (LP II) is companion course of theory courses (core and elective) in Semester II. It is recommended that given assignments of each course should be completed by the student. Course/ Laboratory instructor may modify the domain of mini project as per choice of students keeping similar complexity of work. Student has to submit a report/Journal in standard format approved by the Program Coordinator.		
	Guidelines for CCA	
Continuous assessment of laboratory work is done based on performance of student. Each assignment/ mini project assessment is to be done based on parameters with appropriateweightages as defined by the program coordinator.		
	Guidelines for ESE	
It is recommended that examination should be conducted as presentation by student based on one ofthe mini projects completed and the content understanding of laboratory work.		
	Suggested List of Assignments	
A. PCC4: Deep Learning and Applications		
	Assignment 1 Implement Convolutional Neural Network for traffic sign recognition. **Assignment 2** Implement automatic speech recognition system using Recurrent NeuralNetwork **Assignment 3** Use Autoencoders to implement image/audio compression and reconstruction.	
PEC 2 A: Network and Cyber Security		
	Assignment 1 Case Study: How To Detect And Prevent Black Hole Attack in Mobile AdHoc Network **Assignment 2** Consider a case study of cybercrime, where the attacker has performed onlinedebit card fraud. Prepare a report and also list the laws to be imposed on attacker **Assignment 3** Configure and demonstrate use of vulnerability assessment tool given below · Wireshark, · Tcpdump · SNORT	
PEC 2 B: Computer Vision		
	Assignment 1	

	Write a program to perform global and local Thresholding on an input image **Assignment 2** Write a program to perform basic image processing for Edge Detection and LineDetection **Assignment 3** Implement mini project based on computer vision application
PEC 2 C: Natural Language Processing	
	Assignment 1 Implement word embedding approach on any document using i) one hot encoding ii) Bagof words(BOW) iii) TF-IDF. **Assignment 2** Implement a semantic language processor that uses WordNet for semantic tagging. **Assignment 3** Create a transformer architecture model from scratch using the Pytorch library
PEC 2 D: IoT Security	
	Assignment 1 Study the fundamentals of IoT software's and components **Assignment 2** Experiments using Raspberry Pi / Arduino: implement security system with the help ofPIR sensor, buzzer and keypad. **Assignment 3** Implement mini project on IoT network security using appropriate simulator

Rubrics for Continuous Evaluation

Component	**Level**	**Laboratory Practice II**	**Total**	**Passing**	**Process Evaluation**
Continuous Comprehensive Evaluation (CCE)	Faculty	1. Dynamics & Vibrations 2. Design & Optimization 3. Finite Element Techniques	50	20	Refer CCE Guideline
ESE	Institute		50	20	External Oral Examination

M Tech in Computer Engineering | FY M Tech Semester I

Course Code: CN226RM213, Course Title: Research Seminar

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks		Practical % Marks		
					Max	Min for Pass	Max	Min for Pass	
0	0	2	1	CCE	-		100	40	
Total Hours									
0	0	26	Total: 26						

Prerequisites: NA	
Course Objectives: Purposes of the course are	
To recognize the research work done by various researchers. To explore and elaborate latest research area demonstrated in the research papers.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Analyze the research content demonstrated in the papers referred
CO2	Identify the research gap by performing comparative analysis of work done in the specificresearch area
CO3	Summarize optimized research work in the form of research paper.

Guidelines

The students need to deliver the Research Seminar based on a topic on the latest state-of-the-art work in the specific area of the elective course. The topic has to be approved by the authorities. Thorough literature study based on the broad identified topic has to be carried out. It is advised that the study done in the Seminar leads to the Dissertation work phases to be performed in the Semester III and IV.

The students are expected to submit the duly certified report in the prescribed format, as part of satisfactory completion of the work, certified by the Guide and Head of department.
The students are supposed to publish their work in standard platforms as per guidelines of the BoS in order to validate the study.

The students have to exhibit the continuous progress through regular reporting, presentations and proper documentation of the activities. The continuous assessment of the progress need to be recorded.

Rubrics for Continuous Evaluation

Component	Level	Research Seminar	Total	Process Evaluation
Continuous Comprehensive Evaluation(CCE)	Faculty	To findings and technological innovations in the advancement of engineering field and prepare a report	100	Refer CCE Guideline/ORAL

D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University,

F Y M Tech in Computer Engineering, Semester II

Course Code: CM226HM214 **Course Title: Human Rights II**

Category: Humanities Social Science and Management

Teaching Scheme				Evaluation Scheme				
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Theory % Marks		Practical % Marks	
					Max %	Min marks for Passing	Max %	Min marks for Passing
0	0	2	1	100	0	0	100	40
Total Hours								
0	0	26						

Prerequisites: Not Required	
Course Objectives:	
4. To introduce the basic idea of human rights to the students. 5. To equip the student with an ability to distinguish between human rights, fundamental rights and also between individual rights and group rights. 6. To discuss human rights in the context of global political order.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Explain the concepts of vulnerable and disadvantaged groups and analyze their socio-economic and cultural challenges in the context of human rights.
CO2	Examine the status and human rights of women and children at national and international levels, with reference to relevant legal standards and frameworks.
CO3	Analyze the human rights issues of socially and economically disadvantaged groups including SC/ST, minorities, aged, disabled, and indigenous communities in Indian and global contexts.
CO4	Evaluate the human rights concerns of vulnerable groups such as stateless persons, migrant workers, sex workers, and HIV/AIDS victims from a legal and ethical perspective.
CO5	Assess the enforcement mechanisms of human rights in India, including the role of judicial organs and statutory bodies such as the National and State Human Rights Commissions

Syllabus

Unit I	**GENERAL INTRODUCTION**	**4Hrs**
• Meaning and Concept of Vulnerable and Disadvantaged Groups, • Customary, Socio-Economic and Cultural Problems of Vulnerable and Disadvantaged Group		
Unit II	**SOCIAL STATUS OF WOMEN AND CHILDREN IN INTERNATIONAL AND NATIONAL PERSPECTIVE**	**4 Hrs**
• Human Rights and Women's Rights –International and National Standards • Human Rights of Children-International and National Standard		

Unit III	**STATUS OF SOCIAL AND ECONOMICALLY DISADVANTAGED PEOPLE**	**5 Hrs**

- Status of Indigenous People and the Role of the UN
- Status of SC/ST and Other Indigenous People in the Indian Scenario
- Human Rights of Aged and Disabled
- The Minorities and Human Rights

Unit IV	**Human Rights of Vulnerable Groups**	**5 Hrs**

- Rights of Stateless Persons
- Rights of Sex Workers
- Rights of Migrant Workers
- Rights of HIV/AIDS Victims

Unit V	**HUMAN RIGHTS: ENFORCEMENT MECHANISM**	**8 HRS**

- Brief Overview of Human Rights : Issues in India
- National Human Rights Act 1993
- Judicial Organs National Human Rights Commission
- Maharashtra State Human Rights Commission
- Commissions on Women, Children, Minority and Scheduled Castes and Scheduled Tribes
- National Commission for Women , Maharashtra State Commission for Women
- National Commission for Protection of Child

Reference Books

12. Baxi Upendra, 2002, The Future of Human Rights, New Delhi, Oxford University Press.
13. 2. Byrne Darren, 2003, Human Rights, Delhi, Pearson.
14. 3. Campbell Tom and Goldberg David et al., 1986, Human Rights, Oxford, Basil Blackwell.
15. 4. Coicaud J. M. and Doyle M. W. et al., 2004, The Globalization of Human Rights, Tokyo, United
16. Evans Tony, 2005, The Politics of Human Rights, London, Pluto Press.
17. Hawkesworth Mary and Kogan Maurice(eds.), 1992, Encyclopedia of Government and Politics- Vol. II, London, Routledge.
18. Narang A.S.(eds.), 2009, Human Rights in India, New Delhi, Indira Gandhi National Open University.
19. Narang A.S.(eds.), 2015, Human Rights: Evolution, Concepts and Concerns, New Delhi, Indira Gandhi National Open University.
20. Sastry T. S. N., 2011, Introduction to Human Rights and Duties, Pune, University of Pune Press.
21. Sastry T. S. N., 2014, Human Rights and Duties in India: Law, Policy, Society and Enforcement Mechanism, Pune, University of Pune Press.

E Recourses:

- Historical Development of Human Rights
https://youtu.be/3meTWtONgP8
- Understanding Human Rights
https://youtu.be/NtNSPpafQHE
- Human Rights Meaning, Definition and Scope
https://youtu.be/Q9jhx0jGsFg
- Human Rights Discourse and Education in India
https://youtu.be/nYVGB9nheWU
- Fundamental rights and their enforceability
https://youtu.be/vqFuq1osXaM
- Human Rights Education Responsibilities of state https://youtu.be/3oNPYaH4EdI

Marking Scheme for Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous Comprehensive Evaluation (CCE)	Progressive Evaluation	Understanding Viva Voce	20	50	20
		Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	20		
	End Evaluation	Performance	25	50	20
		Oral Examination	25		

D Y Patil College of Engineering, Akurdi, Pune

F Y M Tech in Computer Engineering, Semester II

Course Code: CN226FP215

Course Category: FPR **Course Title: Industry Based Mini Project**

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
0	0	4	2	CCE				100	40
0	0	52	Total: 52						

Industry Based Mini Project involves students working on real-world projects in collaboration with industry partners. This course provides practical experience, allowing students to apply theoretical knowledge to solve industry-specific problems. It includes regular mentoring sessions, project planning, execution, and final presentations. By the end of the course, students gain valuable insights into industry practices, enhance their technical and professional skills, and improve their employability.

Prerequisites: Knowledge of Statistics, problem solving approach.	
Course Objectives: 1. To gain practical insights into Industry specific practices, challenges and standards. 2. To develop critical thinking by aligning complexities of Industrial Environment.	
Course Outcomes: After successful completion of the course the student will be able to	
CO1	Design, plan and execute the project which provides a viable solution or improvement related to existing solutions.
CO2	Author findings and solution effectively through written reports and oral presentation.

Syllabus
Task 1: Explore domain specific industry websites to identify relevant projects. Task 2: Prepare project plan involving problem statement, objectives, methodology, intended outcomes. Task 3: Conduction and deliver progress review presentations with results and discussions. Task 4: Preparation and presentation of final Mini project report

References

Kerzner, H. (2017). Project management: A systems approach to planning, scheduling, and controlling (12th ed.). Wiley.

Kerzner, H. (2017). Project management case studies (5th ed.). Wiley Smith, N. J. (2019). Engineering project management (4th ed.). Wiley-Blackwell

Oberlender, G. D. (2014). Project management for engineering and construction (3rd ed.). McGraw-Hill Education.

Rubrics for Continuous Evaluation

Component	Level	Industry Based Mini Project	Total	Passing	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	Mini project Report	50	20	Refer CCE Guideline
ESE	Department	Mini project Presentation	50	20	Refer Guidelines

D Y Patil College of Engineering, Akurdi, Pune

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Savitribai Phule Pune University

Curriculum Structure and Syllabus

S.Y. M. Tech Computer Engineering

(2025 Pattern)

(With effect from Academic Year 2025-26)

National Education Policy (NEP) based Curriculum

D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

Preface

D Y Patil College of Engineering, Akurdi, Pune (DYPCOE) has been recognized for providing quality education in Maharashtra for the past 40 years. With a commitment to academic excellence and a vision for the future, DYPCOE is now boarding a new journey towards Autonomy, in line with the latest educational reforms. The Institute is dedicated to the effective implementation of the New Education Policy (NEP) 2020, as per the guidelines by the Government of Maharashtra. This initiative is aimed at fostering the holistic development of our students, ensuring they are well-equipped to meet the challenges of the 21st century.

The present syllabus details the FY M.Tech Computer Engineering syllabus, meticulously designed to align with the NEP 2020 and effective from the academic year 2025-26. The curriculum is structured to provide a robust foundation through Program Core courses and Program Elective Courses. It also integrates vocational skill enhancement courses. This comprehensive approach aims to cultivate well-rounded engineers who are adaptable to Internationalization.

One of the key highlights of this syllabus is its emphasis on Experiential Learning and hands-on experience. By integrating theoretical knowledge with practical laboratory sessions, we aim to enhance the learning process and foster a deeper understanding of core concepts. Additionally, the curriculum promotes research and innovation by encouraging students to engage in project-based learning.

The development of this curriculum has been a collaborative effort, and we owe a debt of gratitude to all those who have contributed to its creation. Our sincere thanks go to the Management, Steering Committee Members, Heads of Departments, and the Board of Studies chairpersons and members for their invaluable input and dedication. Their collective expertise and commitment have been instrumental in shaping this curriculum.

We are confident that this new curriculum will pave the way for our students to achieve academic excellence and holistic development, preparing them to thrive in an ever-evolving global landscape.

Dr. Mrs. P. Malathi

Principal

D Y Patil College of Engineering, Akurdi, Pune

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Abbreviations and Definitions

NEP: National Education Policy

PEO: Program Educational Objectives PO: Program Outcomes

CO: Course Outcomes

PCC: Program Core Course PEC:

Program Elective Course OE:

Open Elective

MDM: Multidisciplinary Minor Course

NC: Non Credit Course

VSEC: Vocational and Skill Enhancement Courses

CCE: Continuous Comprehensive Evolution

ESE: End Sem Examination

Cr: Credits

SL: Self Learning

L: Lecture

T: Tutorial

P: Practical

XX Program Code

ELC Experiential Learning Courses

HSM Humanities Social Science and Management Courses

VSC Vocational and Skill Enhancement Course

FPR Field Project

AEC Ability Enhancement Courses

MDC Multidisciplinary Courses

OJT On Job Training/Internship

PRJ Project

VEC Value Education Course

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Department of Computer Engineering

Second Year (SY) M Tech in Computer Engineering, Semester III

Course Type	Course Code	Course	Teaching Scheme				Evaluation Scheme					
								Theory Marks			Practical Marks	
			L	T	P	Cr	Exam	Max	Min for Pass		Max	Min for Pass
PRJ1	CN226PR316	Dissertation Phase I (Synopsis)	0	0	6	3	CCE				100	40
PRJ2	CN226PR317	Dissertation Phase II	0	0	6	3	CCE				50	20
							ESE				50	20
MDC1	CN226MD318	Open Elective – Soft Computing	2	0	0	2	CCE	50	20	40		
							ESE	50	20			
MDC2	CN226MD319	Introduction to Cyber Security	4	0	0	4	CCE	100	40			
VEC	HS226VC320	Introduction to Constitution of India	2	0	0	2	CCE	100	40			
VSC1	CN226VS321	Skill Development I	0	0	4	2	CCE				100	40
OJT	CN226OT322	On Job Training/Internship	0	0	12	6	CCE				100	40
		Total	**8**	**0**	**28**	**22**						
					Hrs							
L	Lecture	CCE: Continuous and Comprehensive Evaluation	**Theory**		**8**							
T	Tutorial		**Pract/Lab**		**28**							
P	Practical	ESE: End Semester Evaluation	**Total**		**36**			**wef 2025-26**				
Cr	Credits											

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Department of Computer Engineering

Second Year (SY) M Tech in Computer Engineering, Semester IV

Course Type	Course Code	Course	Teaching Scheme				Evaluation Scheme					
								Theory Marks			Practical Marks	
			L	T	P	Cr	Exam	Max	Min for Pass		Max	Min for Pass
PRJ3	CN226PR423	Dissertation Phase III	0	0	20	10	CCE				100	40
PRJ4	CN226PR424	Dissertation Phase IV	0	0	20	10	CCE				50	20
							ESE				50	20
VSC2	CN226VS425	Skill Development Course-II	0	0	4	2	CCE				100	40
		Total	**0**	**0**	**44**	**22**						
					Hrs							
L	Lecture	CCE: Continuous and Comprehensive Evaluation	**Theory**		**0**							
T	Tutorial		**Pract/Lab**		**44**							
P	Practical	ESE: End Semester Evaluation	**Total**		**44**			**wef 2026-27**				
Cr	Credits							**R5, 25 Mar 2026**				

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M Tech in Computer Engineering | SY M Tech Semester III

Category: Project

Course Code: CN226PR316 **Course Title:** Dissertation Phase I

	Teaching Scheme				Evaluation Scheme				
L	T	P	SL	Cr	Exam	Theory Marks		Practical Marks	
						Max	Min for Pass	Max	Min for Pass
0	0	6	0	3	CCE	-	- -	100	40
Total Hours									
0	0	78	12	Total: 90	ESE	-			

*SL-Self Learning Component must be completed

Prerequisites: Completion of all 4 semesters	
Course Objectives:	
To prepare the synopsis of the dissertation	
Course Outcome: After successful completion of the course the student will be able to	
CO1	Construct the Synopsis on the Dissertation topic considering Statement of Problem, Significance, Objective, Hypothesis and Methodology.
CO2	Demonstrate the Synopsis on the Dissertation topic with Classified Literature Review, Rationale, Research Question, Time Frame, Budget and References.

Syllabus

Unit I	Synopsis Submission	70 hrs

1. Introduction (1 Page): Provide a brief overview of the theories and models relevant to your topic.
2. Literature Review (2-4 pages): Summarize relevant and related research in classified way
3. Statement of the Problem (1 Page): Identify research gaps based on the Literature Review and justify the conduct of the study
4. Significance/Rationale (1/2 Page): Explain the importance and contribution of the findings
5. Objectives: List the objectives (min 4) (1/2 page)
6. Hypotheses/Research Questions: State your expectations from the dissertation (1/2 page)
7. Methodology: Specify whether the project is Experimental, Theoretical/Mathematical Modelling, Survey based, or a combination, Design of Experiment (DoE), Describe the strategy and framework proposed, indicate if the approach is quantitative, qualitative, or mixed methods. (1 Page)

8. Time Frame of Dissertation: Provide timeline of the work 9. Budget: Provide Budget (if required) 10. List of References		
Unit II	**Submission of Synopsis and its Presentation**	**30hrs**
Student is required to present his/her synopsis in front of Committee of the Department		

Rubrics for Continuous Evaluation

Rubrics for CCE (100)		
No	**Component**	**Marks**
1	Complete Submission of Synopsis in hard copy of 5 sets	70
2	Seminar presentation on Synopsis	30

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D Y Patil College of Engineering, Akurdi, Pune

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M Tech in Computer Engineering | SY M Tech Semester III

Category: Project

Course Code: CN226PR317 **Course Title:** Dissertation Phase II

	Teaching Scheme				Evaluation Scheme					
L	T	P	SL	Cr	Exam	Theory Marks			Practical Marks	
						Max	Min for Pass		Max	Min for Pass
0	0	6	0	3	CCE	-	-	-	50	40
Total Hours										
-	0	78	12	Total: 90	ESE	-			50	

*SL-Self Learning Component must be completed

Prerequisites: Submission of Synopsis	
Course Objectives:	
To present the dissertation work	
Course Outcome: After successful completion of the course the student will be able to	
CO1	Construct the Synopsis on the Dissertation topic considering Statement of Problem, Significance, Objective, Hypothesis and Methodology.
CO2	Demonstrate the Synopsis on the Dissertation topic with Classified Literature Review, Rationale, Research Question, Time Frame, Budget and References.

Syllabus

Unit I	Submission of Report	70 hrs

1. Introduction
2. Literature Review
3. Statement of the Problem
4. Significance/Rationale
5. Objectives
6. Hypotheses/Research Questions
7. Methodology
8. Results and Discussions
9. Summary of Objectives Completed (50 % should complete)
10. List of References

Unit II	Submission of Report and its Presentation	30 hrs

Student is required to present his/her work in front of Internal and External Committee of the Department

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Rubrics for Continuous Evaluation

Rubrics for CCE and ESE (100)		
No	**Component**	**Marks**
1	Complete Submission of Report in hard copy	70
2	Presentation on the work in front of Internal and External Committee appointed by Department.	30

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D Y Patil College of Engineering, Akurdi, Pune

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M Tech in Computer Engineering | SY M Tech Semester III

Course Category	Multidisciplinary Course	**Course Code**	RN226MD303
Course Title	Soft Computing		

Teaching Scheme					**Evaluation Scheme**					
L	**T**	**P**	**SL**	**Cr**	**Exam**	**Theory Marks**			**Practical Marks**	
						Max	**Min Marks for Pass**		**Max**	**Min for Pass**
2	0	0	0	2	CCE	50	20			
Total Hours					ESE	50	20	40	-	-
39	0	0	51	Total hrs: 90		100				

*SL *SL-Self Learning Component must be completed

Prerequisites: Machine learning

Course Objectives: Purposes of the courses are

- To understand the soft computing techniques and algorithms for problem solving
- To be familiar with the various application areas of soft computing
- To develop intelligent systems using the hybrid systems
- To explore and solve problems using genetic Algorithms
- To learn various Bio Inspired optimization Algorithm

Course Outcomes: After successful completion of the course units the student will

CO1: **Compare** soft and hard computing techniques to identify suitable computing technique to solve the problem.
CO2: **Implement** fuzzy algorithms for various operations in different domain such as e-Commerce, automotive, Home appliances, Structural analysis and Design etc.
CO3: D**esign** Artificial Neural Network for implementation of the solution to real life Problems.
CO4:**Apply** Genetic Algorithm to provide effective solutions with optimization for the problem
CO5: **Create** system with nature-inspired algorithms to provide optimal solution

Syllabus

Unit I	**Introduction To Soft Computing**	**8 hrs**
Introduction, historical Development of Soft Computing, characteristics of Soft Computing, Soft Computing Vs Hard Computing, major Areas of Soft Computing, Basic tools of Soft Computing, Applications of Soft Computing.		
Unit II	**Fuzzy Logic and Sets**	**10 hrs**
Introduction to Fuzzy Logic, Fuzzy Membership Functions, Fuzzy Sets and Operations, Properties of Fuzzy Sets, Fuzzy Relations, Fuzzy Propositions, Fuzzy Implications, Fuzzy Inferences, Fuzzy If-		

Then Rule, Fuzzy Algorithms, Fuzzification and Defuzzification, fuzzy computing problems. Fuzzy Logic Controller, Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy rule-based system, Fuzzy Decision Making, Fuzzy expert system, case study on fuzzy reasoning.

Unit III	**Neural Networks**	**7 hrs**

Neural Network Basics, Perceptron, Types of Activation Functions, Architecture of Neural Network, Unsupervised Learning Networks, Neuro-Fuzzy System, case study on neural network for the application

Unit IV	**Genetic Algorithm**	**7 hrs**

An Introduction to Genetic Algorithms, Genetic Algorithm and Search Space, Operators in Generic Algorithm, Classification of Genetic Algorithm, Holland Classifier System, case study on genetic algorithm.

Unit V	**Bio-Inspired Optimization Algorithms**	**7 hrs**

Biological Motivation, from natural to artificial, Swarm Intelligence, standard algorithm of Ant Colony Optimization, Particle Swarm Optimization, cuckoo search algorithm, bat algorithm

Tutorial:

1. Design fuzzy sets and its basic operations **2 hrs**
2. Create application using Neural Network **2hrs**
3. Provide solution for real life problem using Genetic Algorithm **2 hrs**
4. Create optimization based application for any domain **2 hrs**
5. Mini Project – Hybrid system with optimization **5 hrs**

Text Books :

1. S.N. Sivanandam- “Principles of Soft Computing”, Wiley India- ISBN- 9788126527410
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley India, ISBN: 978-0- 470-74376-8

Reference Books :

1. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publications 1994.
2. Fuzzy Social Choice Theory - Michael B. Gibilisco. Annie M. Gowen Karen E. Albert John N. Mordeson Mark J. Wierman. Terry D. Clark.
3. Russell C. Eberhart , Yuhui Shi , James Kennedy, “ Swarm Intelligence: The Morgan Kaufmann Series in Evolutionary Computation”, 1st Edition, ISBN-13: 978-1558605954

e-Contents :

1. NPTEL Course on Introduction to Soft Computing https://archive.nptel.ac.in/courses/106/105/106105173/
2. NPTEL Course on Introduction to Artificial Neural Networks
3. https://nptel.ac.in/courses/117105084
4. Swayam course on Evolutionary Computation for Single and Multi-Objective Optimization
5. https://onlinecourses.nptel.ac.in/noc21_me43/preview

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Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Process Evaluation
Continuous Comprehensive Assessment (CCE)	Faculty	10	10	10	10	10	50	Refer CCE Guideline
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	Each Unit Carries 10 marks Question

D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester III

Course Category: Multidisciplinary course
Course Title: Introduction to Cyber Security **Course Code:** CN226MD319

	Teaching Scheme				Evaluation Scheme				
L	**T**	**P**	**SL**	**Cr**	**Exam**	**Theory % Marks**		**Practical % Marks**	
						Max	**Min for Pass**	**Max**	**Min for Pass**
4	0	0	0	4	CCE	100	40	-	-
	Total Hours								
52	0	0	68	Total: 120					

*SL-Self Learning Component must be completed

Prerequisites: Basic knowledge of Computer Systems and Networks	
Course Objectives: Purposes of the course are 1. To introduce students to the foundational concepts of cybersecurity, increasing threat landscape, and terminologies essential for understanding attacks and vulnerabilities. 2. To familiarize learners with various types of cybercrimes affecting computer systems, mobile devices, individuals, and organizations, along with crime reporting procedures and real-world case studies. 3. To provide comprehensive knowledge of national and international cyber laws, including the IT Act 2000, its amendments, and legal/ethical issues arising from emerging technologies. 4. To develop understanding of data, metadata, privacy, and data security principles, including major global data protection regulations and their applications. 5. To equip students with the skills to understand cybersecurity management, governance, risk assessment, business continuity, and compliance through national policies and standards	
Course Outcomes: After successful completion of the course the student will be able to:	
CO1	To Understand and apply the fundamental concepts of cybersecurity, threat landscape, cyber terminologies, and various types of cyber-attacks with relevant case studies.
CO2	Identify and classify different categories of cybercrimes targeting computer systems, mobile devices, individuals, and organizations, and demonstrate understanding of crime reporting procedures.
CO3	Interpret the provisions of the IT Act 2000, its amendments, global cyber laws, and legal/ethical issues related to emerging technologies.
CO4	Analyze data privacy and data security principles, major data protection regulations (PDP Bill, GDPR, PIPEDA), and evaluate privacy challenges in big data and social media.

CO5	Develop a basic cybersecurity management plan by applying concepts of risk assessment, security controls, business continuity, compliance, and national cybersecurity policies.

Unit I	**Overview of Cyber security**	**7 hrs**
Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.		
Unit II	**Cyber crimes**	**9 hrs**
Cybercrimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cybersquatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.		
Unit III	**Cyber Law**	**7 hrs**
Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and social media, Cyber Laws of other countries, Case Studies		
Unit IV	**Data Privacy and Data Security**	**9 hrs**
Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016, Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues		
Unit V	**Cyber security Management, Compliance and Governance**	**7 hrs**
Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy		

Reference Books

1. Nina Godbole & Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India.
2. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Education.
3. Chuck Easttom, Computer Security Fundamentals, Pearson Education.
4. Pankaj Agarwal, Cyber Laws and Information Security, S. Chand Publications.

Tutorial: (13 Hrs)

1. Demonstrate password strength analysis and secure password creation.
2. Analyze a recent cyber-attack and present mitigation techniques.
3. Configure basic firewall or antivirus policies (simulation).
4. Prepare a report on cyber laws and penalties for cybercrimes in India.
5. Perform a mini case study on IoT/robotics/civil system vulnerability and propose security solutions.

Rubrics for Continuous Evaluation

Sr. No.	Component	Syllabus	Marks	Weightage
1	Open Book Test	Unit 1,2	50	50
2	Quiz	Unit 3,4,5	50	50
		Total	**100**	**100**

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D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester III

Category: Humanities Social Science and Management

Course Code: HS226VC320 **Course Title:** Introduction to Constitution of India

Teaching Scheme					Evaluation Scheme				
L (Hr)	T (Hr)	P (Hr)	SL	Cr	Exam	Theory Marks		Practical Marks	
						Max	Min for Pass	Max	Min for Pass
2	0	0	0	2	100	0	0	100	40
Total Hours									
26	0	0	34	Total:60					

*SL-Self Learning Component must be completed

Prerequisites: Not Required

Course Objectives:

1. To create an awareness on the Constitution of India.
2. To understand the function wings of the Government, fundamental rights and duties of citizens,
3. To analyses the powers of central, state, and local government, and strengthen constitutional institutions

Course Outcomes: After successful completion of the course the student will be able to

CO1	Describe historical background of the constitution making and its importance for building a democratic India
CO2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO3	Explain the value of the fundamental rights and duties for becoming good citizen of India
CO4	Analyze the decentralization of power between central, state and local self-government
CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Syllabus

Unit I	Introduction to Indian Constitution	5 Hrs

- Constitution meaning of the term –
- The making of the Indian Constitution
- Sources and constitutional history –
- Philosophy of Constituent Assembly
- Citizenship, Preamble, Fundamental Rights and Duties,
- Directive Principles of State Policy.

Unit II	The Union: Executive, Legislative and Judiciary	5 Hrs

- Union Government and its Administration Structure:
- President and Vice President
- : Role, power and position,
- PM and Council of ministers, Cabinet and Central Secretariat,
- LokSabha, RajyaSabha,
- The Supreme Court and High Court: Powers and Functions.

Unit III	**The States and The Union Territories**	**5 Hrs**

- Status of Indigenous People and the Role of the UN
- Status of SC/ST and Other Indigenous People in the Indian Scenario
- Human Rights of Aged and Disabled
- The Minorities and Human Rights

Unit IV	**Local Administration**	**6 Hrs**

- District's Administration Head
- Role and Importance, Municipalities
- Mayor and role of Elected Representative
- Pachayati Raj: Functions PRI: Zilla Panchayat,
- Elected officials and their roles
- Block level Organizational Hierarchy,
- Village level - Role of Elected and Appointed officials
- Importance of grass-root democracy

Unit V	**Emergency Provisions and Election Commission**	**5 Hrs**

- Emergency: Proclamation of Emergency, types of emergency
- Election Commission: Role of Chief Election Commissioner
- State Election Commission
- Functions of Commissions for the welfare of SC/ST/OBC and women

Reference Books

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th Edition, Universal Law Publication.
6. J.C. Johari, Indian Government and Politics Hans
7. M.V. Pylee, Indian Constitution DurgaDasBasu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt.Ltd.. New Delhi
8. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Recourses:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Marking Scheme for Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous Comprehensive Evaluation (CCE)	Progressive Evaluation	Understanding Viva Voce	20	50	20
		Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	20		
	End Evaluation	Performance	25	50	20
		Oral Examination	25		

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M Tech in Computer Engineering | SY M Tech Semester III

Course Category: Core Course

Course Code: CN226VS321 **Course Title: Skill Development-I**

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
0	0	4	2	CCE	--	--	--	100	40
0	0	52	Total:52						

Category: Core Course

Prerequisites: NIL

Course Objectives: Purposes of Course are:

1. Enhance Technical Expertise: Equip students with advanced technical skills and knowledge in their specific field of study, enabling them to solve complex engineering problems and contribute to innovative solutions.
2. Industry-Relevant Skills: Bridge the gap between academic knowledge and industry requirements by providing training in the latest tools, technologies, and methodologies used in the industry, ensuring students are job-ready upon post-graduation.
3. Professional Development: Develop essential soft skills such as leadership, teamwork, communication, and project management, preparing students for leadership roles in their professional careers and enhancing their overall employability.

Course Outcomes: After Successful completion of course units, students will

CO1	Demonstrate advanced technical skills and practical knowledge in their specialized field, enabling them to effectively design, analyze, and implement complex engineering solutions using industry-standard tools and technologies.
CO2	Exhibit strong professional skills, including effective communication, teamwork, and project management, preparing them to lead and collaborate in multidisciplinary teams within a dynamic work environment.

M Tech in ~~Mechanical Design~~ | FY M Tech Semester III

Syllabus		
Unit I	**Modern Tools**	**26 hrs**
Overview of current Industry trends in Latest and Modern Software/Gadget/Equipment/Concept/Procedure/Tools, Hands on Training, Integrating these tools for comprehensive solutions. Applications of software.		
Unit II	**Professional and Technical Communication**	**26 hrs**
Understanding the importance of professional and technical communication, Key elements of effective communication, Hands on writing technical reports, research papers, and documentation. Structuring and formatting technical documents. Clarity, conciseness, and coherence in technical writing. Use of visual aids (charts, graphs, diagrams) in documents. Preparing and delivering technical presentations. Public speaking skills for technical contexts. Effective use of presentation tools (e.g., PowerPoint, Canva). Communicating within a team and with stakeholders. Conducting and participating in technical meetings and discussions. Listening skills and feedback mechanisms. Effective email communication. Utilizing digital platforms for collaboration and communication (e.g., Zoom, Microsoft Teams).		
References: 1. "Technical Communication: Principles and Practice" by Meenakshi Raman and Sangeeta Sharma, Oxford University Press, Third Edition, 2015, New Delhi 2. "Professional Communication" by Aruna Koneru, Tata McGraw-Hill Education, Second Edition, 2008, New Delhi 3. "Effective Technical Communication" by M. Ashraf Rizvi, Tata McGraw-Hill Education, Second Edition, 2010, New Delhi 4. "Communication Skills for Engineers" by Sunita Mishra and C. Muralikrishna, Pearson Education India, First Edition, 2011, New Delhi 5. "Advanced Technical Communication" by Kavita Tyagi and Padma Misra, PHI Learning Pvt. Ltd., First Edition, 2011, New Delhi		

Rubrics for Continuous Evaluation

Component	Level	Unit 1	Unit 2	Total	Passing	Process Evaluation
Continuous Comprehensive Evaluation (CCE)	Faculty	50	50	100	40	Refer CCE Guideline

D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester III

Category: On Job Training/Internship

Course Code: CN226OT322 **Course Title:** On Job Training

Teaching Scheme					Evaluation Scheme					
L	T	P	SL	Cr	Exam	Theory % Marks			Practical % Marks	
						Max	Min for Pass		Max	Min for Pass
0	0	12	0	6	CCE	-	-	-	100	40
Total Hours										
0	0	48	132	Total: 180						

*SL-Self Learning Component must be completed

Prerequisites: NIL	
Course Objectives:	
1. To Investigate Different Industries and Career Paths 2. To Develop a Professional Network 3. To Apply Academic Knowledge in a Professional Setting 4. To Enhance Time Management and Communication Skills 5. To Increase Employment Opportunities	
Course Outcome: After successful completion of the course the student will be able to	
CO1	Investigate Various Industries and Employability Opportunities through Internship.
CO2	Develop Professional Network through effective communication.

Syllabus

Unit I	**Internship**	**42-hrs**
The student is expected to complete an internship in an industry related to the PG program, working at least 6 hours a day for a minimum of 3 weeks. This internship should take place after the end of Semester II and before the commencement of Semester III, after the examinations. The evaluation will be carried out in Semester III. The student must submit a daily report electronically to his/her supervisor. At the end of the internship, the student will submit a comprehensive final report.		
Unit II	**Submission of Report on Internship**	**6-hrs**
Student is required to submit report on internship work to his/her supervisor.		

Rubrics for Continuous Evaluation

Rubrics for CCE and ESE (100)		
No	**Component**	**Marks**
1	Progressive Weekly Assessment of Internship work (14 x 3 weeks)	75
2	Complete Submission of Internship Report in hard copy	25

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D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester IV

Category: Project
Course Code: CN226PR423 **Course Title:** Dissertation Phase III

	Teaching Scheme				Evaluation Scheme					
						Theory % Marks			Practical % Marks	
L	T	P	SL	Cr	Exam	Max	Min for Pass		Max	Min for Pass
0	0	20	0	10	CCE	-	-	-	100	40
Total Hours										
0	0	260	40	Total: 300						

*SL-Self Learning Component must be completed

Prerequisites: Completion of DP II	
Course Objectives:	
To prepare the report of the dissertation work	
Course Outcome: After successful completion of the course the student will be able to	
CO1	Construct the Progress Report on the Dissertation topic major focusing on Summary of Objectives Completed and Findings with discussions.
CO2	Demonstrate the Progress Report on the Dissertation topic with major findings and their discussions.

Syllabus

Unit I	Submission of Progress Report	70 hrs
1. Introduction 2. Literature Review 3. Statement of the Problem 4. Significance/Rationale 5. Objectives 6. Hypotheses/Research Questions 7. Methodology 8. Results and Discussions 9. Summary of Objectives Completed (More than 75 % should complete) 10. List of References		
Unit II	**Submission of Progress Report and its Presentation**	**30 hrs**
Student is required to present his/her synopsis in front of Committee of the Department		

Rubrics for Continuous Evaluation

Rubrics for CCE (100)		
No	**Component**	**Marks**
1	Submission of Report in hard copy	70

2	Presentation on Dissertation Work	30

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D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester IV

Category: Project

Course Code: CN226PR424 **Course Title:** Dissertation Phase IV

	Teaching Scheme				Evaluation Scheme					
L	T	P	SL	Cr	Exam	Theory % Marks			Practical % Marks	
						Max	Min for Pass		Max	Min for Pass
0	0	8	0	4	CCE	-	-	-	50	40
Total Hours										
-	0	104	16	Total: 120	ESE	-			50	

*SL-Self Learning Component must be completed

Prerequisites: Completion of DP III	
Course Objectives:	
To prepare the final report of the dissertation work	
Course Outcome: After successful completion of the course the student will be able to	
CO1	Construct the Final Report on the Dissertation major focusing on Summary of Objectives Completed and Findings with discussions.
CO2	Demonstrate the Final Report on the Dissertation with major findings and their discussions.

Syllabus

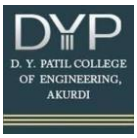
Unit I	Submission of Final Report	70 hrs

1. Introduction
2. Literature Review
3. Statement of the Problem
4. Significance/Rationale
5. Objectives
6. Hypotheses/Research Questions
7. Methodology
8. Results and Discussions
9. Summary of Objectives Completed (100 % should complete)
10. List of References
11. List of Papers Published
12. Vita

Student is expected to publish a paper in the SCI/SCOPUS indexed Journal or file and publish a patent and Present the work in reputed conferences on his/her dissertation work.

Unit II	Submission of Final Report and its Presentation	30 hrs

Student is required to present his/her work in front of Internal and External Committee of the Department.



Rubrics for Continuous Evaluation

Rubrics for CCE and ESE (100)		
No	**Component**	**Marks**
1	Complete Submission of Final Report in hard copy (4 Sets)	70
2	Presentation on the final work in front of Internal and External Committee appointed by Department.	30

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D Y Patil College of Engineering, Akurdi, Pune

An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

M Tech in Computer Engineering | SY M Tech Semester IV

Course Category: Vocational and Skill Enhancement Course

Course Code: CN226VS425 **Course Title: Skill Development-II**

Teaching Scheme				Evaluation Scheme					
L	T	P	Cr	Exam	Theory % Marks			Practical % Marks	
					Max	Min for Pass		Max	Min for Pass
0	0	4	2	CCE	--	--	--	100	40
0	0	52	Total:52						

Category: Core Course

Prerequisites: Skill Development-I

Course Objectives: Purposes of Course are:

1. AI Technologies: To cultivate a comprehensive understanding of current industry trends and develop proficiency in AI-enabled and modern tools for research, data analysis, and engineering problem-solving.
2. Professional Communication: To enhance students' capabilities in technical writing, presentation, and effective communication using digital collaboration platforms.
3. Research Innovation: To promote scholarly aptitude by enabling students to undertake research activities leading to review papers, journal publications, and intellectual property (IPR/patents).

Course Outcomes: After Successful completion of course units, students will

CO1	Apply modern and AI-enabled tools to analyze industry trends, perform research activities, and develop effective technical solutions.
CO2	Demonstrate proficiency in technical communication and research dissemination through the preparation of reports, presentations, journal publications, and intellectual property (IPR/patents).

Syllabus

Unit I	**Current Industry Trends, AI Tools, and Research Publication Techniques**	**26 hrs**

Overview of current industry trends:
A study of the latest advancements and emerging trends in modern software, gadgets, equipment, concepts, procedures, and tools. It also includes hands-on training and practical exposure, along with the integration of these technologies to develop comprehensive and effective solutions. Additionally, it covers the applications of various software and the use of Origin software for data analysis and visualization.

AI tools for publications:
Utilization of AI-based tools such as Mendeley, Zotero, EndNote, Paperpile, Paperpal, and iThenticate to support research activities, including reference management, academic writing, and plagiarism checking.

Students are expected to submit:

A) Student will write and submit Copyright/Design IPR (Sem III)

B) Student will write and submit a Review Paper (at least 100 papers to review) at Quality

Indexed Journal suggested by Guide using modern tools. (Sem III)

Unit II	**Advanced Technical Communication and Research Dissemination**	**26 hrs**

Professional and Technical Communication:
Understanding the importance of technical communication, focusing on key elements like clarity, conciseness, and coherence. It includes hands-on practice in writing reports, research papers, and proper document structuring, along with the use of visual aids.

Presentation and Communication Skills:
Developing technical presentation and public speaking skills using tools like Microsoft PowerPoint and Canva, along with effective team communication and participation in meetings.

Digital Collaboration:
Improving email communication and using platforms like Zoom and Microsoft Teams for efficient collaboration and interaction.

A) Student will write and submit a Journal paper based on his/her dissertation work at Quality Indexed Journal suggested by Guide. (Sem IV)
B) Student will write and submit Utility Patent (Sem IV)

References:

1. *"Business Writing with AI: Tools and Techniques"* by Sheryl Lindsell-Roberts, John Wiley & Sons, First Edition, 2024, New York.
2. *"Generative AI for Technical Writing: Comparing Human and LLM Assessments of Generated Content"* by Karen de Souza et al., Proceedings of NoDaLiDa Conference, 2025, Estonia.
3. *"ChatGPT as an Academic Writing Tool: Factors Influencing Researchers' Intention"* by Manuel B. Garcia, International Journal of Human-Computer Interaction, 2025.
4. *"Technical Report Writing Efficiency Using AI-Powered Tools: Opportunities, Challenges, and Future Directions"* by Mohammad Awad AlAfnan, Journal of Artificial Intelligence and Technology, 2025.
5. *"AI Snake Oil: What Artificial Intelligence Can Do, What It Can't, and How to Tell the Difference"* by Arvind Narayanan and Sayash Kapoor, Princeton University Press, 2024.

Rubrics for Continuous Evaluation

Component	**Level**	**Unit 1**	**Unit 2**	**Total**	**Passing**	**Process Evaluation**
Continuous Comprehensive Evaluation (CCE)	Faculty	50	50	100	40	Refer CCE Guideline

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