

Dr. Babasaheb Ambedkar Technological University, Lonere
(Established as a University of Technology in the State of Maharashtra)

(Under Maharashtra Act No. XXIX of 2014)

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Course Structure and Detailed Syllabus

For

M. Tech Computer Science and Engineering

In line with New Education Policy 2020 guidelines

(Effective from Academic Year 2024-25)

Dr. Babasaheb Ambedkar Technological University
M. Tech Computer Science and Engineering
In line with New Education Policy 2020 guidelines
(Effective from AY 2024-25)

	Course Code	Course Title	L	T	P	Cr	Categorization
SEM- I	MTCSEBS101	Applied Mathematics-Number Theory Concepts	3	1	-	4	BS
	MTCSEPC102	Research Methodology and IPR	3	-	-	3	PCC
	MTCSEPC103	Advanced Operating System	3	-	-	3	PCC
	MTCSEPC104	Advances in Algorithm	3	-	-	3	PCC
	MTCSEPE105	Program Elective-I	3	1	-	4	PEC
	MTCSEPE106	Program Elective-II	3	1	-	4	PEC
	MTCSEPC107L	Advance Operating System Laboratory	-	-	2	1	PCC
	MTCSEAU108	YOGA for Stress Management	-	-	2	-	Audit Course
		Total	18	2	8	22	
SEM- II	MTCSEPC201	Advanced Database Management System	3	1	-	4	PCC
	MTCSEPC202	Advanced Computer Network & Security	3	1	-	4	PCC
	MTCSEPE203	Program Elective-III	3	1	-	4	PEC
	MTCSEOE204	Open Elective I	3	-	-	3	OE
	MTCSEPC205L	Computer Networking & DBMS Laboratory	-	-	2	1	PCC
	MTCSEMP206	Mini Project with Seminar	-	-	2	1	ELC
	MTCSEAE207	IKS Bucket [#]	3	-	-	3	AEC/VEC/IKS
	MTSCEAU208	Disaster Management	-	-	2	-	Audit Course
		Total	15	3	6	20	
SEM- III	MTCSEOE301	Open Elective II	3	-	-	3	OE
	MTCSEMD302	Multidisciplinary Minor	3	-	-	3	MD M
	MTCSESE303	Seminar II	-	-	4	2	ELC
	MTCSEPR304	Project I	-	-	-	10	ELC
		Total	6	2	4	18	
SEM-IV	MTCSEPR401	Project II	-	-	-	20	ELC
		Total				20	

Note:

1. Students can complete 40% of the courses from SWAYAM /NPTEL/Coursera/ from Institutes with MoU signed by university.
2. Existing passing rules will be applicable.

Credit Distribution

SEM I	SEM II	SEM III	SEM IV	Total
22	20	18	20	80

Abbreviations: PCC (Programme Core Course), PEC (Programme Elective Course), ELC (Experiential Learning Courses), OE (Open Elective), AEC (Ability Enhancement Courses), VEC (Value Education Courses), IKS (Indian Knowledge System), MD M (Multidisciplinary Minor).

Program Elective -I

- A) Artificial Neural Networks
- B) Agile Project Management & Devops
- C) Advance Soft Computing
- D) Digital Image Processing And Forensics Science
- E) Social Network Analysis

Program Elective -II

- A) Computer Graphics & Multimedia
- B) Cluster, Grid and Cloud Computing
- C) Mobile Computing
- D) Advanced Web Technology
- E) Coding and Information Theory

Program Elective -III

- A) Image Processing
- B) Pattern Recognition
- C) Distributed System Principle
- D) Block Chain & Cyber Security
- E) Malware Analysis and Network Security

Open Elective I

- A) New Labour Codes of India
- B) Urban Utilities Planning: Water Supply, Sanitation and Drainage
- C) Environment and Development
- D) Entrepreneurship
- E) Research Methodology

Open Elective II

A)	Student Psychology
B)	Business To Business Marketing (B2B)
C)	Organizational Behavior
D)	Principles Of Economics
E)	Intellectual Property & Rights
F)	Introduction to Public Administration

Multidisciplinary Minor

A)	Design Of Mechatronic Systems
B)	Ethical Hacking
C)	Sustainable Power Generation Systems
D)	Components and Applications of Internet of Things
E)	Linear Algebra
F)	Artificial Intelligence and Machine Learning

IKS Bucket

Indian Knowledge System (IKS)

A)	Indian Knowledge System (IKS): Concepts and Applications in Engineering
B)	Indian Knowledge System(IKS): Humanities and Social Sciences

Semester - I

MTCSEBS101	Applied Mathematics-Number Theory Concepts	Credits 04
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Teaching Hours/Week (L:T:P) 3:1:0

Course Objectives:

This course will enable students to:

1. Have an insight into statistical methods.
2. Apply the concept of probability distribution of discrete and continuous random variables.
3. Apply the concept of various graphs and Vector Spaces.
4. Analyze the statistical data for testing of hypothesis and to draw the conclusions.

Course outcomes:

The students will be able to

1. CO1: Apply probability formulations for new predictions with discrete and continuous RV's.
2. CO2: Solve the vector spaces and related topics arising in magnification and rotation of images.
3. CO3: demonstrate knowledge and critical understanding of the well-established principles within Number Theory;
4. CO4: Apply the statistical tools in multi variable distributions.
5. CO5: Summarize the Numerical and Statistical tools using programming

Unit -I

Preamble: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.

Introduction: Understanding of Vector spaces, graph theory, Statistical models & their applications in Engineering, Economics and Statistics.

Linear Algebra-I

Vector Spaces: Vector spaces; subspaces Linearly independent and dependent vectors, Basis and dimension, coordinate vectors-Illustrative examples. Linear transformations, Representation of transformations by matrices. (08 Hrs.)

Unit-II

Linear Algebra-II

Computation of Eigen values and Eigen vectors of real symmetric matrices-Jacobi and Given's method. Orthogonal vectors and orthogonal basis. Gram-Schmidt orthogonalization process. QR decomposition, singular value decomposition. . (08 Hrs.)

Unit-III

Statistical Inference: Introduction to multivariate statistical models: Correlation and Regression analysis, Curve fitting (Linear and Nonlinear). (08 Hrs.)

Unit-IV

Number Theory: Divisibility, GCD, Euclidean algorithm, Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem (08 Hrs.)

Unit-V

Probability Theory: Random variable (discrete and continuous), Probability mass function (pmf), Probability density function (pdf), Mathematical expectation, Sampling theory: testing of hypothesis by t -test, z - test. (08 Hrs.)

Textbooks:

1. David C.Lay, Steven R.Lay and J.J.McDonald, "Linear Algebra and its Applications",5th Edition, Pearson Education Ltd., 2015.
2. T.Veerarajan, "Probability, Statistics and Random Process", 3rdEdition, Tata Mc- Graw Hill Co., 2016.
3. Neal Coblitz, "A Course in Number Theory and Cryptography", Springer Verlag, Second edition.

References:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. John Vince, "Foundation Mathematics for Computer Science", Springer International Publishing, Switzerland, 2015.
3. Burton, David M. Elementary number theory. Second edition. W. C. Brown Publishers, Dubuque, IA, 1989.

MTCSEPC102 Research Methodology and Intellectual Property Rights Credits 03

Teaching Hours/Week (L: T: P) 3:0:0

Course Objectives:

This course will enable students to:

1. Give an overview of the research methodology and explain the technique of defining a research problem.
2. Explain the functions of the literature review in research and carry out a literature search, its review and develop theoretical and conceptual frameworks.
3. Explain various research designs, sampling designs, and also different methods of data collections.
4. Understand hypothesis and chi- square test.
5. Develop the art of interpretation and the art of writing different research reports.
6. Explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.

Course Outcomes: The student will be able to:

1. CO1: Understand the concepts of research methodology, research problem and literature review.
2. CO2: Understand various forms of the intellectual property rights, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.
3. CO3: Analyze various research designs, sampling designs, measurement and scaling techniques and different methods of data collections.
4. CO4: Apply several parametric tests of hypotheses.
5. CO5: Develop the art of interpretation and writing research reports

Unit-I

Introduction: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. **Defining the Research Problem:** Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

(8 Hrs.)

Unit-II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **Research Design:** Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. (8 Hrs.)

Unit-III

Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale. Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

(8 Hours)

Unit-IV

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, and Cautions in Using Chi Square Tests. (8 Hours)

Unit-V

Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organization (WIPO), WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, (8 Hours)

Textbooks :

1. C.R. Kothari, Gaurav Garg, "Research methodology: Methods and Techniques", New Age International, 4th Edition, 2018.
2. Ranjit Kumar, "Research Methodology a step-by-step guide for beginners", SAGE Publications Ltd., 4th Edition, 2014.
3. The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, September 2013.

References:

1. Trochim, Research Methods: the concise knowledge base, Atomic Dog Publishing, 2005.
2. Fink A, Conducting Research Literature Reviews: From the Internet to Paper, Sage Publications, 2009.
3. Panneerselvam R, Research Methodology, Prentice Hall of India, New Delhi, 2004

Course Learning Objectives:

This Course will enable students to:

1. **To understand** the basic concepts and functions of operating systems.
2. **To understand** Processes and Threads
3. **To analyze** Scheduling algorithms.
4. **To understand** the concept of Deadlocks
5. **Examine** the challenges and complexities associated with distributed operating systems.
6. **Analyze** the Distributed Mutual Exclusive algorithms employed in multi-processor Operating Systems.

UNIT – I: OS Overview and System Structure

09 Hours

Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Computing environments. **Operating System Services: User - Operating System interface; System calls;** Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines;

UNIT – II: Process Management

08 Hours

Process Management: Process concept; Process scheduling; Operations on processes. **Multi-threaded Programming:** Overview; Multithreading models; Threading issues. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms.

UNIT – III: Process Coordination

08 Hours

Process Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; problems of synchronization; Monitors **Deadlocks:** Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

UNIT – IV: Architectures of Distributed Systems

07 Hours

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. **Theoretical Foundations:** Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT – V: Distributed Mutual Exclusion

07 Hours

Distributed Mutual Exclusion: Introduction, The Classification of Mutual Exclusion Algorithms, **Non-Token – Based Algorithms:** Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, **Token-Based Algorithms:** Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Heuristic Algorithm

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2010
2. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjana G. Shivaratri, Tata McGraw- Hill Edition 2001.

REFERENCE BOOKS:

1. Operating Systems-Internals and Design Principles, William Stallings, 6th Edition, Pearson Education, 2009.
2. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition –2, 2007

E-Resources:

1. <https://www.udacity.com/course/advanced-operating-systems--ud189>

MTCSEPC107L ADVANCES IN OPERATING SYSTEMS LABORATORY Credit 02

List of Experiment

1. Write a program to create a new process that exec a new program using system calls fork(), execlp() & wait()
2. Write a program to display PID and PPID using system calls getpid () & getppid ()
3. Write a program using I/O system calls open(), read() & write() to copy contents of one file to another file
4. Process Management Write a program to implement multithreaded program using pthreads
5. Write program to simulate the following CPU scheduling algorithms
a) FCFS b) SJF c) Priority d) Round Robin
6. Process synchronization Write a program to simulate producer-consumer problem using Semaphores
7. Deadlock Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8. Write a program to simulate deadlock detection.
9. Memory Management Write a C program to simulate page replacement algorithms
a) FIFO b) LRU c) LFU
10. I/O System Write a program to simulate the following file organization techniques
a) Single level directory b) Two level directory
11. Write a program to simulate the following file allocation strategies.
a) Sequential b) Indexed

MTCSEPC104

Advances in Algorithm

Credits 03

Course Learning Objectives:

This Course will enable students to:

1. **Analyze** the non-recursive and recursive algorithms and to represent efficiency of these algorithms in terms of the standard Asymptotic notations.
2. **Devise** the Brute Force and Divide and Conquer techniques to design the algorithms and apply these methods in designing algorithms to solve a given problem.
3. **Explain** the Decrease and Conquer, Transform and Conquer algorithm design techniques, and Time versus Space Trade-offs.

4. **Get the idea** of Greedy method and dynamic programming methods and apply these methods in designing algorithms to solve a given problem.
5. **Describe** and illustrate the idea of Backtracking and Branch and Bound algorithm design techniques to solve a given problem.

At the end of the course the student will be able to:

1. **Explain** the algorithm design techniques and standard asymptotic notations. Analyze non-recursive and recursive algorithms to obtain worst-case running times of algorithms using asymptotic analysis and derive and solve recurrences describing the performance of various sorting.
- 2 **Interpret.** Graph data structures are particularly useful in fields such as social network analysis, recommendation systems, and computer networks. In the field of sports data science, graph data structures can be used for analysis and Polynomial algorithms are a class of algorithms that use polynomial expressions to solve problems. They are used in various fields such as machine learning, optimization, and cryptography
- 3 **Describe** String matching algorithms it helps in performing time-efficient tasks in multiple domains. These algorithms are useful in the case of searching a string within another string and there are different ways to represent signed integers in binary form
- 4 **Identify and explain** introduces important algorithms and techniques of scientific computing, focusing on the areas of linear algebra and matrix computations. The course presents both theoretical and practical aspects of the algorithms The FFT algorithm is an efficient algorithm for computing the DFT, and it is widely used in signal processing and other applications.
- 5 **Describe** A linear programming algorithm finds a point in the polytope where this function has the smallest (or largest) value if such a point exists and Randomized algorithms, on the other hand, are algorithms that use a random number generator to make decisions during the execution of the algorithm.

UNIT – I

08 Hours

INTRODUCTION:

Fundamentals of Analysis Techniques:

Growth of Functions: Asymptotic notations, Standard notations and common functions.

Sorting: Review of various sorting algorithms, topological sorting.

Recurrences and Solution of Recurrence equations: The substitution method, The recurrence – tree method, The master method, **Amortized Analysis:** Aggregate, Accounting and Potential Methods.

UNIT – II

08 Hours

Graph Algorithms: Johnson's Algorithm for sparse graphs, Maxflow-mincut theorem, Flow networks and Ford-Fulkerson method, Maximum bipartite matching.

Polynomials and the FFT: Representation of polynomials; The DFT and FFT, Efficient implementation of FFT, Edmond's Blossom algorithm to compute augmenting path.

UNIT – III

08 Hours

String-Matching Algorithms: Naïve string Matching, Rabin - Karp algorithm, Knuth-Morris-Pratt algorithm, Boyer – Moore algorithms.

Representation of integers: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation, Powers of an element, RSA cryptosystem, Primality testing, Integer factorization

UNIT – IV

08 Hours

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring, Fast Fourier Transform algorithm, Schönhage -Strassen Integer Multiplication algorithm.

UNIT – V 08 Hours

Linear Programming: Formulation of Problems as Linear Programs, Duality, Simplex, Interior Point, and Ellipsoid Algorithm, proof of NP-hardness and NP-completeness.

Probabilistic and Randomized Algorithms: Probabilistic algorithms, Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms, Probabilistic numeric algorithms.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI, 2014.
2. Kenneth A. Berman. Algorithms. Cengage Learning. 2002

REFERENCE BOOKS:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms".
2. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms".
3. Kleinberg and Tardos. "Algorithm Design"

E-Resources:

1. <https://nptel.ac.in/courses/106/101/106101060/>
2. <http://cse01-iiith.vlabs.ac.in/>
3. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>
4. Harvard University - YouTube
5. MIT OpenCourseWare - YouTube

MTCSEPE105A Program Elective –I Artificial Neural Network

Credits 04

Unit - I

Introduction to artificial neural networks

8 Hrs.

Biological neural networks, Pattern analysis tasks: Classification, Regression, Clustering, Computational models of neurons, Structures of neural networks, Learning principles Linear models for regression and classification

Unit- II

8 Hrs.

Polynomial curve fitting, Bayesian curve fitting, Linear basis function models, Bias-variance decomposition, Bayesian linear regression, Least squares for classification, Logistic regression for classification, Bayesian logistic regression for classification

Unit III

8 Hrs.

Feed forward neural networks Pattern classification using Perceptron, Multilayer feed forward neural networks (MLFFNNs), Pattern classification and regression using MLFFNNs, Error back propagation learning, Fast learning methods: Conjugate gradient method, Auto associative neural networks, Bayesian neural networks.

Unit IV

8 Hrs.

Radial basis function networks Regularization theory, RBF networks for function approximation, RBF networks for pattern classification, Kernel methods for pattern analysis Statistical learning theory, Support vector machines for pattern classification, Support vector regression for function approximation, Relevance vector machines for classification and regression

Unit- V

8 Hrs.

Self-organizing maps Pattern clustering, Topological mapping, Kohonen's self-organizing map Feedback neural networks Pattern storage and retrieval, Hopfield model, Boltzmann machine, Recurrent neural networks.

Reference Books:

1. B. Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003

3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

MTCSEPE105B Program Elective –I Agile Project Management & Devops Credits 04

Course Learning Objectives:

This Course will enable students to:

1. **Compare and contrast** the differences between Agile and other Traditional project management Methodologies.
2. **Interpret and apply** various Scrum principles, phases and activities of the Scrum methodology
3. **Develop** the Agile Scrum planning principles for real life situations and learn the basics of SAFe for scaled agile
4. **Understand** the Agile Testing principles for real life situations and learn the basics of SAFe for scaled agile
5. **Identify and use** the various tools for Agile development and DevOps principles for CI/CD.

At the end of the course the student will be able to:

1. **Compare and contrast** the differences between Agile and other Traditional project management methodologies.
2. **Interpret and apply** various Scrum principles, phases and activities of the Scrum methodology
3. **Develop** the Agile Scrum planning principles for real life situations and learn the basics of SAFe for scaled agile
4. **Understand** the Agile Testing principles for real life situations and learn the basics of SAFe for scaled agile
5. **Identify and use** the various tools for Agile development and DevOps principles for CI/CD

UNIT – I: Introduction

07 Hours

Introduction: Introduction to Software engineering, SDLC, Software process models: waterfall, V model, Iterative model, Spiral model etc. Introduction to Agile: Agile development, The Agile Manifesto and principles, Agile Project management, **Specific Agile methodologies:** Scrum, XP, Lean, and Kanban. **Agile Requirements:** User Story and story mapping. **Scrum Introduction:** What is scrum, Scrum Origins, Why Scrum?

UNIT – II: Scrum and Sprint

9 Hours

Scrum Process Frame Work: Overview, Scrum Roles, Scrum activities and Artifacts Sprints: Overview, Time Boxed, Short Duration, consistent Duration, No Goal-Altering Changes, Definition of done.

Requirements and User Stories: Overview, what are user stories, 3cs, INVEST in good stories, Nonfunctional requirements, Knowledge Acquisition Stories, Story Mapping, Prioritizing Stories (WSJF

technique from SAFe), How we do sprint planning, daily scrums, Multiple scrum teams

UNIT – III: Planning

08 Hours

Scrum Planning and Principles: Multilevel Planning, Portfolio Planning, Product Planning, Release Planning

UNIT – IV: Agile Testing

08 Hours

Introduction: What Is Agile Testing, What Do We Mean by “Agile Testing”? A Little Context for Roles and Activities on an Agile Team How Is Agile Testing Different? Traditional vs. Agile Testing, Ten Principles for Agile Testers, Applying Agile Principles and Values **Other Types of testing:** Concurrency Testing, Internationalization and Localization, Regression Testing Challenges, User Acceptance Testing, A/B Testing, User Experience Testing, The Agile Testing Quadrants. Planning for Test Automation, Test automation pyramid.

UNIT – V: DevOps

08 Hours

Artificial Neural Networks

8 Hrs.

Basic concept of neural networks, Mathematical model, Typical architectures: single layer, multilayer, Common activation functions; basic models, Perceptron, Multilayer feed forward network, Back propagation, ADALINE, MADALINE, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps. Classification techniques : Different learning methods: Supervised, Unsupervised & reinforced; Simple Clustering algorithm, k-means & k-medoid based algorithm. Deep learning: Why Deep Learning? Deep Convolutional Networks, Recurrent Nets, Deep Learning Use Cases.

Unit-IV

Genetic Algorithms

8 Hrs.

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), role of GA in optimization, Fitness function, Selection of initial population, Cross over, Mutation, Inversion, Deletion, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, multi objective evolutionary algorithm (MOEA)

Unit-V

Hybrid Systems

6 Hrs.

Neural –Network based Fuzzy Systems , Fuzzy Logic-Based Neural Networks, Fuzzy Logic controlled G.A ,Genetic Algorithm for Neural Network

Books/References:

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.
3. S. Haykin, “Neural Networks”, Pearson Education, 2ed, 2001.
4. S. Rajasekaran & G. A. V. Pai, Neural Networks, Fuzzy logic, and Genetic Algorithms, PHI.
5. Klir & Yuan , Fuzzy Sets and Fuzzy Logic, Klir & Yuan, PHI, 1997
- 6 D. Ruan, Intelligent Hybrid Systems, Kluwer Academic Publisher, 1997.
- 7 Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT press
- 8 Pravir Chawdhry, Raj Kumar Roy, Raj Pant, “Soft Computing in Engineering Design and Manufacturing”, Springer.

MTCSEPE105D Program Elective –I Digital Image Processing and Forensics Science Credits 04

Course Objectives:

This Course will enable students to:

1. Understand the roles of image processing systems in a variety of applications.
2. Explore and implement programs to read/write and manipulate images: enhancement, segmentation, spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation

Course Outcomes:

At the end of the course the student will be able to:

1. Utilize basic image fundamentals and perform mathematical transformations necessary for image processing

2. Analyze image enhancement techniques in Spatial & frequency domain
3. Apply restoration models and compression models for image processing
4. Ability to synthesis image using segmentation and representation techniques
5. Utilize the fundamentals of digital forensics technology along with different systems and services in real world practice

UNIT – I

08 Hours

INTRODUCTION: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Examples of fields that uses digital image processing

UNIT – II

08 Hours

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN:

Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

UNIT – III

08 Hours

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN:

Image Enhancement In Frequency Domain: Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.

UNIT – IV

08Hours

IMAGE SEGMENTATION:

Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

UNIT – V

07 Hours

INTRODUCTION TO DIGITAL FORENSICS:

Digital forensics fundamentals: Use of Computer Forensics - Benefits of Professional Forensics Methodology - Steps Taken by Computer Forensics Specialists - Case Studies - Types of Computer Forensics Technology: Military, Law Enforcement, Business - Specialized Forensics Techniques -Hidden Data and How to Find It - Protecting Data from Being Compromised - Internet Tracing Methods

TEXT BOOKS(TB)

1. Gonzalez.R.C& Woods. R.E., “Digital Image Processing”, 3rd Edition, Pearson Education, Indian edition published by Dorling Kindersely India Pvt. Ltd. Copyright© 2009, Third impression 2011.
2. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2015, Second Edition, Charles River Media, Inc

REFERENCE BOOKS:

1. Milan Sonka, “Image Processing, analysis and Machine Vision”, Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.
4. Digital Image Processing (with Matlab and Labview), Vipul singh, elsiver.Filip learning

E-Resources:

1. <https://nptel.ac.in/courses/117105135>
2. <https://nptel.ac.in/courses/117/104/117104069/>(NPTEL Course by Prof. Sumana Gupta from IIT Kanpur)

MTCSEPE105E	Program Elective –I	Social Network Analysis	Credits 04
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This Course will enable students to:

1. Use the basic concepts of social networks like nodes, edges, adjacency matrix, neighborhood, degree, geodesic, diameter and clustering coefficient to analyze the social network data
2. **Interpret** content-based analysis and static and dynamic analysis for real-time data or online content.
3. **Examine** the importance of Social network APIs and community detection in real-time networks.
4. **Predicting** the relationship between nodes by analyzing the impact on the specified social network like twitter, LinkedIn and Facebook.
5. **Simulate and validate** the social networks by using different tools of SNA.

At the end of the course the student will be able to:

1. Use the basic concepts of social networks like nodes, edges, adjacency matrix, neighborhood, degree, geodesic, diameter and clustering coefficient to analyze the social network data
2. **Interpret** content-based analysis and static and dynamic analysis for real-time data or online content
3. **Examine** the importance of Social network APIs and community detection in real-time networks.
4. **Predicting** the relationship between nodes by analyzing the impact on the specified social network like twitter, LinkedIn and Facebook. L4: Analyzing
5. **Simulate and Validate** the social networks by using different tools of SNA

UNIT – I: Introduction**07 Hours**

Social network analysis –Key concepts. Organizational Network analysis large scale networks, Community centrality analysis, online social networking –Benefits, security threats. Social Network Data - Issues and challenges, Measuring social networks-connectivity, centrality. Applications of Social Networks.

UNIT – II: Analysis of social networks**08 Hours**

Link based analysis-social network metrics-degree, density, connectedness, betweenness, ego-centric, closeness Content-based analysis-Conceptual and relational analysis. Static and dynamic analysis-Evolution in Dynamic Social Networks. Mathematical Representation of social networks- Centrality.

UNIT – III: Social Networking APIs**09 Hours**

Social networking API -Types of APIs Statistical Analysis of Social Networks. Community Detection in Social Networks - node-centric community, group-centric community, network-centric community and hierarchy centric community. Node Classification in Social Networks

UNIT – IV: Social Influence analysis**08 Hours**

Social Influence Analysis -Link Prediction in Social Networks- Preferential attachment score, Adamic/Adar,Jaccard coefficient. Data Mining - Social Media data mining-types of social media Text Mining in Social Networks - Social Tagging -Building social services

UNIT – V: Social Network Analysis Tools**07 Hours**

UCINET – PAJEK– NETDRAW – Stocnet – S-Plus - R – NodeXL- SIENA and RSIENA -Case Studies -Real-world networks (Facebook graph, Twitter networks,)

TEXT BOOKS:

1. Christina Prell, Social Network Analysis: History, Theory and Methodology, SAGE Publications Ltd, Publication Year 2011

2. Stanley Wasserman and Katherine Faust, “Social Network Analysis: Methods and Applications”, Cambridge University Press, 1994

REFERENCE BOOKS:

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, 2010
2. Carrington and Scott (eds). The SAGE Handbook on Social Network Analysis SAGE, First Edition 2011
3. Lei Tang and Huan Liu, Community Detection and Mining in Social Media, Morgan & Claypool Publishers
4. Guandong Xu, Yanchun Zhang and Lin Li, -Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.

E-Resources:

1. <https://nptel.ac.in/courses/106106239>
2. https://onlinecourses.nptel.ac.in/noc23_cs106/preview

MTCSEPE106A Program Elective –II Computer Graphics & Multimedia Credits 04

Unit- I

Introduction to computer graphics & graphics systems, Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software. Scan conversion:, Points & lines, Line drawing algorithms; DDA algorithm, Bresenham’s line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm

Unit - II

2D transformation & viewing, Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear, Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse, 3D

Unit –III

Transformation & viewing, 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Unit- IV

Curves, Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. Hidden surfaces, Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter’s algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry, Color & shading models [2L], Light & color model; interpolative shading model; Texture.

Unit-V

Multimedia, Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia; Image, video and audio, standards. Audio: digital audio, MIDI, processing sound, sampling, compression. Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intraframe compression. Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.

Reference Books:

1. Hearn, Baker – “Computer Graphics (C version 2nd Ed.)” – Pearson education
2. Z. Xiang, R. Plastock – “Schaum’s outlines Computer Graphics (2nd Ed.)” – TMH
3. D. F. Rogers, J. A. Adams – “Mathematical Elements for Computer Graphics (2nd Ed.)” – TMH

4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
5. Sanhker, Multimedia –A Practical Approach, Jaico
6. Buford J. K. – “Multimedia Systems” – Pearson Education
7. Andleigh & Thakrar, Multimedia, PHI
8. Mukherjee Arup, Introduction to Computer Graphics, Vikas Hill,
9. Computer Graphics using open GL, Pearson Education

MTCSEPE106B Program Elective –II Cluster, Grid and Cloud Computing Credits 04

Unit- I

Cluster Computing A general introduction to the concept of cluster based distributed computing. Hardware technologies for cluster computing, including a survey of the possible node hardware and high-speed networking hardware and software. Software and software architectures for cluster computing, including both shared memory (OpenMP) and message passing (MPI/PVM) models.

Unit –II

MPI-2 extension, dynamic process creation, one-sided communication, parallel I/O. Variants based on new low level protocols (MVAPICH), evaluation and tuning of system and software performance. Performance evaluation tools, HINT, netperf, netpipe, ttcp, Iperf.

Unit- III

Grid Computing. The Grid - Past, Present, Future, A New Infrastructure for 21st Century Science – The Evolution of the Grid - Grids and Grid Technologies, Programming models - A Look at a Grid Enabled Server and Parallelization Techniques – Grid applications. The concept of virtual organizations – Grid architecture –Grid architecture and relationship to other Distributed Technologies – computational and data Grids, semantic grids.

Unit- IV

Cloud Computing Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS.

Unit –V

Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing. Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Issues in cloud computing, Implementing real time application over cloud platform Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment.

Reference Books:

1. Cluster Computing by Rajkumar Buyya, Clemens Szyperski
2. High Performance Cluster Computing: Architectures and systems by Rajkumar Buyya
3. Grid and Cluster Computing by C.S.R Prabhu
4. Fran Bernm, Geoffrey Fox, Anthony Hey J.G., “Grid Computing: Making the
5. Joshy Joseph, Craig Fallenstein, “Grid Computing”, Pearson Education, New Delhi, 2004,
6. Ian Foster, Carl Kesselman, “The Grid2: Blueprint for a New Computing Infrastructure”. Morgan Kaufman, New Delhi, 2004
7. Ahmar Abbas, “Grid Computing: Practical Guide to Technology and Applications”, DelmarThomson Learning, USA, 2004,
8. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)

MTCSEPE106C Program Elective –II Mobile Computing

Credits 04

Unit- I

Fundamentals of Cellular Communications, Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Teletraffic Engineering, Radio Propagation and Propagation Path-Loss Models, Cellular Geometry, Interference in Cellular Systems, Frequency Management and Channel Assignment Issues, Multiple Access Techniques, GSM Logical Channels and Frame Structure, Privacy and Security in GSM, Mobility Management in Cellular Networks.

Unit- II

Wireless Transmission Fundamentals, Spread Spectrum (SS) and CDMA Systems, Wireless Medium Access Control, IEEE 802.11 Architecture and Protocols, Issues in Ad Hoc Wireless Networks (Medium Access Scheme), Routing, Multicasting, Transport Layer Protocols, QoS Provisioning, Energy Management and Energy Consumption Models, Traffic Integration in Personal, Local, and Geographical Wireless Networks, Bluetooth, Technologies for High-Speed WLANs, Third-Generation Cellular Systems: UMTS.

Unit-III

Mobile Adhoc Networks, Introductory Concepts. Different models of operation, Various applications of MANET, Destination-Sequenced Distance Vector protocol - overview, Route Advertisement, Extending Base Station Coverage, Properties of DSDV protocol, Dynamic Source Routing protocol - overview and properties, DSR Route Discovery, Route Maintenance, Support for Heterogeneous Networks and Mobile IP, Multicast routing with DSR, Ad Hoc On-Demand Distance-Vector protocol - properties, Unicast Route Establishment, Multicast Route Establishment, Broadcast Optimizations and Enhancements, Link Reversal Routing - Gafni-Bertsekas Algorithm, lightweight mobile routing algorithm, Temporally Ordered Routing Algorithm, Preserving battery life of mobile nodes - Associativity Based Routing, Effects of beaconing on battery life.

Unit- IV

Wireless Sensor Networks, Sensor networks overview: introduction, applications, design issues, requirements, Sensor node architecture, Network architecture: optimization goals, evaluation metrics, network design principles, Sensor network operating systems and brief introduction to sensor network Programming, Network protocols: MAC protocols and energy efficiency, Routing protocols: data centric, hierarchical, location-based, energy efficient routing etc, Sensor deployment, scheduling and coverage issues, Self-Configuration and Topology Control, Querying, data collection and processing, collaborative information processing and group connectivity, Target tracking, localization and identity management, Power management, Security and privacy.

Unit- V

Topology Control and Clustering in Adhoc Networks, Algorithms for Graphs Modeling Wireless Ad Hoc Networks, Clustering and Network Backbone, Dominating-Set-Based Routing in Ad Hoc Wireless Networks, Formation of a Connected Dominating Set, Backbone-Formation Heuristics.

Reference Books

1. Gabrilovska, Prasad, "Adhoc Networking towards Seamless Communication", Springer.
2. Azzedine Boukerche, "Handbook of Algorithms for Wireless Networking and Mobile Computing", Chapman and Hall/CRC, New York.
3. Wagner, Wattenhofer (Eds.), "Algorithms for Adhoc and Sensor Networks: Advanced Lectures", Springer Lecture Notes in Computer Science.
4. Mukherjee, Bandopadhyay, Saha, "Location Management and Routing in Mobile Wireless Networks", Artech House, London.

5. Redl, S.M., Weber, M.K., Oliphant, M.W.: An Introduction to GSM. Artech House, London.
6. Mehrotra, A.: GSM System Engineering. Artech House, London.
7. Ivan Stojmenovic, "Handbook of Wireless Networking and Mobile Computing", Wiley Inc, New York.
8. XiangYang Li, "Wireless Adhoc and Sensor Networks", Cambridge University Press.

MTCSEPE106D Program Elective –II Advanced Web Technology

Credits 04

Unit-I

Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Server Concept and Architecture. Definition of DNS (Domain Name System). Domain and Sub domain, Address Resolution, FTP & its usage, Telnet Concepts, Remote Logging, HTTP & HTTPS.

Unit-II

Client Side Application Development, HTML & CSS, Introduction, Editors, Elements, Tags, Attributes, Heading, Paragraph. Formatting, Link, Image, Table, List, Block, Form, Frame Layout, DHTML, Basic Web Page Development, CSS- Create Class Styles, Create ID Styles, Span, Colors. HTML5 in brief. Extensible Markup Language (XML), Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation, Tree, Syntax, Elements, Attributes, Validation, and Viewing. XHTML in brief. JavaScript, Introduction, JavaScript in Web Pages, The Advantages of JavaScript Writing JavaScript into HTML; Building Up JavaScript Syntax; Basic Programming Techniques; Operators and Expressions in JavaScript; JavaScript Programming Constructs; Conditional Checking Functions in JavaScript, Dialog Boxes, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array. Function, Errors, Validation. The JavaScript Document Object Model-Introduction (Instance, Hierarchy); The JavaScript Assisted Style Sheets DOM; Understanding Objects in HTML (Properties of HTML objects, Methods of HTML objects); Browser Objects, Handling Events Using JavaScript

Unit- III

Server Side Programming with PHP & MySQL Installing and Configuring Current and Future Versions of MySQL and PHP, How to Get MySQL, Installing MySQL on Windows, Trouble Shooting your Installation, Basic Security Guidelines, Building PHP on Windows with Apache, Windows, php.ini. Basics, The Basics of PHP scripts. The Building blocks of PHP (3L), Variables, Data Types, Operators and Expressions, Constants. Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser,

Unit- IV

Functions, What is function? Calling functions, Defining Functions. Variable Scope, more about arguments. Working with Arrays and Some Array-Related Functions. Working with Objects, Creating Objects, Object Instance Working with Strings, Dates and Time: Formatting strings with PHP, Investigating Strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP. Working with Forms, Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, and Working with File Uploads.

Unit- V

Multimedia Application Development (4L), Pixel, Image Resolution, Image Editing using Photoshop, 2D & 3D Animation, Logo Design, Banner. Animated Component Preparation using

Flash & Action script. Multimedia Web Applications (2L), Multimedia over IP: RTP, RTCP. Streaming media, Codec and Plugins, VoIP, Text and Voice Chat.

Reference Books:

1. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.
2. Web Technology & Design, C.Xavier, New Age International Publication, Delhi
3. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
4. Sams Teach Yourself PHP in 24 Hours, Third Edition
5. Wrox, Beginning PHP, Apache, MySQL Web Development
6. Wrox, Beginning PHP

MTCSEPE106E Program Elective –II Coding and Information Theory Credits 04

COURSE OBJECTIVES:

1. Covers information theory and coding within the context of modern digital communications applications.
2. To help students in quantify the notion of information in a mathematically and intuitively sound way.
3. Explaining how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems

COURSE OUTCOMES: By the end of the course students will

1. Learn various coding methods.
2. Learn various error control methods.

SYLLABUS

Unit I

Source Coding - Introduction to information theory, uncertainty and information, average mutual information and entropy, source coding theorem, Shannon-fano coding, Huffman coding, Arithmetic coding, Lempel-Ziv algorithm, run-length encoding and rate distortion function.

Unit II

Channel capacity and coding - channel models, channel capacity, channel coding, information capacity theorem, random selection of codes. Error control coding: linear block codes and their properties, decoding of linear block code, perfect codes, hamming codes, optimal linear codes and MDS codes.

Unit III

Cyclic codes - polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, burst error correction, fire codes, golay codes, CRC codes, circuit implementation of cyclic codes. BCH codes: minimal polynomials, generator polynomial for BCH codes, decoding of BCH codes, Reed-Solomon codes and nested codes.

Unit IV

Convolutional codes - tree codes and trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, generation function, matrix description of convolutional codes, Viterbi decoding of convolutional codes, distance bounds for convolutional codes, turbo codes and turbo decoding.

Unit V

Trellis Coded Modulation - concept of coded modulation, mapping by set partitioning, ungerboeck's TCM design rules, TCM decoder, Performance evaluation for Additive White Gaussian Noise (AWGN) channel, TCM for fading channels.

REFERENCES:

1. Lin S. and D. J. Costello, "Error Control Coding — Fundamentals and Applications", Second Edition, Pearson Education Inc., NJ., USA, 2004.
2. Shu Lin and Daniel J. Costello, "Error Control Coding", Second Edition, Prentice Hall, 1983.
3. E. R. Berlekamp, "Algebraic Coding Theory", McGraw-Hill, New York, 1968.
3. R. E. Blahut, "Algebraic Codes for Data Transmission", Cambridge University Press Cambridge, UK, 2003.
4. Ranjan Bose, "Information theory, coding and cryptography", Tata McGraw Hill, 2002.
5. Viterbi, "Information theory and coding", McGraw Hill, 1982.
6. John G. Proakis, "Digital Communications", 2nd Edition, McGraw Hill, 1989

Course Objectives:

1. Understand the physiological and psychological aspects of stress and its impact on overall well-being.
2. Learn and practice specific yoga postures, breathing exercises, and relaxation techniques to alleviate stress.
3. Explore the connection between mindfulness, meditation, and stress reduction, fostering mental clarity.
4. Discover holistic practices that promote better sleep, nutrition, and overall lifestyle habits for stress management.
5. Develop practical skills to manage stress in daily life, enhancing resilience and promoting emotional balance.

MTCSEAU108

YOGA for Stress Management

Audit

Course Outcomes:

1. Recognize the signs and sources of stress, understanding its effects on mental and physical well-being.
2. Master a variety of yoga techniques, including postures, breathing, and meditation, to effectively manage stress.
3. Acquire relaxation strategies that promote calmness, reduce anxiety, and enhance overall mental clarity.
4. Incorporate healthy habits inspired by yoga principles to foster better sleep, nutrition, and self-care routines.
5. Develop practical skills to navigate and cope with stress, enhancing emotional balance and promoting a more harmonious life.

UNIT I

Introduction to Yoga for Stress Management - 1 Introduction to Yoga for Stress Management - 2
Stress according to Western perspective
Stress Eastern Perspective
Developmental process: Western and Eastern Perspective Stress Hazards and Yoga

UNIT II

Meeting the challenges of Stress - 1 Meeting the challenges of Stress - 2 Introduction to Stress
Physiology
Stress, Appetite and Dietary management- Modern and Yogic perspective
Sleep and Stress: understanding the relationship for effective management of stress

UNIT III

Stress Assessment methods- a valuable tool toward stress management

Role of Yoga in prevention and management of stress related disorders – a summary of research evidence

Concept of stress and its management - perspectives from Patanjali Yoga Sutra - Part 1 Concept of stress and its management - perspectives from Patanjali Yoga Sutra - Part 2 Concept of stress and its management - perspectives from Patanjali Yoga Sutra - Part 3

UNIT IV

Concept of stress and its management - perspectives from Bhagavad Gita - Part 1 Concept of stress and its management - perspectives from Bhagavad Gita - Part 2 Concept of stress and its management - perspectives from Bhagavad Gita - Part 3

UNIT V

Bio-Psycho-Socio-Spiritual model of stress management Yoga practices for Stress Management Breathing practices – 1 Hands in and out breathing, Hands stretch breathing, Ankle stretch breathing Breathing practices – 2 Dog Breathing, Rabbit breathing, Tiger breathing, Sashankasana breathing Breathing practices – 3

Bhujangasana breathing, Ardha Shalabhasana breathing (alternate legs), Straight leg raising (alternate legs), Straight leg raising (both legs), Sethubandhasana lumbarstretch, Instant Relaxation Technique (IRT) Loosening Practices – 1

Shoulder Rotation, Side bending, standing twist, Hip rotation, Thigh strengthening Loosening practices – 2 Chakki chalan, Bhunamasana Chalana, Alternative toe touching Loosening practices – 3 Side leg raising, Pavana muktasana kriya: Wind releasing pose movements, Quick Relaxation Technique (QRT)

UNIT VI

Asana practices – 1

Tadasana, Ardhakati Chakrasana, Ardha Chakrasana, Trikonasana, Vrikshasana Asana practices – 2 Vakarasana, Janu Sirshasana, Ushtrasana, Sashankasana, Asana practices – 3 Ardhamatseyndrasana, Paschimottanasana, Poorvottanasana, Gomukhasana Asana practices – 4 Makarasana, Bhujangasana, Salambha Shalabahasana, Dhanurasana Asana practices – 5 Setubandhasana, Sarvangasana, Mastyasana, Deep Relaxation Technique (DRT) Soorya Namaskar Pranayama – 1

Kapalbhati kriya and Sectional Breathing Pranayama – 2 Nadishuddhi Pranayama Pranayama – 3 Bhramari, Sheetali, Sitkari and Ujjayi Om Meditation

Cyclic Meditation Integrated Yoga Module I Integrated Yoga Module II Integrated Yoga Module III

Textbooks / References:

1. H R Nagendra and R Nagarathna. Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashana. 2011.
2. Contrada, R., & Baum, A. (Eds.). The handbook of stress science: Biology, psychology, and health. Springer Publishing Company. 2010
3. Al'Absi, M. (Ed.). Stress and addiction: Biological and psychological mechanisms. Elsevier. 2011.
4. Van den Bergh, O. Principles, and practice of stress management. Guilford Publications. 2021.
5. Swami Muktibodhananda, Hatha Yoga Pradipika, Bihar School of Yoga, 1998
6. Swami Satyananda Saraswati, Four Chapters on Freedom, Bihar School of Yoga, 1975

7. Swami Tapasyananda, Srimad Bhagavat Gita, Sri Ramakrishna Math, 2012

Semester -II

MTCSEPC201	Advanced DBMS	Credits 04
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Course Learning Objectives:

This Course will enable students to:

1. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
2. Able to differentiate various database architecture.
3. Infer and represent the real-world data using object-oriented database.
4. Get familiarized about web and Mobile database.
5. Apply security concepts for the development of application software's

At the end of the course the student will be able to:

1. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
2. Able to differentiate various database architecture.
3. Infer and represent the real-world data using object-oriented database.
4. Get familiarized about web and Mobile database.
5. 5 Apply security concepts for the development of application software's

UNIT – I: Database Design and tuning

06 Hours

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FD's, Normal forms, properties of decompositions, Normalization, schema refinement in database designs, other kinds of dependencies.

Physical Database Design and Tuning: Introduction to physical database design, guidelines for index selection, basic examples of index selection, clustering and indexing, indexes that enables index- only plan, tools to assist in index selection, overview of database tuning, choices in tuning the conceptual schema, choices in tuning queries and views, Impact of concurrency.

UNIT – II: PARALLEL AND DISTRIBUTED DATABASES

09 Hours

Parallel databases: introduction, architecture for parallel databases, parallel query evaluation, parallelizing individual operations, parallel query optimization. **Distributed DBMS-Concepts and Design:** Introduction, overview of networking, functions and architecture of a DBMS, distributed relational database design, transparencies in a DDBMS, Dates twelve rules for a DBMS. **Distributed DBMS—Advanced Concepts:** Distributed Transaction Management, Distributed Concurrency control, Distributed deadlock management, distributed database Recovery, the X/Open Distributed Transaction Processing Model, Distributed Query optimization, distribution in oracle.

UNIT – III: OBJECT-DATABASE Management SYSTEMS

07 Hours

Object-Oriented DBMS—Concepts and Design: Next-generation databased systems, introduction to OODBMSs, Persistence in OODBMSs, Issues in OODBMSs, Advantages and disadvantages of OODBMSs, comparison of ORDBMS and OODBMS, object-oriented database design and object-oriented analysis and design with UML.

Object-Oriented DBMS—Standards and Systems: Object Management Group, Object Data Standard ODMG 3.0,1999, Object Store.

UNIT – IV: Web and DBMS

09 Hours

Web Technology and DBMS: Introduction to the internet and the Web, the web, scripting languages, common gateway interface, HTTP Cookies, Extending the web server, Java, Microsoft web platform and oracle internet platform. Semi structured Data and XML: Semi structure data, Introduction to XML, XML-Related technologies, XML schema, XML Query Languages, XML and databases and XML in oracle.

UNIT – V: Mobile Databases and security

08 Hours

Introduction to Mobile Databases: Mobile DBMS, Issues with mobile DBMS.

Security and administration: Database security, Countermeasures- computer based controls, security in Microsoft office access DBMS, security in Oracle DBMS, DBMSs and Web security, Database Administration

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill, 3rd Edition, 2013.
2. Thomas M. Connolly, Carolyn E. Begg, “Database Systems - A Practical Approach to Design,Implementation, and Management”, Sixth Edition ,Pearson Education, 2015.

REFERENCE BOOKS:

1. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2019

E-Resources:

1. <https://link.springer.com/book/10.1007/978-3-7091-2704-9>
2. <https://youtu.be/MEePcZbocZI?si=1AS5jZrgb4-5j5bS>
3. <https://www.youtube.com/watch?v=nhKJ6kin3rc>

MTCSEPC202

Advanced Computer Network & Security

Credits 04

Unit- I

Overview and Introduction, Fundamental of wireless networks and security

Unit-II

Wireless LANS and PANS, Wireless WANS and MANS, AD HOC Wireless Networks, Wireless Sensor Networks, Wireless Body Area Networks

Unit-III

IEEE 802.11 MAC Layer Fundamentals: CSMA/CA, IEEE 802.11 MAC Layer, Advanced, Routing Protocols for AD HOC Wireless Networks, Routing Protocols for AD HOC Wireless Networks

Unit- IV

Energy Management in Wireless Networks, Network Lifetime Enhancement

Unit-V

Security: Introduction, Overview, Security techniques, Cryptography: Concepts & Techniques, Symmetric Key Algorithm, Asymmetric Key Algorithm, Digital Signature and RSA, Internet Security Protocols, User Authentication, Electronic Mail Security, Firewall

Reference Book:

1. Ad Hoc Wireless Networks, Pearson Education, C.Siva Ram Murthy, B.S. Manoj
2. Cryptography and Network Security, Tata McGraw-Hill, Atul Kahate
3. Protocols and Architectures for Wireless Sensor Networks, Paperback, Holger Karl, Andreas Willig

MTCSEPC205L	Advanced Computer Network & DBMS Lab	Credits 04
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DBMS

Experiment List

1. Distributed Database: Implementation of Partitions: Range, List. Self-Learning Topics : Hash Partition, Composite partition
2. OLAP with Oracle : Analytical Queries Self-Learning Topics: Cume_list, Percent_rank
3. ORDBMS : Implementation of, Abstract Data Type
Reference Self-Learning Topics: Nested ADT, Inheritance
4. ETL through Pentaho: ETL Transformation with Pentaho
Self-Learning Topics: Any two more transformation operation in Pentaho beyond the syllabus
5. Basics of R and Data Acquisition:
Introduction to R, Data Types and Objects, Reading and writing data, Reading data from the console
Packages, Loading packages, Attach, and detaching data. Loading Data from different Data Source Self-Learning Topics: Operators, Conditional Statements and Loops, Functions, Loading data from Relational Databases, XML
6. Preprocessing in R: Data preprocessing techniques in R Self-Learning Topics: Sorting, Date Conversion
7. Data Mining - Classification using R Programming: Implementation and Analysis of - Regression, Classification Models Self-Learning Topics: Implement one classification algorithm in weka
8. Data Mining - Clustering and Association using R-Programming: Implementation of Market Basket Analysis and Clustering. Self-Learning Topics: Implementation clustering, association in Weka

Computer Network

Experiment list

1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands.
2. Configuration of IP addressing for a given scenario for a given set of topologies.
3. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.
4. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)
5. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down.
6. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb. Use a TFTP client and repeat the experiment.
7. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails.
8. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a linux PC.
Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS).
Extend this to serve a windows client using SMB. Characterize the NAS traffic using Wireshark

Note: Perform any four practical's from DBMS and Four Practical's from Computer Network

MTCSEPE203A	Program Elective-III	Image Processing	Credits 04
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Unit-I

Introduction Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Unit- II

Digital Image Formation A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Unit- III

Mathematical Preliminaries Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two

Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Unit- IV

Image Enhancement Spatial Domain Method, Frequency Domain Method, Contrast Enhancement Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Unit- V

Image Restoration Degradation Model, Discrete Formulation, Algebraic Approach to Restoration Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation – Spatial Transformation, Gray Level Interpolation. Image Segmentation Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking& Boundary Detection – Local Processing, Global Processing via The Hough Transform; Thresholding Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation – Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

Reference Books:

1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3. Digital Image Processing & Analysis,Chanda & Majumder,PHI
4. Fundamentals of Digital Image Processing, Jain, PHI
5. Image Processing, Analysis & Machine Vision, Sonka, VIKAS

MTCSEPE203B	Program Elective-III	Pattern Recognition	Credits 04
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Unit- I

Basic concepts- Definitions, data sets for Pattern Recognition, Structure of a typical pattern recognition system. Different Paradigms of Pattern Recognition. Representations of Patterns and Classes. Metric and nonmetric proximity measures

Unit-II

Feature vectors - Feature spaces - Different approaches to Feature Selection-Branch and Bound Schemes. Sequential Feature Selection.

Unit-III

Principal Component Analysis (PCA), Kernel PCA

Unit-IV

Pattern classification using Statistical classifiers - Bayes classifier - Classification performance measures – Risk and error probabilities. Linear Discriminant Function, Mahalanobis Distance, K-NN Classifier, Fisher's LDA, Single Layer Perceptron, Multi-layer Perceptron, Training set, test set; standardization and normalization

Unit- V

Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures. K-means algorithm, K-medoids, DBSCAN Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy techniques, and real life examples.

Reference Books:

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
3. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
4. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009

MTCSEPE203C	Program Elective-III	Distributed System Principle	Credits 04
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Unit-I

Distributed Systems Computer architecture: CICS, RISC, Multi-core Computer networking: ISO/OSI Model Evolution of operating systems Introduction to distributed computing systems. DCS design goals, Transparencies, Fundamental issues

Unit-II

Distributed Coordination Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection

Unit-III

Process synchronization ,Distributed mutual exclusion algorithms, Performance matrix

Unit-IV

Inter-process communication, Message passing communication, Remote procedure call, Transaction communication, Group communication, Broadcast atomic protocols

Unit-V

Distributed file systems , Deadlocks in distributed systems and Load scheduling and balancing techniques

Reference Books:

1. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
2. Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill
3. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
4. Distributed Operating Systems, A.S. Tanenbaum, Prentice Hall
5. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International
6. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 1995.
7. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.
8. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
9. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
10. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.
11. Galli, D.L., Distributed Operating Systems: Concepts and Practice (ISBN 0-13-079843-6), Prentice-Hall 2000.

MTCSEPE203D Program Elective-III Block Chain & Cyber Security Credits 04

Unit-1

Introduction: Objective, scope and outcome of the course. Introduction Block chain: History, Definition, Types of Block chain, Hash Functions, Properties of Hash Function, Digital Signature, Working of Block chain, Issues and needs of Block chain, Benefits and Challenges of Block chain, features of Block chain, Block chain Network and Nodes, Peerto-Peer Network

Unit-2

Block chain Architecture: Mining Mechanism, Life cycle of Block chain, Merkle Patricia Tree, Gas Limit, Transaction Fees, Anonymity, Reward, Chain policy, Applications of Block chain, Fork and its Types, Generic elements of Block chain, Cryptography in Block chain, Nash Equilibrium, Prisoner's Dilemma, ZeroSum Games.

Unit-3

Introduction to Cybercrime and Laws: Definition and Origins of Cybercrime, information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cyber-cafe and Cybercrimes, Bot-

nets, Attack Vector, The Indian IT ACT 2000 and amendments

Unit- 4

Tools and Methods used in Cybercrime : Introduction, Proxy Server and Anonymizers, Password Cracking, Key-loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow. Phishing and Identity Theft: Introduction, Phishing - Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.

Unit -5

Network Defense tools: Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs. Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.

TEXT BOOK

1 Dejey Nurugan: Cyber forensics, Oxford University Press

2 Jennifer L. Bayuk: Cyber Security, Policy Guide Book, Wiley Publisher

3 Nina Godbole: Cyber Security, Wiley Publisher, Latest Edition

4 Hands-On Cyber security with Block chain by Rajneesh Gupta, Packt Publication, June 2018, ISBN9781788990189.

MTCSEPE203E Program Elective-III Malware Analysis and Network Security Credits 04

Unit I

Goals of Malware Analysis, AV Scanning, Hashing, Finding Strings, Packing and Obfuscation, PE file format, Static, Linked Libraries and Functions, Static Analysis tools, Virtual Machines and their usage in malware analysis, Sandboxing, Basic dynamic analysis, Malware execution, Process Monitoring, Viewing processes, Registry snapshots, Creating fake networks,

Unit II

X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, Disassembly, Global and local variables, arithmetic operations, Loops, Function Call Conventions, C Main Method and Offsets. Portable Executable File Format, The PE File Headers and Sections, IDA Pro, Function analysis, Graphing, The Structure of a Virtual Machine, Analyzing Windows programs, Anti-static analysis techniques, obfuscation, packing, metamorphism, polymorphism

Unit III

Live malware analysis, dead malware analysis, analyzing traces of malware, system calls, api calls, registries, network activities. Anti-dynamic analysis techniques, VM detection techniques, Evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching

Unit IV

Downloaders and Launchers, Backdoors, Credential Stealers, Persistence Mechanisms, Handles, Mutexes, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection, YARA rule based detection Unit V Android Malware Analysis: Android architecture, App

development cycle, APK Tool, APK Inspector, Dex2Jar, JD-GUI, Static and Dynamic Analysis, Case studies,

Unit V

Android Malware Analysis: Android architecture, App development cycle, APKTool, APKInspector, Dex2Jar, JD-GUI, Static and Dynamic Analysis, Case studies,

Books recommended:

1. "Practical Malware Analysis" by Michael Sikorski and Andrew Honig
2. "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition by Reverend Bill Blunden
3. "Rootkits: Subverting the Windows Kernel" by Jamie Butler and Greg Hoglund
4. "Practical Reverse Engineering" by Dang, Gazet, Bachaalany
5. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015

MTCSEOE204A	New Labour Codes of India	Credits 03
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Course Objectives:

1. Gain a clear understanding of the key Labour Codes, namely the Code on Wages, Code on Social Security, Code on Occupational Safety, Health, and Working Conditions, and the Industrial Relations Code.
2. Explore the legal structure and scope of each Labour Code, understanding their applicability to different categories of workers and industries.
3. Examine the provisions related to wages, including wage definitions, payment structures, deductions, and methods for calculating wages
4. Analyse the components of social security as outlined in the Code on Social Security, including provident funds, health insurance, maternity benefits, and pensions.
5. Explore the mechanisms for resolving disputes and conflicts between employers and employees, including the role of labour courts, tribunals, and the appellate process.

Course Outcomes:

1. Understand the historical context and reasons behind the overhaul of labour laws in India.
2. Analyze the economic, social, and administrative motivations driving the implementation of the new labour codes.
3. Evaluate the impact of the new Industrial Relations Code on trade unions, collective bargaining, and dispute resolution mechanisms.
4. Analyze the potential effects of these provisions on both workers and employers.
5. Speculate on the possible evolution of labour practices and employer-employee relations in response to these codes.

UNIT I

History of Labour Laws

Introduction, Government Policies, History of Labour Laws in the Country, History: Previous Social Legislations in India, National Labour Commission Reports

UNIT II

Trade Unions

Evolution of Trade Unions in India, Constitutional Freedom to Form Association and Unions, International Labour Organization on Trade Unions, Trade Union – Definition, Registration, Cancellation, Management of Funds, Trade Union – Recognition, Immunities.

UNIT III

Strikes & Layoffs

Industrial Dispute – Introduction, Definitions, Resolution of Industrial Disputes, Concept of Workmen, Contract of service, Contract for service, Strike, Lock-out, Retrenchment, Closure of Undertakings, Industrial Employment (Standing Orders), Disciplinary Action and Procedures.

UNIT IV

Payment of Wages

The Code on Wages 2019 – An Introduction, Minimum Wages, Floor Wages, Central and State Advisory Board, Payment of Wages, Deductions & Recovery, Fines, Equal Remuneration, Bonus, Minimum Wage Fixing Convention, 1970, Protection of Wages Convention, 1949, Equal Remuneration Convention, 1951: International Instruments on Equality of Pay, Protection of Workers' Claims (Employer's Insolvency) Convention, 1992, Discrimination (Employment and Occupation) Convention, 1992

UNIT V

Social security & Insurance

Employees State Insurance, Different Benefits under the ESI Scheme, Employee's Provident Fund, Gratuity, Maternity Benefit, Social Security in case of Building and other Construction Workers, Social Security for Unorganized sector and Platform workers, Bonded Labour System Abolition and Regulation, Child Labour Prohibition, Plantation Labour.

UNIT VI

Factories & various types of workers

The Meaning of Factory, Manufacturing Process, Approval and Licensing of Factories, Role of Inspector-cum-facilitator and Other Authorities, Social Security Fund, Offences and Penalties, Contract Labour and Proposed ILO Convention, Inter-State Migrant Workers, Mines Workers, Beedi and Cigar Workers (Kerala & West Bengal Legislations), Audio- Visual workers, Cine-workers and Dock workers, The Effective Abolition of Child Labour (ILO: C029, C105, C138 & C182), The Governance Convention of ILO Labour Standards.

Textbooks / References:

1. Labour Law (Taxman)
2. E-book of the Ministry of Labour and Employment - <https://labour.gov.in/e-book-1>
3. Reading material prepared by the Course Co-ordinator.
4. Avtar Singh and Harpreet Kaur, Introduction to Labour and Industrial Laws, 2nd ed., Lexis Nexis Butterworths Wadhwa.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
New Labour Codes of India	Prof. KD Raju	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc23_lw05/preview

**MTCSEOE20B Urban Utilities Planning: Water Supply, Sanitation and Drainage
Credits 03**

Course Objectives:

1. To develop a clear understanding of the significance of water supply, sanitation, and drainage systems in urban areas.
2. To explore different sources of water supply for urban areas, including surface water, groundwater, and treated wastewater.
3. To delve into various sanitation systems, such as sewerage networks, on-site sanitation solutions, and wastewater treatment plants.
4. To learn about hydraulic calculations, pipe sizing, pump station design, and related technical aspects.

Course Outcomes:

1. Students should be able to demonstrate a clear understanding of the fundamental concepts related to water supply, sanitation, and drainage systems in urban settings.
2. Students should be capable of applying design principles to develop efficient and sustainable water supply, sanitation, and drainage systems that meet the needs of urban populations while considering factors such as population growth, climate change, and land use.
3. Students should be able to outline strategies for the effective management, operation, and maintenance of water supply, sanitation, and drainage infrastructure to ensure long-term sustainability and functionality.

UNIT I

Urban Utilities

Urban utilities planning: Introduction, Urban Water Supply, Collection of water.

UNIT II

Water Storage & Distribution

Pumping and storage, Water supply Distribution system and Plans, Water Quality, testing, treatment, and cost.

UNIT III

Sanitation

Sanitation and Drainage Fundamentals, Water carriage system, Sewer design,

UNIT IV

Sewage treatment

Sewer appurtenances and master plans, Sewage treatment, drainage, and recharge

Textbooks / References:

1. Water Supply Engineering, S. K. Garg (18th ed.), Khanna Publishers.
2. Water Supply and Sanitary Engineering, G. S. Birdie & J. S. Birdie (8th ed.), Dhanpat Rai Publishing Company, New Delhi.
3. Stormwater drainage manual Planning, Design and Management, Drainage services department, Government of the Hong Kong Special Administrative Region.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link

Urban Utilities Planning: Water Supply, Sanitation and Drainage	Prof. Debapratim Pandit	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc23_ar08/preview
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Course Objectives:

1. To help students comprehend the complex interconnections between environmental factors and development processes, highlighting how they can either support or impede each other.
2. To identify and analyze key environmental challenges arising from development activities, such as pollution, resource depletion, deforestation, loss of biodiversity and climate change.
3. To study the effect of climate change on environment.
4. To analyze real-world case studies of both successful and unsuccessful attempts to integrate environmental considerations into development projects and policies

Course Outcomes:

1. Demonstrate a deep understanding of the complex interrelationships between environmental factors and socioeconomic development, including how they influence and shape each other.
2. Identify and critically analyze key environmental challenges resulting from development activities, and evaluate their impacts on ecosystems, natural resources, and human well-being.

UNIT I

Environmental movement

Introduction: Development, economic growth and sustainable development, Basic ecosystem ecology, Environmentalism, Environmental Movement, Environmentalism in the global south,

UNIT II

Social ecology

Approaches to environment: Ecofeminism, Feminist political ecology, Marxism and ecology, Debates on environmental ethics: Deep ecology, Gandhi and ecology, social ecology.

UNIT III

Impact of Religion on environment

Religion, environment, and conservation: Religion, environment and historical roots of ecological crisis, Biodiversity conservation ethics in Buddhism and Hinduism, Christian religion in the age of ecological crisis

UNIT IV

Natural Resources & development

Natural resource management, Common property vs. private property, Livelihoods, forests, and conservation, Displacement, dispossession, and development: Conservation-induced displacement, Environment impact assessment and national rehabilitation & resettlement policy, Dispossession, and land acquisition.

UNIT V

Gender & Development, Climate change

Development theory and gendered approach to development, Gender, environment & sustainable development.

Environment and climate change: Climate change interventions and policy framework, Eastern Himalayas, and climate change.

UNIT VI

Belief and local knowledge of environment

Belief and knowledge systems, biodiversity conservation and sustainability: Ecological knowledge, biodiversity conservation and sustainability, Traditional religion and conservation of nature in Northeast India: Case study

Local knowledge in the environment-development discourse: Indigenous knowledge, environment and development, Relevance of indigenous knowledge: case study

Textbooks / References:

1. Arnold, David, and Guha, Ramchandra, (eds.), 1997. Nature, Culture and Imperialism, New Delhi: Oxford University Press.
2. Baviskar, Amita. 1997. In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley, OUP, Delhi.
3. Barnhill, David Landis & Roger S. Gottlieb. (eds.) 2001. Deep Ecology and World Religions: New Essays on Sacred Grounds. State Univ. of New York Press, Albany.
4. Bicker, Alan, Paul Sillitoe and Johan Pottier. 2004. Development and Local Knowledge: New Approaches to Issues in Natural Resources Management, Conservation and Agriculture. Routledge, London & New York.
5. Esteva, G. 1997. 'Development' in W. Sachs, ed., The Development Dictionary, Orient Longman, pp. 8-34.
6. Gadgil, Madhav and Guha, Ramchandra. 1995. Ecology and Equity: The use and Abuse of Nature in Contemporary India, New Delhi: Oxford University.
7. Gottlieb, Roger S. 2004. This Sacred Earth: Religion, Nature, Environment. Routledge, New York, and London.
8. Merchant, Carolyn. 1994. Ecology: Key Concepts in Critical Theory, Humanities Press, New Jersey.
9. Ramakrishnan, P.S. 1992. Shifting Agriculture and Sustainable Development: An Interdisciplinary Study from North-Eastern India, Man and the Biosphere Series, Volume 10, UNESCO.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Environment and Development	Prof. Ngamjahao Kipgen	IIT Guwahati	https://onlinecourses.nptel.ac.in/noc21_hs83/preview

MTCSEOE204D

Entrepreneurship

Credits 03

Course Objectives:

1. To understand the role of entrepreneurs in driving innovation and economic growth.
2. Guide students through the process of developing a comprehensive business plan, including market research, financial projections, competitive analysis, and risk assessment.
3. Provide students with essential financial literacy skills, including budgeting, financial forecasting, and understanding different funding options such as bootstrapping, loans, venture capital, and angel investment.

4. Guide students through the process of developing, prototyping, and refining their products or services to meet customer needs and expectations.

Course Outcomes:

1. Students will be able to generate innovative business ideas by identifying market gaps, customer needs, and emerging trends.
2. Students will be capable of developing comprehensive business plans that encompass market research, financial projections, and strategic goals.
3. Students will gain skills in budgeting, financial forecasting, and managing financial resources for their entrepreneurial ventures.
4. Students will be able to identify and manage potential risks associated with entrepreneurship, including financial, operational, and market risks.

UNIT I

Entrepreneurial Journey, Entrepreneurial Discovery, Ideation and Prototyping,

UNIT II

Testing, Validation and Commercialisation, Disruption as a Success Driver

UNIT III

Technological Innovation and Entrepreneurship – 1, Technological Innovation and Entrepreneurship – 2, Raising Financial Resources.

UNIT IV

Education and Entrepreneurship, Beyond Founders and Founder-Families, India as a Start-up Nation

UNIT V

National Entrepreneurial Culture, Entrepreneurial Thermodynamics,

UNIT VI

Entrepreneurship and Employment, Start-up Case Studies

Textbooks / References:

1. Zero to One: Notes on Startups, or How the Build the Future by Peter Thiel.
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries.
3. India as Global Start-up Hub: Mission with Passion by C B Rao.
4. Elon Musk: Tesla, SpaceX, and the Quest for a Fantastic Future by Ashlee Vance.
5. Steve Jobs by Walter Isaacson.
6. Innovation and Entrepreneurship: Practice and Principles by Peter F Drucker.
7. The Innovator's Solution: Creating and Sustaining Successful Growth by Clayton M Christensen.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Entrepreneurship	Prof. C Bhaktavatsala Rao	IIT Madras	https://onlinecourses.nptel.ac.in/noc20_mg35/preview

Course Objectives:

1. To develop a research orientation among the scholars and to acquaint them with fundamentals of research methods.
2. To develop understanding of the basic framework of research process.
3. To identify various sources of information for literature review and data collection.
4. To understand the components of scholarly writing and evaluate its quality.

Course Outcomes:

1. Learner will learn the meaning, objective, motivation, and type of research
2. Learner will be able to formulate their research work with the help of literature review
3. Learner will be able to develop an understanding of various research design and techniques
4. Learner will have overview knowledge of modelling and simulation of research work
5. Learner will be able to collect the statistical data with different methods related to research work
6. Learner will be able to write their own research work with ethics and non-plagiarized way.

UNIT I

Philosophy of Science (subjective versus objective, materialism versus idealism, causality, etc.) Logical Reasoning (inductive logic, deductive logic, syllogistic logic)

UNIT II

History of development of science and the influence of philosophy, What Scientists Actually Do

UNIT III

Forming a Hypothesis, Techniques of Scientific Measurement

UNIT IV

Testing of hypothesis, Methods of Theoretical Research

UNIT V

The Art of Scientific Communication, Presentation in Seminars and Conferences, Sponsored Research, Ethical Conduct in Science

Textbooks / References:

1. Soumitro Banerjee, Research Methodology for Natural Sciences, IISc Press, 2022.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Research Methodology	Prof. Soumitro Banerjee	IISER Kolkata	https://onlinecourses.nptel.ac.in/noc22_ge08/preview

MTSCMP206

Mini-Project

Credits 02

The mini project shall be based on the recent trends in the industry, research and open problems from the industry and society. This may include mathematical analysis, modelling, simulation, and hardware implementation of the problem identified. The mini project shall be of the student's choice and approved by the guide. The student has to submit the report of the work carried out in the prescribed format signed by the guide and head of the department/institute.

MTCSAE207A

Indian Knowledge System (IKS): Concepts and Applications in Engineering

Credits 03

Course Objectives:

1. Introduce students to the foundational concepts, philosophies, and components of Indian knowledge systems, including ancient scriptures, philosophies, and traditional practices.
2. Introduce students to Vedic mathematical principles and computational techniques from ancient Indian texts, demonstrating their practical use in engineering calculations.
3. Explore the potential benefits of incorporating yogic and meditative practices into engineering to enhance focus, creativity, and overall well-being.
4. Study architectural concepts from Indian traditions and evaluate how they can inform modern urban planning and sustainable architecture.
5. Encourage students to draw inspiration from IKS to develop innovative engineering solutions that align with ancient wisdom while meeting contemporary needs.

Course Outcomes:

1. Gain a comprehensive understanding of the philosophical, scientific, and technological aspects of Indian Knowledge Systems and their historical development.
2. Understand the philosophical underpinnings of IKS, including concepts like dharma, karma, and holistic thinking, and explore their relevance to engineering.
3. Understand Vedic mathematical principles and computational methods, and their potential relevance in solving modern engineering problems.
4. Investigate the connections between yoga, meditation, and stress management, and their potential impact on mental well-being in engineering contexts.
5. Reflect on the ethical, cultural, and social dimensions of integrating IKS concepts into engineering practices and applications.

UNIT I

Indian Knowledge System – An Introduction & Vedic Corpus

What is IKS? Why do we need IKS? Organization of IKS, Historicity of IKS, Some salient aspects of IKS,

Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedāᅅgas, Prologue on Śikᅅᅅā and Vyākaraᅅᅅa, Basics of Nirukta and Chandas, Introduction to Kalpa and Jyotiᅅa, Vedic Life: A Distinctive Features.

UNIT II

Number system & Mathematics

Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhūta-Saṁkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system.

Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry, Trigonometry, Binary mathematics, and combinatorial problems in Chandah Śāstra, Magic squares in India

UNIT III

Engineering Technology: Metal & Other applications

Wootz Steel: The rise and fall of a great Indian technology, The Indian S & T heritage, Mining and ore extraction, Metals and metalworking technology, Iron and steel in India, lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components.

Irrigation systems and practices in South India, literary sources for science and technology, Physical structures in India, irrigation and water management, dyes and painting technology, the art of making perfumes, Surgical techniques, shipbuilding, sixty-four art forms (64 Kalās) status of Indigenous S & T.

UNIT IV

Town Planning and Architecture:

Perspective of Arthaśāstra on town planning, Vāstu-śāstra – The science of architecture eight limbs of Vāstu, town planning, temples in India: Marvelous stone architecture for eternity, temple architecture in India, Iconography.

UNIT V

Knowledge Framework and classifications:

Indian scheme of knowledge, The knowledge triangle, Prameya – A vaiśeṣikan approach to physical reality, Dravyas – the constituents of the physical reality, Attributes – the properties of substances and Action – the driver of conjunction and disjunction, Sāmānya, viśeṣa, samavāya, Pramāṇa – the means of valid knowledge, Saṁśaya – ambiguities in existing knowledge, Framework for establishing valid knowledge, Deductive or inductive logic framework, Potential fallacies in the reasoning process, Siddhānta: established tenets in a field of study.

UNIT VI

Linguistics

Introduction to Linguistics, Aṣṭādhyāyī, Phonetics, word generation, computational aspects, Mnemonics, Recursive operations, Rule based operations, Sentence formation verbs and prefixes, role of Sanskrit in natural language processing.

Textbooks / References:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), —Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Ltd. Delhi.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Indian Knowledge	Prof. B. Mahadevan, Dr. Vinayak Rajat	(IIMB), Chanakya	https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

System (IKS): Concepts and Applications in Engineering	Bhat, Dr. R Venkata Raghavan	University, Bangalore	
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MTCSAE207B

Indian Knowledge System (IKS): Humanities and Social Sciences

Credits 03

Course Objectives:

1. Introduce students to the diverse range of Indian philosophical, cultural, and social knowledge systems that have evolved over millennia.
2. Encourage students to critically compare Indian knowledge systems with other global philosophies and social theories, fostering a nuanced understanding.
3. Study Vedic texts, ancient scriptures, and philosophical treatises to understand the core ideas and insights that inform Indian knowledge systems.
4. Investigate the intersections of spirituality, psychology, and well-being in Indian knowledge systems, exploring practices like meditation, yoga, and mindfulness.
5. Study the role of language, symbols, and communication in Indian knowledge systems, including Sanskrit as a language of knowledge transmission.

Course Outcomes:

1. Recognize the interdisciplinary nature of IKS, integrating traditional knowledge with contemporary concepts in humanities and social sciences.
2. Explore India's rich cultural heritage, including literature, art, music, dance, and rituals, and analyze their significance in shaping identity and social cohesion.
3. Explore Indian philosophical schools and their insights into consciousness, self-awareness, and psychological well-being.
4. Analyze India's cultural diversity, pluralism, and the coexistence of various belief systems, contributing to tolerance and social harmony.

UNIT I

Indian Knowledge System – An Introduction & Vedic Corpus

What is IKS? Why do we need IKS? Organization of IKS, Historicity of IKS, Some salient aspects of IKS,

Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedāṅgas, Prologue on Śikṣā and Vyākaraṇa, Basics of Nirukta and Chandas, Introduction to Kalpa and Jyotiṣa, Vedic Life: A Distinctive Features.

UNIT II

Philosophical Systems

An introduction to philosophical systems, development of philosophy unique features of philosophy, Sāṅkhya approach of philosophy, Introduction to Yoga, tenet of Nyāya philosophy principles of Vaiśeṣika, doctrine of Pūrva-Mīmāṃsā Darśana, thesis of Vedānta and synopsis of Advaita philosophy of Viśiṣṭādvaita.

UNIT III

Wisdom through ages

Gateways of ancestral wisdoms, introduction to Purāṇa, the Purāṇic repository, Issues of interest in Purāṇas, Introduction to Itihāsas, Key messages in Itihāsas, Wisdom through Nīti-śāstras, Wisdom through Subhāṣita.

UNIT IV

Health Wellness and Psychology:

Introduction to health, Āyurveda: approach to health, Sapta-dhātavaḥ: seven-tissues, role of agni in health, tri-doṣas, Āyurveda: definition of health, Psychological aspects of health, disease management elements, Dinacaryā: daily regimen for health & wellness, Importance of sleep, Food intake methods and drugs, Approach to lead a healthy life, Indian approach to psychology, the tri guṇa system & holistic picture of the individual, the Nature of Consciousness, consciousness studies and issues

UNIT V

Linguistics:

Introduction to Linguistics, Aṣṭādhyāyī, phonetics, word generation, computational aspects, mnemonics, recursive operations, rule-based operations, sentence formation, verbs and prefixes, role of Sanskrit in natural language processing.

UNIT VI

Governance and Public Administration:

Introduction to raja dharma, Arthaśāstra: a historical perspective, Elements of a kauṭilyan state, The king & the amātya, Janapada & durga, treasury and the state economy (Kośa), danda, Mitra, the administrative setup, relevance of Arthaśāstra, public administration in Epics.

Textbooks / References:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), —Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Ltd. Delhi.
2. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
3. Sampad and Vijay (2011). —The Wonder that is Sanskrit, Sri Aurobindo Society, Puducherry.
4. Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
5. Kapoor Kapil, Singh Avadhesh (2021). —Indian Knowledge Systems Vol – I & III, Indian Institute of Advanced Study, Shimla, H.P.
6. Dasgupta, S. (1975). A History of Indian Philosophy- Volume 1, Motilal Banarsidass, New Delhi.
7. PLofer, K. (1963). Mathematics in India, Princeton University Press, New Jersey, USA"

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Indian Knowledge System(IKS): Humanities and	Prof. B. Mahadevan, Dr. Vinayak Rajat Bhat, Dr. R Venkata Raghavan	Indian Institute of Management Bangalore	https://onlinecourses.swayam2.ac.in/imb23_mg55/preview

Social Sciences		(IIMB), Chanakya University, Bangalore	
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MTCSEAU208	Disaster Management	Audit
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Course Objectives:

1. Mastering strategies to manage disasters and ensure public safety during emergencies.
2. Identifying hazards, vulnerabilities, and crafting plans to reduce disaster impact.
3. Collaborative Skills: Working across disciplines to address complex disaster challenges.
4. Developing, improving, and implementing disaster management policies. Community Empowerment: Educating and engaging communities for proactive disaster readiness.

Course Outcomes:

1. Learners will be able to understand the basic concept of disaster(s) and disaster management, their significance, and types.
2. Learners will develop the analytical skills to study relationship between vulnerability, disasters, disaster prevention and risk reduction
3. Learners will gain a preliminary understanding of approaches to Disaster Risk Reduction (DRR)
4. Learners will be empowered with the awareness of institutional processes in the country for Disaster Management

UNIT I

Disaster Management: Disaster and Disaster Management – Concepts, Issues Concerned with Disaster Management.

Disaster Management: Phases of Disaster Management, Phases of Disaster Management

Types of Disasters: Bhopal Disaster: A Case Study, Types of Disasters-An Introduction, Natural Disaster, Man-made Disaster

UNIT II

Types of Disasters: Slow onset Disasters & Rapid onset Disasters, Simple and Complex, Tsunami: A Case Study Disasters, Tsunami: A Case Study, Cyclone Phallin 2013: A Case Study

UNIT III

Disaster Management in India -An Over View: Evolution of Disaster Management in India, Disaster and Disaster Management in India, National institute of Disaster Management, National Disaster Management Act 2005.

UNIT IV

Disaster Management in India -An Over View: The National Policy on Disaster Management, 2009.

Refugee Problem: National Plan on Disaster Management 2016, Refugee Problems, Impact of Disaster on the lives of Refugees.

Refugee Problem: Problems of Women and Children during disasters, Principles Of Psychosocial Care, Issues And Recovery During Emergency.

Refugee Problem: Relationship between Disasters, Development and Vulnerabilities, Relationship between Disasters, Development and Vulnerabilities.

UNIT V

Refugee Problem: Equity Issues in Disaster.

Refugee Problem: Issues of Rehabilitation and Resettlement among the Disaster Survivors, Stakeholders in Disaster Relief Management - An Introduction.

Stakeholders in Disaster Relief Management: Central Government.

Stakeholders in Disaster Relief Management: State Government, District Administration. Armed Forces.

UNIT VI

Stakeholders in Disaster Relief Management: Para-Military Forces, Fire Services.

Disaster Risk Reduction: Disaster Risk Reduction Strategies, Risk Reduction Preparedness Plans.

Disaster Risk Reduction: Action Plans and Procedures, Early Warning Systems, Components of Disaster Relief, Factors contributing to Vulnerability.

Disaster Risk Reduction: Disaster Risk Reduction - Master Planning for the Future, Capacity Building Rehabilitation measures and long-term reconstruction, Understanding Kerala Disaster 2018.

Textbooks / References:

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
3. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
4. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
5. Encyclopaedia of disaster management, Vol I, II and III. Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006
6. Encyclopaedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2, Angus M. Gunn, Greenwood Press, 2008
7. Disasters in India Studies of grim reality, Anu Kapur & others, 2005, 283 pages, Rawat Publishers, Jaipur.
8. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006, 201 pages
9. Natural Disasters, David Alexander, Kluwer Academic London, 1999, 632 pages
10. Disaster Management Act 2005, Publisher by Govt. of India
11. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
12. NIDM Publications
13. High Power Committee Report, 2001, J.C. Pant
14. Disaster Mitigation in Asia & Pacific, Asian Development Bank
15. National Disaster Management Policy, 2009, GoI
16. Disaster Preparedness Kit, American Red Cross

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Disaster Management	Naveen Kumar Nanjundan	University Of Hyderabad	https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

SEMESTER III

MTCSEO301A

Student Psychology

Credits 03

Course Objectives:

1. Gain an understanding of prominent learning theories and models, enabling you to grasp the foundational concepts that influence effective teaching and learning.
2. Acquire skills to assess and appreciate diverse student characteristics, including learning styles, cultural backgrounds, and individual differences that impact learning.
3. Gain proficiency in understanding, administering, and interpreting psychological tests and inventories to assess cognitive abilities, personality traits, and emotional development in learners.
4. Examine psychological theories of motivation and cultivate the skills needed to apply motivational strategies that enhance student engagement, commitment, and achievement.
5. Investigate the stages of physical, cognitive, emotional, and social development in individuals, equipping you to design instructional methods that support comprehensive growth.
6. Acquire an understanding of NLP concepts and techniques that can be used to improve communication, establish rapport, and optimize teaching and learning experiences.

Course Outcomes:

1. Understanding of Psychological Factors: Gain a comprehensive understanding of the psychological factors that influence students' learning, behaviour, and overall well-being in educational settings.
2. Recognition of Diverse Student Needs: Develop the ability to recognize and appreciate the diverse cognitive, emotional, and social needs of students, enabling tailored support and fostering inclusive learning environments.
3. Application of Psychological Strategies: Apply psychological theories and principles to address various challenges in student development, including motivation, learning difficulties, and behavioural issues.
4. Competence in Student Assessment: Acquire skills in utilizing psychological assessment tools to evaluate students' cognitive abilities, emotional states, and learning styles, informing instructional strategies and support plans.
5. Promotion of Positive Learning Experiences: Learn to create positive and conducive learning experiences by integrating insights from student psychology, fostering engagement, motivation, and holistic growth among learners.

UNIT I

Teaching Learning Process

UNIT II

Student Characteristics, Types and Problems

UNIT III

Psychological Tests and Inventories, Student Motivation

UNIT IV

Physical and Cognitive Development

UNIT V

Emotional and Social Development

UNIT VI

Neuro-Linguistic Programming, Counselling Skills, and Summary

Textbooks / References:

1. Sharma, R.A. (2007). Training Technology. Meerut: Surya Publications.
2. Sharma, R.A. (2007). Psychology of Teaching-Learning Process. Meerut: Surya Publications.
3. B.Mukhopadhyay(1997). Motivation in Educational Management. New Delhi: Sterling Publishers.
4. Barki & Mukhopadhyay. (1995). Guidance and Counselling. New Delhi: Sterling Publishers.
5. Agochya, D. (2010). Life competencies for adolescents. New Delhi: Sage Publications.
6. Davies, I.K. (1971). Management of Learning. Berkshire: McGraw Hill.
7. Dusay. (1980). Egograms. New York: harper & Row.
8. Goleman, D. (1996). Emotional Intelligence. New York: Bantom Books.
9. Anastasi. (2016). Psychological Testing. New Delhi: Pearson Education. Psychological Tests.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Student Psychology	Dr. S. Renukadevi	NITTTR, Chennai	https://onlinecourses.swayam2.ac.in/ntr19_ed23/preview

MTCSEO301B

Business To Business Marketing (B2B)

Credits 03

Course Objectives:

1. Develop a comprehensive understanding of the unique characteristics, dynamics, and complexities that define business-to-business (B2B) marketing, including the role of intermediaries, supply chains, and collaborative relationships.
2. Learn how to segment B2B markets based on factors such as industry, company size, and purchasing behaviour. Understand the significance of effective market segmentation in tailoring marketing strategies to specific B2B customer segments.
3. Explore the elements of the B2B marketing mix, including product/service offerings, pricing strategies, distribution channels, and promotional approaches. Develop the ability to design marketing strategies that align with the unique needs and preferences of B2B customers.
4. Gain insights into relationship-building strategies in B2B contexts. Learn how to nurture long-term, mutually beneficial partnerships with B2B clients through effective communication, trust-building, and value delivery.
5. Acquire skills in B2B sales processes, negotiations, and contract management. Understand the intricacies of negotiation dynamics, procurement processes, and key decision-making factors in B2B transactions.

Course Outcomes:

1. Foundational Knowledge: Gain a strong grasp of the core concepts and theories that form the basis of B2B marketing, enabling practical application.
2. Market Analysis Expertise: Develop skills to analyse B2B markets, segment customers effectively, and make informed marketing decisions.
3. Strategic Implementation: Acquire the ability to design and execute B2B marketing strategies tailored to the unique needs of business customers.
4. Relationship Management: Learn how to build and nurture enduring relationships with B2B clients through effective communication and collaboration.
5. Sales and Negotiation Proficiency: Master the art of B2B sales, negotiation strategies, and contract management for successful transactions.

UNIT I

Introduction to B2B Marketing: Business marketing, Classifying goods for the business market, Business market customers, Market structure, Environment and Characteristics of Business Marketing, Strategic role of marketing, Commercial enterprises, Commercial and institutional customers, B2B vs B2C Marketing.

Organizational Buying and Buyer Behaviour: Organizational buyers' decision process - A Stepwise Model and A Process Flow Model, Organizational and business markets - Government as a customer - Commercial enterprises - Commercial and institutional customers, Value analysis, Buygrid framework, Strategic procurement.

UNIT II

B2B Marketing Strategy: Strategy making and strategy management process, Industrial product strategy– Managing Products for Business Markets-Managing Services for Business Markets-Managing Business Market Channels the Growth-Share Matrix, Multifactor Portfolio Matrix, The Balanced Scorecard.

B2B Marketing STP: Market Segmentation, bases for segmenting business markets, basic framework of segmentation, choosing target segments and positioning.

UNIT III

Business Marketing Communications- B2B Advertising, Digital marketing, - Trade shows, exhibitions, business meets - Managing the sales force - Deployment analysis, Direct marketing Demand forecasting: industrial market, Forecasting- meaning, importance and relevance, issues related to forecasting, forecasting measurement models, sales force forecasting, estimating segment demand, Collaborative approach to estimate demand, qualitative and quantitative forecasting methods.

UNIT IV

Product management: (existing and new) in industrial market, role of product in the industrial market, new product development, industrial product life cycle, product evaluation matrix, techniques for identifying new products QFD, perceptual mapping, reverse engineering, fish bone diagram, role of service and maintenance in industrial markets, customer experience life cycle, service quality.

Pricing: Pricing strategies; The pricing policy; Price on the Internet; Financial marketing, competitive bidding, commercial terms and conditions, role of leasing.

UNIT V

Buyer seller relationship, types of relationships, transactional and collaborative relationships, influencing industrial customers, role of service in industrial markets. CRM.

B2B marketing research, challenges in B2B research, developing a marketing information system, role of qualitative research techniques in B2B research.

UNIT VI

Business marketing channels and participants - Channel design and management decisions - B2B logistics management, types of industrial middlemen and intermediaries, marketing logistics and physical distribution.

Strategic decision making in industrial markets, strategic planning at corporate levels, allocation of resources, portfolio analysis, developing SBU'S objectives and goals, implementing and controlling marketing plan. Marketing through electronic commerce.

Textbooks / References:

1. Business Market Management Understanding, Creating and Delivering Value by James C. Anderson, Das Narayandas, James A. Narus and D.V.R. Seshadri Pearson, 2010 3rd edition
2. Business Marketing Management b2b By Hutt and Speh South-Western CENGAGE Learning www.cengagebrain.com 2013
3. B2B Brand Management by Kotler and Pfoertsch Springer www.springer.com 2006
4. Business Marketing: Text and Cases by Krishna K Havaldar, McGrawhill Publications, 2014 4th edition.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Business To Business Marketing (B2B)	Prof. J. K. Nayak	IIT Roorkee	Business To Business Marketing (B2B) – Course (nptel.ac.in)

MTCSEOE301C

Organizational Behaviour

Credits 03

Course Objectives:

1. Explore how personality, motivation, perception, attitudes, and emotions impact employee performance and job satisfaction.
2. Study group formation, communication, decision-making, conflict resolution, and leadership's role in fostering teamwork.
3. Learn about the role of organizational culture in shaping behaviour, and develop skills to manage and align culture with goals.
4. Gain insights into leadership styles, communication, and team management for enhancing performance and satisfaction.
5. Navigate change, promote inclusivity, and address diversity-related challenges to cultivate adaptability and resilience in the workplace.

Course Outcomes:

1. Develop a grasp of how individual factors influence workplace behaviour, impacting job satisfaction and performance.

2. Acquire skills to foster productive group dynamics, facilitating better communication, decision-making, and conflict resolution.
3. Understand the role of organizational culture, and learn to manage and cultivate cultures aligned with organizational goals.
4. Gain insights into diverse leadership styles, enhancing the ability to manage teams and guide them towards success.
5. Develop the capacity to navigate change, promote diversity, and create an inclusive work environment, fostering resilience.

UNIT I

Introduction – a) defining organization, behavior and organizational behavior, b) assumptions of OB, c) principles of OB, d) levels of OB, e) scope of OB, f) OB and Human Resource Management, g) Applications of OB, h) Historical developments of OB, i) emerging concerns
Perception and Learning – a) understanding perception, b) Basic elements of perception, c) Principles of perceptual selection, d) Perceptual grouping, e) Social Perception, f) Self-perception and identity, g) attribution of causality, h) Perceptual biases in social perception, i) Implications for human resource management, j) defining learning, k) classical and operant conditioning l) learning in organizations.

UNIT II

Personality – a) Defining Personality, b) History of the concept, c) Key assumptions, d) biological and social determinants, e) Theories – Intrapsychic theory, social learning theory, self-theory, Trait, and type theories f) Related concepts (locus of control, dogmatism, authoritarianism, Machiavellianism), g) measuring personality.

Attitudes – a) Definition, b) Key elements of attitudes, c) Attitudes and related concepts (Values, opinion, belief, and ideology), e) Characteristics of attitudes, f) Attitude formation, g) Attitude measurement, h) Changing attitudes, i) Attitudes at workplace (job satisfaction, work attitude and organizational commitment), j) Prejudice and discrimination at workspace.

UNIT III

Emotions in workplace - a) Definition, b) Types of emotions, c) Related concepts (mood, temperament), d) Stress in workplace, e) General Adaptation Syndrome, f) Managing Stress, g) Psychosomatic disorders and stress h) emotional labor and emotional contagion.

Motivation – a) Definition, b) Process of motivation, c) Types of motives, d) Motivators at workplace, e) Motivation theories (Process and Content theories).

UNIT IV

Interpersonal Dynamics – a) Definition, b) Psychological Contract, c) Trust and trust building, d) Prosocial behaviour, e) Cooperation Vs Competition f) Conflict management, g) Levels and types of conflict at workplace, h) Conflict management Styles, i) Managing Negotiations

Power and Leadership - a) Defining Power, b) Sources of Power, c) Organizational politics, d) Leadership e) Managers Vs Leaders, f) Trait and Type approach to leadership g) Leadership style, h) Leadership Grid, i) Contingency Theories j) Contemporary issues

UNIT V

Team Dynamics – a) Groups and Teams, b) Types of Teams, c) Stages in group development, d) problems in team work (Free riding, social loafing, group think), e) Cross-cultural virtual teams.

Organizational culture – a) Defining culture, b) levels of culture, c) cultural dimensions, d) high and low context cultures, e) Strong and weak organizational cultures, f) Expressions of organizational culture, g) Impact of culture on individuals, h) Organizational cultural change

UNIT VI

Organization Change – a) Change in Organizations, b) Nature of the change process, c) Types of change, d) Impact of change, e) Managing resistance to change, f) Organizational Development interventions

Organizational Structure and Design – a) Basic dimensions of structure, b) Departmentalization, c) Organizational life cycle, d) Organizations as socio-technical systems, e) Organizational design and its impact on employees, f) Organizational boundary spanning.

Textbooks / References:

1. Behaviour in Organizations by Jerald Greenberg and Robert A. Baron, PHI learning private Ltd, New Delhi (Ninth Edition).
2. Understanding Organizational Behaviour by Udai Pareek, Oxford University Press (Third Edition).
3. ORGB by Nelson, Quick and Khandelwal, Cengage Learning New Delhi (second edition).

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Organizational Behaviour	Prof. M. P. Ganesh	IIT Hyderabad	Organizational Behaviour – Course (nptel.ac.in)

MTCSEO301D	Principles of Economics	Credits 03
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Course Objectives:

1. Introduce essential economic terms and concepts for analysing real-world situations.
2. Understand market dynamics, supply and demand, and resource allocation.
3. Study national indicators, inflation, unemployment, and government policies' effects.
4. Learn to make informed choices using opportunity cost, utility, and cost analysis.
5. Explore global interdependencies, trade, exchange rates, and policy impacts.

Course Outcomes:

1. Grasp key economic principles, like supply and demand, opportunity cost, and marginal analysis, forming a foundation for economic understanding.
2. Gain insights into market structures, pricing mechanisms, and factors influencing consumer and producer behaviour.
3. Understand the role of government interventions, regulations, and fiscal/monetary policies in shaping economic outcomes.
4. Learn how societies allocate scarce resources efficiently, exploring topics like production, distribution, and factors of production.
5. Develop analytical thinking by applying economic principles to real-world scenarios, making informed personal and business decisions.

UNIT I

Principles of Economics, Thinking like an Economist; Interdependence and the gains from Trade.

UNIT II

Market forces of supply and Elasticity, Application of elasticity; supply, demand, and government policies

UNIT III

Consumer and producer surplus; cost of taxation and international trade, Externalities, and cost of production

UNIT IV

Competitive market and monopoly market, Game theory and oligopoly, measures national income, measuring cost of living

UNIT V

Production and growth; Saving, Investment and the financial system, the monetary system, Money growth and inflation

Textbooks / References:

1. N.Gregory Mankiw, Principles of Economics.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Principles Of Economics	Prof. Sabuj Kumar Mandal	IIT Madras	Principles Of Economics – Course (nptel.ac.in)

MTCSEOE301E Intellectual Property & Rights Credits 03

Course Objectives:

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

Course Outcomes:

1. The students once they complete their academic projects, they get awareness of acquiring the patent.
2. They also learn to have copyright for their innovative works.
3. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

UNIT I

Introduction to IPR: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Introduction to TRIPS and WTO, Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade; Secret and trade dress, Design, Layout Design, Geographical Indication, Plant. Varieties and Traditional Knowledge.

UNIT II

Patent Rights and Copy Rights— Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.

UNIT III

Copy Right—Origin, Definition &Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.

UNIT IV

Trade Marks: Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties. Domain Names on cyber space.

UNIT V

Design- Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.

UNIT VI

Basic Tenents Of Information Technology Act-2000, IT Act - Introduction, E-Commerce and legal provisions, E- Governance and legal provisions, Digital signature and Electronic Signature. Cybercrimes.

Textbooks / References:

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra
3. IPR by P. Narayanan
4. Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Intellectual Property & Rights	Prof. Feroz Ali	IIT Madras	https://onlinecourses.nptel.ac.in/noc23_hs55/preview

Course Objectives:

1. Define public administration and explain its role in society.
2. Identify and analyze the different types of public organizations.
3. Apply public administration theories and principles to real-world problems.
4. Develop the skills and knowledge necessary to pursue a career in public administration.

Course Outcomes:

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

1. Define public administration and explain its role in society.
2. Identify and analyze the different types of public organizations.
3. Apply public administration theories and principles to real-world problems.
4. Develop the skills and knowledge necessary to pursue a career in public administration.

UNIT – I

Public Administration: Meaning Nature, Scope and Significance of Public, Administration. Difference between Public and Private Administration, Administration as an Art or Science, New Public Administration, New Public Management, E-Governance: Concept, Rationale and significance.

UNIT – II

Theories of Organization – Classical, Neo classical and Modern theory, Approaches to the study of Public Administration: Structural – functional, systems, approach, Behavioral approach, Public Choice approach, Bureaucracy: Meaning types and Weberian model of Bureaucracy.

UNIT – III

Organization: formal and informal organizations, Principles of organization – Hierarchy, Span of control, unity of command and Coordination.

UNIT IV

Concepts of Public Administration: Power, Authority, and responsibility, Decision Making: Meaning, Classification and Essentials of decision making, Process of decision making, techniques of decision making, approaches to decision making.

UNIT – V

Good Governance: Concept, characteristics, elements. Issues and Challenges, Leadership: Development of leadership, Qualities of leadership, Accountability and control –Executive, Legislative, Judicial. Citizen and Administration: Issues and problems, Methods to promote good relationship.

References/Textbooks:

1. Felix, A. Nigro and C. Nigro Modern Public Administration (New York: Lloyd Harper and Row, Latest edition)
2. John Pfiffner and Frank Sherwood Administrative Organization (New Delhi: Prentice Hall, Latest ed.).

3. Peter F. Drucker Management: Tasks, Responsibilities, Practices (Bombay: Allied Publishers, latest ed.).
4. H. Koontz and Cyril O'Donnell Principles of Management, (Tokyo: McGraw Hill, latest ed).
5. Amitai Etzioni Modern Organizations (New Delhi: Prentice Hall, latest ed.).
6. Robert T. Golembiewsky Public Administration as a Developing Discipline (New York: Marcel, latest ed.).
7. Mohit Bhattacharya Public Administration (Calcutta: World Press, latest ed).
8. Mamta Mokta, S.S.Chauhan, S.K. Mahajan and Simmi Agnihotri Challenges in Governance(ed) Anamica Publishers,New Delhi 2011
9. C.P. Bhambri Public Administration (Theory and Practice (Meerut: Educational Publishers, latest ed.).
10. Bertram Gross The Managing of Organisations (London: Free Press, latest ed.).
11. W.M. Newman, C. Summer and E.Warren Management Concepts, behaviour & practice, edu. Publishers Meerut.
12. P. Hersey and K.H. Blanchard Management of Organisational Behaviour (New Delhi:latest ed.).
13. Nicholas Henry Public Administration and Public Affairs, (New Jersey: Prentice Hall, latest ed.).
14. Herbert G. Hicks and Ray C. Gutlet Organisations: Theory and Behaviour (New York: McGraw Hill, latest ed.).
15. Ramesh, K. Arora (ed.) Perspective in Administrative Theory (New Delhi: Associated, latest ed.).
16. S.L. Kaushik and Pardeep Sahni (eds.) Public Administration in India: Emerging Trends (Allahabad: Kitab Mehal, latest ed.).
17. J.S. Vickers and George K. Yarrow Privatization: An Economic Analysis (Cambridge: MIT Press, latest ed.).
18. David Osborne and T. Gaebler Re-inventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector (New York: Addison Wesley, latest ed.).

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Introduction to Public Administration	By Prof. Y. Pardhasaradhi	Osmania University Hyderabad.	https://onlinecourses.swayam2.ac.in/cec21_hs06/preview

MTCSEMD302A Design of Mechatronic Systems Credits 03

Course Objectives:

1. Introduce students to the interdisciplinary nature of mechatronics, emphasizing the integration of mechanical engineering, electronics, control systems, and computer science.
2. Familiarize students with a variety of sensors and actuators commonly used in mechatronic systems, and explain their principles of operation and selection criteria.
3. Provide an understanding of control system theory, enabling students to design and implement closed-loop control strategies for mechatronic systems.
4. Introduce software development concepts, including programming languages, real-time operating systems, and software architecture for mechatronic applications.

5. Demonstrate techniques for integrating mechanical components, electronics, and software modules seamlessly, ensuring proper communication and synchronization.

Course Outcomes:

1. Apply knowledge to select appropriate sensors and actuators based on system requirements, considering factors such as accuracy, range, and compatibility.
2. Analyze and process sensor data using signal processing techniques, demonstrating the capability to extract meaningful information from noisy sensor measurements.
3. Proficiently program microcontrollers and embedded systems to interface with sensors, actuators, and other hardware components.
4. Integrate mechanical components and subsystems with electronics and software, ensuring seamless communication and optimal functionality.

UNIT I

Introduction: Elements of mechatronics system: Sensor, actuator, plant, and controller. Applications of mechatronics system. Systems like CDROM, scanner opened to see whats there inside and why? Integrated mechanical-electronics design philosophy. Examples of real-life systems. Smart sensor concept and utility of compliant mechanisms in mechatronics

UNIT II

Microprocessor building blocks, combinational and sequential logic elements, memory, timing, and instruction execution fundamentals with example of primitive microprocessor. Microcontrollers for mechatronics: Philosophy of programming interfaces, setting sampling time, and getting started with TIVA programming. programming different interfaces PWM, QEI etc. Mathematical modeling of mechatronic systems,

UNIT III

Modeling friction, DC motor, Lagrange formulation for system dynamics. Dynamics of 2R manipulator, Simulation using Matlab, Selection of sensors and actuators.

UNIT IV

Concept of feedback and closed loop control, mathematical representations of systems and control design in linear domain. Basics of Lyapunov theory for nonlinear control, notions of stability, Lyapunov theorems and their application

UNIT V

Trajectory tracking control development based on Lyapunov theory, Basics of sampling of a signal, and signal processing.

UNIT VI

Digital systems and filters for practical mechatronic system implementation. Research example/ case studies of development of novel mechatronics system: 3D micro-printer, Hele Shaw system for microfabrication.

Textbooks / References:

1. Devdas Shetty, Richard A. Kolk, —Mechatronics System Design,| PWS Publishing company.

2. Boukas K, Al-Sunni, Fouad M —Mechatronic, Systems Analysis, Design and Implementation,|| Springer,
3. Sabri Cetinkunt, —Mechatronics with Experiments,|| 2nd Edition, Wiley.
4. Janschek, Klaus, —Mechatronic Systems Design,|| Springer.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Design Of Mechatronic Systems	Prof. Prasanna Gandhi	IIT Bombay	Design Of Mechatronic Systems – Course (nptel.ac.in)

MTCSEMD302B Ethical Hacking Credits 03

Course Objectives:

1. Introduce students to the concept of ethical hacking, its importance in cybersecurity, and the role of ethical hackers in identifying vulnerabilities.
2. Provide an overview of cybersecurity principles, threats, and attacks, highlighting the need for ethical hacking to strengthen defences.
3. Teach students a structured approach to hacking, including reconnaissance, scanning, gaining access, maintaining access, and covering tracks.
4. Cover essential network concepts to help students understand how networks function, including protocols, IP addressing, and network architecture.

Course Outcomes:

1. Gain a comprehensive understanding of ethical hacking concepts, methodologies, and its role in enhancing cybersecurity.
2. Acquire a solid grasp of cybersecurity principles, types of threats, and the importance of proactive defence strategies.
3. Develop proficiency in various hacking techniques, including reconnaissance, scanning, exploitation, and post-exploitation activities.
4. Perform effective vulnerability assessments on systems and networks, identifying potential security weaknesses and exposures.
5. Demonstrate the ability to conduct penetration tests, simulating real-world attacks to evaluate the strength of security measures.

UNIT I

Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

IP addressing and routing. TCP and UDP. IP subnets. Routing protocols. IP version 6.

UNIT II

Installation of attacker and victim system. Information gathering using advanced google search, archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool.

UNIT III

Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment. System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

UNIT IV

Introduction to cryptography, private-key encryption, public-key encryption. Cryptographic hash functions, digital signature and certificate, applications. Steganography, biometric authentication, network-based attacks, DNS, and Email security.

UNIT V

Packet sniffing using Wireshark and Burpsuite, password attack using burp suite. Social engineering attacks and Denial of service attacks. Elements of hardware security: side-channel attacks, physical inclinable functions, hardware trojans.

UNIT VI

Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc. Attack on web servers: password attack, SQL injection, cross site scripting.

Textbooks / References:

1. Data and Computer Communications -- W. Stallings.
2. Data Communication and Networking -- B. A. Forouzan
3. TCP/IP Protocol Suite -- B. A. Forouzan
4. UNIX Network Programming -- W. R. Stallings
5. Introduction to Computer Networks and Cybersecurity -- C-H. Wu and J. D. Irwin
Cryptography and Network Security: Principles and Practice -- W. Stalling

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Ethical Hacking	Prof. Indranil Sengupta	IIT Kharagpur	Ethical Hacking – Course (nptel.ac.in)

MTCSEMD302C

Sustainable Power Generation Systems

Credits 03

Course Objectives:

1. The course content is designed to provide comprehensive knowledge of various renewable energy systems. Specifically, in this course, the design and analysis of renewable energy power plants will be discussed.
2. The concepts will be illustrated with practical examples, schematics and block diagrams wherever required. Enough numerical problems with solutions will be discussed in the course.
3. This course is specifically designed for undergraduate and postgraduate students of Energy Engineering and Technology.
4. Further, the course will be very much useful for students and researchers from varied academic backgrounds for the synthesis of novel energy conversion devices and processes.

Course Outcomes:

1. Explain the principles of sustainability in the context of power generation and understand its significance in the global energy transition.
2. Identify and describe various renewable energy sources, including solar, wind, hydro, geothermal, and biomass, and explain their potential for power generation.
3. Compare and contrast the advantages and limitations of different sustainable power generation technologies, considering factors such as efficiency, scalability, reliability, and intermittency.
4. Analyse the environmental, social, and economic impacts of both conventional and sustainable power generation methods, and evaluate their contributions to mitigating climate change and reducing pollution.

UNIT I

Introduction to power generation:

Global and Indian scenario, an overview of current technologies available for power generation, Concept of the renewable energy- based power plant

Solar Thermal Power Generation:

Fundamentals of Solar thermal energy conversion, solar thermal based power plant design and analysis (flat plate and concentrator), ORC, RC, and Stirling engine.

UNIT II

Solar Photovoltaic Power Generation:

Fundamentals of Solar photovoltaic energy conversion, Solar PV power plant design, Performance analysis of standalone and grid connected PV systems.

Wind Power Generation:

Introduction to wind turbine, classification and analysis of different components, Theory, design, and analysis of wind turbines (horizontal axis and vertical axis) and wind farms.

UNIT III

Hydro Power Generation:

Introduction to hydro power plant, overview of micro, mini and small hydro power plants, hydraulic turbines, Selection and design criteria of pumps and turbines, Brief theory, design, and analysis of hydro power plants

Biomass Power Generation:

Fundamentals of bioenergy production technologies through different routes, design, and analysis of biochemical and thermochemical reactors for clean power generation and value-added products, IGCC.

UNIT IV

Hydrogen energy and fuel cells

Importance, various routes of hydrogen generation, basic principle, and design of different types of fuel cells and their applications, prospects, IGFC

Week 8: Module-8: Geothermal Energy

Fundamentals, classification, theory, design, and analysis of geothermal power plant

UNIT V

Ocean Thermal Energy

Fundamentals, classification, theory, design, and analysis of ocean thermal power plant

Week 10: Module-10: Wave and Tidal Energy

Fundamentals, classification, theory, design, and analysis of wave and tidal power plant

3. Design IoT Applications: Create IoT solutions by integrating hardware and software components, demonstrating proficiency in prototyping, programming, and data handling.
4. Analyse Data from IoT Devices: Collect, analyse, and interpret data generated by IoT devices to extract meaningful insights and support informed decision-making.

UNIT I

Basics of IoT

Introduction to Internet of things, Various sensors, and sensing techniques. Technological trends in IoT. impact of IoT on society. Review of various IoT application domain including agriculture, healthcare, manufacturing, device management, and vehicle to vehicle communication and wearable computing devices.

UNIT II

Microcontroller and Interfacing Techniques for IoT Devices

Introduction to IoT and architecture layers, IoT smart devices, Typical embedded computing systems, Introduction to ARM architecture and programming method, Embedded system development: a case study, Introduction to interfacing techniques.

UNIT III

IoT Protocols & Security

Networking and basic networking hardware. Networking protocols, Interaction between software and hardware in an IoT device. IoT components and technologies to secure systems and devices.

Various security issues related to the IoT and security architectures. Hardware security threats and security vulnerabilities; protecting physical hardware

UNIT IV

Location Tracking

Introduction to device localization and tracking; different types of localization techniques: time-of-arrival (TOA) based, time-difference-of-arrival (TDOA) based, angle-of-arrival (AOA) based, received signal strength (RSS) based, Radio-Frequency Identification (RFID) based and fingerprinting based; Monte-Carlo tracking; Kalman filter based tracking; Cramer-Rao lower bound (CRLB) for device location estimator; Device diversity/heterogeneity issue in IoT networks.

UNIT V

Deep learning for IoT

This topic will focus how to build good model from the past data to predict correctly when the system is provided with a data-point. In this course mostly, supervised learning will be considered. Basics of neural network, activation functions, back-propagation, etc. will be covered. At the end some of the challenges in the context of IoT will be mentioned.

UNIT VI

IoT Applications

Smart grid: Introduction to smart grid, Integration of IoT into smart grid, Standardization activities for IoT aided smart grid, Applications of IoT aided smart grid, Architectures for IoT sided smart grid, Prototypes, Applications of big data and cloud computing, Open Issues, and challenges.

IoT-based Smart Home and Nano-grid Monitoring System

Sensor-Controller Coordination of a DC Microgrid in IoT Platform, Cyber physical system, dc microgrid, dc-dc power converter, distributed energy generator, sensor control and controller design. Low-Cost DC Nano-grid with Smart Remote Monitoring Unit, DC-DC converter modelling, closed loop control, placement of IoT devices, sensors, micro grid, solar energy, low-cost communication system design.

Introduction, objective, components of home monitoring system, control, and management, Zigbee, Wireless Sensor Network (WSN), Internet of Things (IoT).

Internet of Robotic Things (IoRT):

Introduction to stationary and mobile robots; Brief introduction to localization, mapping, planning, and control of robotic systems; Introduction to cloud-enabled robotics; Applications of IoT in robotics; Architectures for IoRT; Examples and case studies; Open issues and challenges.

Textbooks / References:

It will be provided in each of the lecture sessions.

(Refer NPTEL platform)

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Components And Applications of Internet of Things	Dr. Sanjoy Kumar Parida	Indian Institute of Technology Patna	https://onlinecourses.swayam2.ac.in/arp20_ap03/preview

MTCSEMD302E**Linear Algebra****Credits 03****Course Objectives:**

1. Understand the fundamental principles of vector spaces and matrices.
2. Develop the ability to solve systems of linear equations using various methods.
3. Learn how to analyse and manipulate linear transformations and their properties.
4. Apply linear algebra concepts to solve real-world problems in fields such as physics, engineering, and computer science.

Course Outcomes:

1. Students will demonstrate proficiency in performing matrix operations and solving linear equations in diverse mathematical contexts.
2. Students will apply linear algebra concepts to model and solve practical problems across multiple disciplines.
3. Students will analyse and interpret geometric transformations through the lens of linear transformations.
4. Students will develop critical thinking and problem-solving skills by using linear algebra as a foundation for advanced mathematical and scientific studies.

UNIT I

Vectors, vector spaces, span, linear independence, bases

Dimension, linear transformations

UNIT II

Null spaces, range, coordinate bases
Matrix multiplication, Invertibility, Isomorphisms

UNIT III

Coordinate change, products and quotients of vector spaces, duality
Review of elementary row operations, rank, determinants

UNIT IV

Eigenvalues, Eigenvectors
Diagonalization

UNIT V

Characteristic polynomials, inner products and norms
Orthogonal bases, orthogonalization, orthogonal complements
Adjoints, normal and self-adjoint operators
Spectral theorem for normal and self-adjoint operators

References/Textbooks:

1. Bhattacharya P.B., Jain S.K. and Nagpaul S.R., First Course in Linear Algebra, Wiley Eastern Ltd., 1991.
2. Friedberg S.H, Insel A.J. and Spence L.E., Linear Algebra, 4th Edition, Prentice-Hall of India, New Delhi, 2004.
3. Hoffman K. and Kunze R., Linear Algebra, 2nd Edition, Prentice-Hall of India, New Delhi, 2000.
4. Kalman D., A singularly valuable decomposition; the SVD of a matrix, The College Math. Journal, Vol .27, No.1, (1996).
5. Kumaresan, S., Linear Algebra-A Geometric approach, Prentice-Hall of India, New Delhi, 2001.
6. Lay D.C., Linear Algebra and Its application, 3rd edition, Pearson Education(Singapore) Pvt. Ltd., Delhi, 2003.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Linear Algebra	Prof. Pranav Haridas	Kerala School of Mathematics	https://onlinecourses.nptel.ac.in/noc20_ma21/preview

MTCSEMD302F**Artificial Intelligence and Machine Learning****Credits 03****Course Objectives:**

1. Apply AI techniques to solve the given problems.
2. Implement trivial AI techniques on relatively large system
3. Explain uncertainty and Problem-solving techniques.
4. Compare various learning techniques.

Course Outcomes:

This course will enable students to

1. Identify the AI based problems.
2. Apply techniques to solve the AI problems.
3. Define learning and explain various logic inferences.
4. Discuss different learning techniques.

UNIT I

Introduction to AI and State space search, Introduction to unguided and guided search

UNIT II

Problems in search and solutions, Genetic algorithms, Neural Networks, BPNN, learning process in BPNN

UNIT III

Some other search methods and Admissibility, Planning, Game Playing

UNIT IV

Minimax and other game playing algorithms , using predicate logic for Knowledge Representation

UNIT V

Resolution and non-monotonic reasoning, Strong methods for Knowledge Representation; Fuzzy logic and CD, Scripts and Introduction to Expert systems, Developing expert systems and Machine learning

Text/Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach. III Edition
2. E. Rich, K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGrawHill.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hal of India.
4. G. Luger, —Artificial Intelligence: Structures and Strategies for complex problem Solving, Fourth Edition, Pearson Education, 2002.
5. N.P. Padhy —Artificial Intelligence and Intelligent Systems, Oxford University Press- 2015.

NPTEL platform:

NPTEL Course	Name of Instructor	Host Institute	Link
Artificial Intelligence and Machine Learning	By Prof. Bhushan Trivedi	GLS University	https://onlinecourses.swayam2.ac.in/cec21_cs08/preview

MTCSESE303 Seminar II Credits 02

The seminar shall be on the state of the art in the area of the advanced communication of student’s choice approved by an authority. The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work duly signed by the concerned guide and head of the Department/Institute.

MTCSEPR304 Project I Credits 10

Project-I is an integral part of the final project work. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation that may include mathematical model/SRS/UML/ERD/block diagram/ PERT chart, and layout and design of the proposed

system/work. As a part of the progress report of project-I work; the candidate shall deliver a presentation on progress of the work on the selected dissertation topic.

It is desired to publish the paper on the state of the art on the chosen topic in international conference/ journal.

The student shall submit the duly certified progress report of project -I in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.

SEMESTER IV

MTCSEPR401

Project II

Credits 20

In Project - II, the student shall complete the remaining part of the project which will consist of the simulation/ analysis/ synthesis/ implementation / fabrication of the proposed project work, work station, conducting experiments and taking results, analysis and validation of results and drawing conclusions.

It is mandatory to publish the paper on the state of the art on the chosen topic in international conference/ journal.

The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.