# M.D. UNIVERSITY, ROHTAK

## SCHEME OF STUDIES AND EXAMINATION

**Common for**

## B. TECH CSE (Artificial Intelligence and Machine Learning)
## B. TECH (Artificial Intelligence and Machine Learning)
## B. TECH CSE (Artificial Intelligence)
## And
## B. TECH (Artificial Intelligence)
## 4th year

## Modified G Scheme effective from 2025-26

**COURSE CODE AND DEFINITIONS**

| Course Code | Definitions |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Practical |
| BSC | Basic Science Courses |
| ESC | Engineering Science Courses |
| HSMC | Humanities and Social Sciences including Management courses |
| PCC | Professional core courses |
| OEC | Open Elective courses |
| LC | Laboratory course |
| MC | Mandatory courses |
| PROJ | Project |

**Modified G Scheme effective from 2025-26**

**B. TECH CSE (Artificial Intelligence and Machine Learning)**

**B. TECH (Artificial Intelligence and Machine Learning)**

**B. TECH CSE (Artificial Intelligence)**

**and**

**B. TECH (Artificial Intelligence)**

**Scheme of Studies/Examination**

**Modified G Scheme effective from 2025-26**

**Semester-7**

| Sr. No | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | Internal Assessment | Theory | Practical | Total | |
| 1. | PCC-AIML-451G | Deep Learning | 3 | 0 | 0 | 3 | 3 | 25 | 75 | | 100 | 3 |
| 2. | Refer to Annexure-IV | Professional Elective-IV | 3 | 0 | 0 | 3 | 3 | 25 | 75 | | 100 | 3 |
| 3. | Refer to Annexure-V | Professional Elective-V | 3 | 0 | 0 | 3 | 3 | 25 | 75 | | 100 | 3 |
| 4. | Refer to Annexure OEC-I | Open Elective-I | 3 | 0 | 0 | 3 | 3 | 25 | 75 | - | 100 | 3 |
| 5 | PROJ-CSE-423G | Project-II ***(common with B.Tech.(CSE) in semester 7)*** | 0 | 0 | 6 | 6 | 3 | 50 | - | 50 | 100 | 3 |
| 6. | LC-AIML-455G | Deep Learning Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 7. | PT-CSE-425G | Practical Training -II ***(common with B.Tech.(CSE) in semester 7)*** | 0 | 0 | 0 | 1 | 0 | - | - | - | - | - |
| Total | | | | | | | **16** | **175** | **300** | **75** | **550** | |

***1. Practical Training II: The evaluation of Practical Training-II will be based on seminar, viva-voce, report submitted by the students. According to performance, the students will be awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.***

**Grades:** Excellent: A, Good : B, Satisfactory: C, Not Satisfactory: F

**2. Choose one subject from each Professional Elective –IV, Professional Elective –V and Open Elective – I. List of elective subjects is attached as Annexure-I.**

**Annexure IV : Professional Elective -IV**

1. PEC-CSE-403G: Software Project Management
2. PCC-DS-402G : Software Project Management Essentials
3. PEC-CSE-405G: Web Mining
4. PEC-CSE-407G: Predictive Analysis
5. PCC-DS-401G : Advanced Architectures of Computers
6. PEC-AI-413G : AI in Healthcare

**Annexure V : Professional Elective -V**

1. PEC-CSE-411G: Network Security and cryptography
2. PEC-CSE-413G: Software Testing
3. PEC-CSE-415G: Cyber Security Threats
4. OEC-AI-432G : Cyber Security and AI
5. PEC-DS-408G : Predictive Analytics Domains
6. PEC-AI-404G : Social Network Analysis

**Annexure OEC-I : Open Elective-I**

1. OEC-PHY-101G: Material Science
2. OEC-ECE-451-G: Electronic Principles
3. HSMC-08G: Fundamentals of Management
4. OEC-CE-451-G: Disaster Management
5. HSMC-10G: English for Professionals
6. HSMC-20G : Psychology for Everyday Life
7. HSMC-21G: Human Behaviour in Organization

**Modified G Scheme effective from 2025-26**

**B. TECH CSE (Artificial Intelligence and Machine Learning)**
**B. TECH (Artificial Intelligence and Machine Learning)**
**B. TECH CSE (Artificial Intelligence)**
**and**
**B. TECH (Artificial Intelligence)**
**Scheme of Studies/Examination**
**Modified G Scheme effective from 2025-26**
**Semester-8**

| Sr. No | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | Internal Assessment | Theory | Practical | Total | |
| 1 | PCC-AIML-452G | Artificial Intelligence Ethics | 3 | 0 | 0 | 3 | 3 | 25 | 75 | - | 100 | 3 |
| 2 | PCC-AIML-454G | Soft Computing | 3 | 0 | 0 | 3 | 3 | 25 | 75 | - | 100 | 3 |
| 3 | Refer to Annexure OEC-II | Open Elective-II | 3 | 0 | 0 | 3 | 3 | 25 | 75 | - | 100 | 3 |
| 4 | LC-AIML-470G | Artificial Intelligence Ethics Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 5 | LC-AIML-472G | Soft Computing Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 6 | PROJ-CSE-422G | Project III **(common with B.Tech.(CSE) in semester 8)** | 0 | 0 | 8 | 8 | 4 | 50 | - | 50 | 100 | 3 |
| Total | | | | | | | **15** | **175** | **225** | **100** | **500** | - |

**NOTE: Choose one subject from open Elective – II. List of elective subjects is attached as annexure.**

### Annexure OEC-II : Open Elective-II

1. PEC-ME-410G: Quality Engineering
2. OEC-ECE-430G: Wireless Adhoc and Sensor Networks
3. OEC-ECE-452G: Intelligent Instrumentation for Engineers
4. OEC-CE- 448G: Traffic Engineering and Road Safety
5. OEC-EE-08G: Conventional and Renewable Energy Resources
6. OEC-DS-431G : Open Source Programming
7. OEC-AI-436G: Essentials of Hadoop
8. HSMC-22G: Industrial Psychology

# Semester-7

## DEEP LEARNING

| | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-AIML-451G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Deep Learning | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

1. To understand the different issues involved in the design and implementation of Deep Learning Models.
2. To study the basic of Deep Learning.
3. To understand and use of Deep Learning in real world
4. To develop and design Model of Deep Learning to solve real problem

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

Deep Learning: Fundamentals about Deep Learning, Deep learning vs Machine learning, Historical context and motivation for deep learning, Importance of deep learning

**UNIT 2**

Deep Neural Networks: Common architectural Principles of Deep Networks, Building blocks of Deep networks, Role and importance of activation functions in deep networks; types of activation functions. Loss Functions and its types, Over-fitting and Under-fitting, model exploration and hyper parameter tuning.

**UNIT 3**

Convolutional Neural Networks: Basics of convolutional neural networks, Building a CNN: Input layers, Convolutional layers, Pooling layers, Dense layers; Padding, Operations in CNN,Activation functions and optimizers, AlexNet, VGGNET, YOLO

**UNIT 4**

Recurrent Neural Network: Need of Recurrent Neural Network, Bidirectional RNNs, Encoder-Decoder, Backpropagation in RNN, Problems in RNN, Long Short-Term Memory (LSTM), Gated Recurrent Units (GRU)

**Course Outcomes:**

1. For a given conceptual problem, students will be able to analyze the problem and able to visualize in deep learning.
2. Students will be familiar with different deep learning methods.
3. Students will be able to understand the concept of learning in deep learning.

**Suggested Readings:**


1. Josh Patterson, Adam Gibson, Deep Learning-A Practitioners Approach, O'Reilly Media.
2. Nikhil Buduma, Nicholas Locascio, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O'Reilly Media.
3. Li Deng and Dong Yu, Deep Learning Methods and Applications, Foundations and Trends in Signal Processing.
4. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series, MIT Press.
5. SandroSkansi,Introduction to Deep Learning From Logical Calculus to Artificial Intelligence,Springer.
6. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, Second Edition, MIT Press.
7. Wiering, Marco, and Martijn Van Otterlo, Reinforcement learning - Adaptation, Learning, and Optimization.
8. Any other book(s) covering the contents of the paper in more depth. Note: Latest and additional good books may be suggested and added from time to time.

**DEEP LEARNING LAB**

| | | | | | |
|---|---|---|---|---|---|
| Course code | LC-AIML-455G | | | | |
| Category | Professional Core Course | | | | |
| Course title | DEEP LEARNING LAB | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 0 | 0 | 2 | 1 | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | | | | | |

**NOTE: Minimum 05 Lab activities / programs related to the course contents of Deep Learning can be designed and developed by the subject faculty using MATLab/Python / any suitable Open Source tools/ software.**

**Explore different data sources like kaggle, plant village, RoboFlow, etc**

**develop a deep learning model using the available or self made data**

**PROJECT-II**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PROJ-CSE-423G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Project-II | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 0 | 0 | 6 | 3 | |
| Class work | 50 Marks | | | | |
| Exam | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hrs | | | | |

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks),

2. 1st mid-term progress evaluation (10 marks)

3. 2nd mid-term progress evaluation (10 marks)

4. Final submission evaluation (20 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

**PRACTICAL TRAINING-II**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PT-CSE-425G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Practical Training-II | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 0 | 0 | 1 | | |
| Class work | | | | | |
| Exam | | | | | |
| Total | | | | | |
| Duration of Exam | | | | | |

**Practical Training II: The evaluation of Practical Training-II will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.**

# Professional Elective-IV

## SOFTWARE PROJECT MANAGEMENT

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-403G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Software Project Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

By the end of this course the students will be able to:

1. Identify different stages of Project Management and able to manage scope & objectives defined by project stakeholders at the same time as focussing on project success.
2. Analyse cost benefit evaluation, different risk associated with project, and techniques used to evaluate & mitigate risk.
3. Manage the resources, monitoring the progress of project using different techniques and managing contracts & peoples associated with the project.
4. Understand the importance of software quality and techniques to enhance software quality.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

**Introduction to Software Project Management (SPM):** Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization.

**Stepwise Project planning:** Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

**UNIT 2**

**Project Evaluation & Estimation:** Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development, waterfall, V-process model, spiral models, Prototyping, delivery. Albrecht function point analysis.

**Activity planning & Risk Management:** Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project, precedence networks.

**Risk Management:** Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values.

**UNIT 3**

**Resource allocation & monitoring the control:** Introduction, the nature of resources, identifying resource requirements, scheduling resources creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedules, the scheduling sequence.

**Monitoring the control:** Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

**Managing contracts and people:** Introduction, types of contracts, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behaviour, organizational behaviour: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures.

**UNIT 4**

**Software quality:** Introduction, the place of software quality in project planning, the importance of software quality, defining software quality, ISO 9126, Practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality.

**Text Book:**

1. Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH

**Reference Books:**

1. Software Engineering – A Practitioner's approach, Roger S. Pressman (5th edi), 2001, MGH

2. Software Project Management, Walker Royce, 1998, Addison Wesley.

3. Project Management 2/c. Maylor

4. Managing Global software Projects, Ramesh, 2001, TMH.

| Software Project Management Essentials | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-DS-402G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Software Project Management Essentials | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**COURSE OBJECTIVES:**

1. To understand the importance of software project management and identify main stages and stakeholders of a software project
2. To explain the purpose of a project's planning documents and construct the scope statement and the work breakdown structure
3. To portray how the software can assist in project management and articulate what is involved in quality assurance, planning and control on projects
4. To demonstrate RUP, Microsoft project 2010/Above & open source software project management tools

**Unit-I**

**Introduction to Project Management:** Importance of software project management - Stages of Project - The Stakeholder of Project – Project Management Framework - Software Tools for Project Management – Microsoft Project 2010/Above – Software projects versus other types of project – Contract management and technical project management

**Unit-II**

**Project Planning :** Integration Management: Project Plan Development - Plan Execution Scope Management: Methods for Selecting Projects - Project Charter - Scope Statement - WBS. Stepwise Project Planning: Main Steps in Project Planning Use of Software to Assist in Project Planning Activities

**Project Scheduling :** Time Management: Importance of Project Schedules - Schedules and Activities - Sequencing and Scheduling Activity Project Network Diagrams: Network Planning Models - Duration Estimating and Schedule Development - Critical Path Analysis - Program Evaluation and Review Technique (PERT) Use of Software to Assist in Project Scheduling Activities - Software Metrics for Project Management: Metrics Sets for Project Management

**Unit-III**

**Software Risk Management :** Perspectives of Risk Management - Risk Definition – Risk Categories – Risk Assessment: Approaches, techniques and good practices – Risk Identification / Analysis / Prioritization – Risk Control (Planning / Resolution / Monitoring) – Risk Retention – Risk

Transfer - Failure Mode and Effects Analysis (FMEA) – Operational Risks – Supply Chain Risk Management.

**Project Cost Management:** Importance and Principles of Project Cost Management - Resource Planning -

Cost Estimating - Cost Budgeting - Cost Control - Use of Software to assist in Cost Management

**Software Quality Management :** Project Quality: Stages of Software Quality Management - Quality Planning - Quality Assurance - Quality Control – Quality Standards – Tools for Quality control

## Unit-IV

**People Management :** Leadership styles – Developing Leadership skills – Leadership assessment – Motivating People – Organizational strategy – Management – Team building – Delegation – Art of Interviewing People – Team Management – Rewarding - Client Relationship Management - Organizational behavior: a background, Selecting the right person for the job –Instruction in the best methods– The Oldham-Hackman job characteristics model. Recent Trends and tools.

**Suggested References Books:**


1. Information Technology Project Management, Kathy Schwalbe, Seven Edition 2013
2. Software Project Management in Practice, Pankaj Jalote, Pearson, 2015.
3. Murali Chemuturi, Thomas M. Cagley, ―Mastering Software Project Management: Best Practices, Tools and Techniques, J. Ross Publishing, 2010
4. Bole Hughes and Mike Cotterell, "Software Project Management", Tata McGraw Hill, Third Edition, 2002
5. Microsoft Project 2010 Bible,Elaine Marmel


**Course outcomes:**

At the end of course student should be able to -

1. Actively participate or successfully manage a software development project by applying project management concepts
2. Demonstrate knowledge of project management terms and techniques
3. Analyze the Steps involved in analyzing the Software projects and concepts to meet the estimation of the software Projects.
4. Work on Microsoft project, IBM RUP & open source software project management tools.
5. Estimate the organizing team based on industry exposure.

**Web Mining**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-405G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Web Mining | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

1. To understand the architecture of web, mining the data, issues, challenges.
2. To study the methods of extracting knowledge from web data, text and unusual data.
3. To understand and use data mining language like R, Python etc.
4. To understand the optimization of web and its applications.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit: 1**

**Data Mining Foundations:** Basic concepts in data Mining, Web mining versus Data mining, Discovering knowledge from Hypertext data; An overview of web mining : What is Web mining, Web mining taxonomy, Web mining subtasks, issues, challenges

**Unit: 2**

**Web Search and Information Retrieval :** Information Retrieval Models, Web Search and IR, Text Mining, , Latent Semantic Indexing, Web Spamming, Clustering and Classification of Web Pages, Information Extraction , Web Content Mining;

**Unit: 3**

**Optimization :** Introduction to Models and Concept of Computational Intelligence, Social Behavior as Optimization: Discrete and Continuous Optimization Problems, Classification of Optimization Algorithms, Evolutionary Computation Theory and Paradigm, Swarm and Collective intelligence

**Unit: 4**

**Swarm Intelligence Techniques:** Particle Swarm Optimization, Ant Colony Optimization, Artificial Bees and Firefly Algorithm etc., Hybridization and Comparisons of Swarm Techniques, Application of Swarm Techniques in Different Domains and Real World Problems

**Course Outcomes:**

1. Learn how the Web mining helps to improve the power of web search engine by classifying the web documents and identifying the web pages.
2. How to predict user behaviour in the web.
3. For a given data set how the optimization will be performed.

**Suggested books:**


1. Witton Frank, Data Mining , Morgan Kauffan Publishers.
2. Kennedy, J. and Eberhart, R.C., Swarm Intelligence, Morgan Kaufmann Publishers, 2001
3. Bonabeau, E., Dorigo, M. and Theraulaz, G., Swarm Intelligence: From Natural to Artifical Systems, Oxford University Press, 1999
4. Dorigo, M., Stutzle, T., Ant Colony Optimization, MIT Press, 2004
5. Parsopoulos, K.E., Vrahatis, M.N., Particle Swarm Optimization and Intelligence: Advances and Applications, Information Science Reference, IGI Global, 2010
6. Clerc, M., ParticleSwarm Optimization, ISTE, 2006
7. Nature Inspired Metaheuristic Algorithms, Xin-She Yang, Luniver Press, 2010

**PREDICTIVE ANALYTICS**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-407G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Predictive Analytics | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

1. To provide the knowledge of various quantitative and classification predictive models based on various regression and decision tree methods.
2. To provide the knowledge to select the appropriate method for predictive analysis
3. To provide the understanding of how to search, identify, gather and pre-process data for the analysis.
4. To provide the understanding of how to formulate predictive analytics questions.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit 1**

**Introduction**: The Analytics Life Cycle, Introduction to Predictive Analytics, Matrix Notation, Basic Foundations, Model, Method and Feature Selection

**Regression**: Covariance, Correlation and ANOVA review; Simple Linear Regression, OLS Model Diagnostics, Dummy Variables, Multivariate Regression, OLS Assumptions ,Weighted Least Squares (WLS), Generalized Linear Models (GLM).

**Unit 2**

**Classification Models**: Introduction, Binomial Logistic Regression, Multinomial Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis.

**Decision Trees**: Introduction Regression Trees, Regression Tree Issues, Classification Trees, Pruning Trees, Bootstrap Aggregation (Bagging), Random Forest Models.

**Unit 3**

**Data Pre-Processing**: Overview, Variable Types, Introduction to Data Transformations, Data Transformations: Categorical to Dummy Variables, Polynomials, Box-Cox Transformation, Log & Elasticity Models, Logit Transformation, Count Data Models, Centering, Standardization, Rank Transformations, Lagging Data (Causal Models), Data Reduction.

**Unit-4**

**Variable Selection**: Dimensionality Issues, Multi-Collinearity, Variable Selection Methods, Step Methods.

**Dimensionality**: Regularization (Penalized or Shrinkage Models, Ridge Regression, LASSO, Dimension Reduction Models, Principal Components Regression (PCR), Partial Least Squares (PLS).

**Machine Learning**: Machine Learning Overview, Bias vs. Variance Trade-off, Error Measures, Cross-Validation.

**Course Outcomes:**

1. Ability to develop and use various quantitative and classification predictive models based on various regression and decision tree methods.
2. Ability to select the appropriate method for predictive analysis
3. Ability to search, identify, gather and pre-process data for the analysis.
4. Ability to formulate predictive analytics questions.

**Suggested books:**

1. "An Introduction to Statistical Learning: with Applications in R" by James, Witten, Hastie and Tibshirani, Springer, 1st. Edition, 2013.

**Suggested reference books**

1. "The Elements of Statistical Learning-Data Mining, Inference, and Prediction " by Trevor Hastie, Robert Tibshirani, Jerome Friedman , Second Edition , Springer Verlag, 2009.
2. Predictive & Advanced Analytics (IBM ICE Publication)

| Advanced Architectures of Computers | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-DS-401G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Advanced Architectures of Computers | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**COURSE OBJECTIVES:**

1. To make students know about the Parallelism concepts in Programming.
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multicomputer.
5. To study about data flow computer architectures.

**Unit-I**

**Parallel Computer Models:** The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers, PRAM Vs VLSI.
**Program and Network Properties:** Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

**Unit-II**

**Pipelining**: Advanced Processor Technology, Superscalar and Vector Processors, Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

**Unit-III**

**Arithmetic for Computers:** Signed and unsigned Numbers, Addition and Subtraction, Multiplication, Division, Floating Point.
CPU Performance and Its factors, Evaluating performance of CPU.

**Unit-IV**

**Memory hierarchy**-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory

organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Back plane bus systems-Bus addressing, arbitration and transaction.
Recent Trends in parallel processors, Case study of Crey, PowePC,Sun, Intel, AMD and PARAM parallel systems.

**Suggested References Books:**


1. Kai Hwang, Motwani, Advanced Computer architecture Parallelism ,scalablity ,Programmablity ,
   Mc Graw Hill,N.Y, 2003
2. Kai Hwang, Advanced computer architecture; TMH. 2000
3. D. A. Patterson and J. L. Hennessey, Computer organization and design, Morgan Kaufmann, 2nd Ed. 2002
4. J.P.Hayes, computer Architecture and organization; MGH. 1998
5. Harvey G.Cragon,‖Memory System and Pipelined processors; Narosa Publication. 1998
6. V.Rajaranam & C.S.R.Murthy, ―Parallel computer; PHI. 2002
7. R.K.Ghose, Rajan Moona & Phalguni Gupta, Foundation of Parallel Processing, Narosa Publications, 2003
8. Kai Hwang and Zu, Scalable Parallel Computers Architecture, MGH. 2001
9. Stalling W, Computer Organisation & Architecture, PHI. 2000
10. D.Sima, T.Fountain, P.Kasuk, Advanced Computer Architecture-A Design space Approach, Addison Wesley, 1997.
11. M.J Flynn, Computer Architecture, Pipelined and Parallel Processor Design; Narosa Publishing. 1998
12. D.A.Patterson, J.L.Hennessy, Computer Architecture :A quantitative approach; Morgan Kauffmann, feb, 2002.
13. Hwan and Briggs, Computer Architecture and Parallel Processing; MGH. 1999


**Course outcomes:**

1. Understand the Concept of Parallel Processing and its applications.
2. Implement the Hardware for Arithmetic Operations.
3. Analyze the performance of different scalar Computers.
4. Develop the Pipelining Concept for a given set of Instructions.
5. Distinguish the performance of pipelining and non-pipelining environment in a processor.

| AI in Healthcare | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-AI-413G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | AI in Healthcare | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objectives of the course:**

The objective of this course are:

1. To understand the basics of AIML.
2. To describe and understand the use of AI for diagnosis and patient monitoring in the real world.
3. To demonstrates the uses of extract value-adding outcomes from medical literature using AITechniques.

**Detailed Course**

**Unit-I**

**AI and Machine Learning:** Application and Foundations, Become familiar with supervised machinelearning and the types of problems it may be applied to; Real world Case Studies

**Unit-II**

**Using AI for Disease Diagnosis and Patient Monitoring:** Examine real-world applications of AI fordiagnosis and patient monitoring; Real world Case Studies

**Unit-III**

**Natural Language Processing and Data Analytics in Healthcare:** Use AI to extract value-addingoutcomes from medical literature and pathology reports; Real world Case Studies

**Unit-IV**

**Interpretability in Machine Leaning – Benefits and Challenges:** Appreciate the importance andbenefits of interpretable algorithms.

Real world case studies.

**References Books:**

1. P. S. Mahajan, Artificial Intelligence in Healthcare Paperback, July 1, 2018.
2. A. Bohr and K. Memarzadeh, Artificial Intelligence in Healthcare, Academic Press, 2020
3.S. Dua, U. Acharya and P. Dua, Machine Learning in Healthcare Informatics, Springer, 2014
4. Panesar, Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes, AcademicPress; (1e), 5 February 2019

**Course Outcomes:**

After successfully completing the course the student should be able to:

1. Knowhow the basics of AIML.
2. Got insight of the use of AI for diagnosis and patient monitoring in the real world.
3. Manage the uses of extract value-adding outcomes from medical literature using AI Techniques.

# Professional Electives-V

**NETWORK SECURITY AND CRYPTOGRAPHY**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-411G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Network Security and Cryptography | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Course Objectives:**

1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

**UNIT- I**

**Introduction:** Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

**UNIT- II**

**Symmetric Key Algorithms:-** Introduction, algorithms types and modes, DES, AES.

**Asymmetric Key Algorithms:** Introduction, history of asymmetric key cryptography, RSA symmetric and asymmetric key cryptography together, Digital signature.

**UNIT- III**

**Internet Security Protocols:** Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

**UNIT- IV**

**User Authentication And Kerberos:-** Introduction, Authentication basics, Passwords, authentication tokens, certificate based authentication, biometric based authentication, Kerberos, key distribution center( KDC), Security handshake pitfalls, single Sign on(SSO) approach.

**TEXT/ REFERENCE BOOKS:**


1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)
4. SNMP: A Guide to Network Management (MGH)
5. Telecom Network Management by H.H. Wang (MGH)
6. Network Management by U. Dlack (MGH)


**Course Outcomes:**

After completing the course the student will be able to

1. Compare various cryptographic techniques.
2. Work with symmetric & asymmetric key algorithms.
3. Design secure applications.
4. Inject secure coding in the developed applications.

**SOFTWARE TESTING**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-413G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Software Testing | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7 |
| | 3 | 0 | | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

1. To study fundamental concepts of software testing including software testing objectives, process, criteria, strategies, and methods.
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain an insight into techniques and skills on how to use modern software testing tools to support software testing projects.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit 1**

**Introduction:** Overview of Software Development Life Cycle (SDLC), Significance of Software Testing in SDLC, Objectives and Limitations of software testing. Difference between an Error, Fault and Failure (Software Bug), Software Testing Life Cycle (STLC) and Seven Principles of Software Testing, Role of Software Testing in Software Quality

**Unit 2**

**Test Case Design**: Test Cases and Test Suite, Test Case Planning and Designing, Characteristics of Good Test Case Design, Format of test case.

**Testing Activities:** Levels of Testing- Unit, Integration Testing and System Testing. V Model for Software Testing.

**Unit 3**

**Types of Software Testing:** Black box testing, White Box and Gray Box Testing.

**Reporting and Analyzing bugs:** Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools

**Unit 4**

**Test Case Selection:** Need of Regression Testing, Non-feasibility of Exhaustive Testing, Selection, Minimization and Prioritization of test cases in regression testing.

**Testing Tools**: Manual vs Automated Testing, Types of Testing Tools, Automated Test Case Generation

**Course Outcomes:**

1. Understand software testing and quality as a fundamental component of software development life cycle
2. Understand and design the test cases for a given problem
3. Understand the process of Reporting of software failures(bugs) using tools like Bugzilla
4. Develop the knowledge of selection of appropriate test cases for execution during regression testing

**Suggested books:**


1. "Software Testing: Principles and Practices", by Naresh Chauhan. Oxford University Press


**Suggested reference books**


1. "William Perry, Effective Methods for Software Testing , John Wiley & Sons, New York, 1995.
2. Boris Beizer, Software Testing Techniques , Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
3. Louise Tamres, Software Testing , Pearson Education Asia, 2002
4. Roger S. Pressman, Software Engineering – A Practitioner's Approach , Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
5. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems , John Wiley & Sons Inc., New York, 1995.
6. K.K. Aggarwal & Yogesh Singh, Software Engineering , New Age International Publishers, New Delhi, 2003.

**CYBER SECURITY THREATS**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-CSE-415G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Cyber Security Threats | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

1. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
3. The learner will be able to examine secure software development practices.
4. The learner will understand principles of web security.
5. The learner will be able to incorporate approaches for risk management and best practices.
6. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.
7. The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crimes. Network Threats: Active/ Passive – Interference – Interception –Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels –Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

**UNIT 2**

Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation –Threat awareness - Vulnerability sources and assessment- Vulnerability

assessment tools –Threat identification - Threat Analysis - Threat Modelling - Model for Information Security Planning.

**UNIT 3**

Security Elements: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots

**UNIT 4**

Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training, Email and Internet use policies.

**Course Outcomes:**

1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
2. Design, develop, test and evaluate secure software.
3. Develop policies and procedures to manage enterprise security risks.
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
5. Interpret and forensically investigate security incidents.

**Reference Books:**

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.
3. Joseph M Kizza, “Computer Network Security”, Springer Verlag, 2005
4. Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning, 2004.

| Cyber Security and AI | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-AI-432G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Cyber Security and AI | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objectives of the course:**

The objective of this course are:

1. To learn the need of AI for Cyber Security
2. To learn the detection of DDOS using AI techniques
3. To learn the intrusion detection using Neural Networks
4. To learn the various applications of AI to detect cyber attacks

**Unit-I**

**Fundamentals of Cyber Security:** Identity, authentication, confidentiality, privacy, anonymity, availability, and integrity, exploring cryptographic algorithms together with major attacks (using a break-understandand-fix approach), Exploring high-level security protocols;
**Fundamentals of AI for Security:** deep learning fundamentals from a security perspective., case studies;

**Unit-II**

**Web Application Security:** Injection, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control, Security misconfiguration, Cross-Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities, Insufficient logging, and monitoring.

**Unit-III**

**Secure Web:** making websites secure using AI techniques for injection using regular expressions and identifying patterns and matching with existing scores. Case studies;
**Deep learning applications:** Pattern detection and model behavior for anomalous behavior, Advanced Malware Detection Case studies;

**Unit-IV**

**Secure AI Development:** foundations of secure software design, secure programming, and security testing. The section requires a basic understanding of Application Programming Interface (API) and example APIs of companies referred to are: Darktrace, Vectra and Cylance;

**Impact of AI on Cyber Security: T**hreat hunting in memory, file system and network data, analysis of malicious programs; Contemporary issues in Artificial Intelligence for Cyber security.

**Reference Books:**


1. A. Parisi, Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber-attacks and detecting threats and network anomalies, (1e) Packt Publishing, 2019
2. S. Halder, Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the Python ecosystem, (1e), Packt Publishing, 2018
3. L.F. Sikos (Ed.), AI in Cybersecurity, Springer International Publishing, 2019
4. E. Tsukerman, Machine Learning for Cybersecurity Cookbook, Packt Publishing, 2019


**Course Outcomes:**

After successfully completing the course the student should be able to

1. Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism
2. Understand and implement various AI techniques to detect cyber attacks
3. The recent challenges in AI related to cyber security and able to develop new security solutions to the real time applications

| Predictive Analytics Domains | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-DS-408G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Predictive Analytics Domains | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objectives of the course:**

The objective of this course are:

1. It introduces theoretical foundations, algorithms, methodologies for analysing data in various domains such Retail, Finance, Risk and Healthcare.

**Unit-I**

**Retail Analytics:** Understanding Customer: Profiling and Segmentation, Modelling Churn. Modelling Lifetime Value, Modelling Risk, Market Basket Analysis.

**Risk Analytics :** Risk Management and Operational Hedging: An Overview, Supply Chain Risk
Management, A Bayesian Framework for Supply Chain Risk Management, Credit Scoring and Bankruptcy Prediction

**Unit-II**

**Financial Data Analytics:** Financial News analytics: Framework, techniques, and metrics, News events impact market sentiment, Relating news analytics to stock returns
**Financial Time Series Analytics:** Financial Time Series and Their Characteristics, Common Financial Time Series models, Autoregressive models, Markov chain models, Time series models with leading indicators, Long term forecasting

**Unit-III**

**Health care Analytics:** Introduction to Healthcare Data Analytics, Electronic Health Records, Privacy-Preserving Data Publishing Methods in Healthcare, Clinical Decision Support Systems

**Healthcare Data Analytics :** Natural Language Processing and Data Mining for Clinical Text: Core NLP Components, Information Extraction and Named Entity Recognition, Social Media Analytics for Healthcare: Tracking of Infectious Disease Outbreaks, Readmission risk Prediction

## Unit-IV

**Genomic Data Analytics :** Microarray Data, Microarray Data Analysis, Genomic Data Analysis for Personalized Medicine, Patient Survival Prediction from Gene Expression Data, Genome Sequence Analysis; Current trends and Contemporary issues

**References Books:**


1. Chris Chapman, Elea McDonnell Feit "R for Marketing Research and Analytics", Springer, 2015.
2. Olivia Parr Rud “Data Mining Cookbook: Modeling Data for Marketing, Risk, and Customer Relationship Management”, Wiley, 2001.
3. Chandan K. Reddy, Charu C. Aggarwal "Healthcare Data Analytics", CRC Press, 2015.
4. Rene Carmona "Statistical Analysis of Financial Data in R", Springer, 2014.
5. James B. Ayers “Handbook of Supply Chain Management” Auerbach Publications, 2006.
6. Panos Kouvelis, Ling xiu Dong, Onur Boyabatli, Rong Li "The Handbook of Integrated Risk Management in Global Supply Chains", Wiley, 2012.


**Course Outcomes:**

After successfully completing the course the student should be able to

1. Recognize challenges in dealing with data sets in domains such as finance, risk and healthcare.
2. Identify real-world applications of machine learning in domains such as finance, risk and healthcare.
3. Identify and apply appropriate algorithms for analyzing the data for variety of problems in finance, risk and healthcare.
4. Make choices for a model for new machine learning tasks based on reasoned argument

| Social Network Analysis | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-AI-404G | | | | |
| Category | Professional Elective Course | | | | |
| Course title | Social Network Analysis | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**COURSE OBJECTIVES:**

1. Understand the concepts of Social Web
2. Understand Network features Visualizing approach
3. Study and understand Link prediction
4. Learn and understand various analysis algorithms
5. Understand the concept of social influence and actions in marketing

**Unit-I**

**Introduction to Social Web:** Nodes, Edges and Network measures, Describing Nodes and Edges,
Describing Networks, Layouts;

**Unit-II**

**Visualizing Network features:** The role of Tie Strength, Measuring Tie Strength, Tie Strength and Network Structure, Tie Strength and Network Propagation, Link Prediction, Entity Resolution;
**Link Prediction:** Case Study Friend Recommendation, Introduction to Community Discovery, Communities in Context, Quality Functions;

**Unit-III**

**Algorithms:** The Kernighan-Lin algorithm, Agglomerative Algorithms, Spectral Algorithms, Multi-level Graph Partitioning, Markov Clustering, Other Approaches;

**Unit-IV**

**Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing

**Suggested References Books:**


1. S.P. Borgatti ,M.G. Everett , J.C. Johnson, *Analyzing Social Networks (2e*) SAGE Publications Ltd,2018
2. J. Goldbeck, *"Analyzing the Social Web",* Morgan Kaufmann Publications, 2013.
3. C. C. Aggarwal, "*Social Network Data Analytics*", Springer Publications, 2011.
4. J. Scott, *"Social Network Analysis", (3e),* SAGE Publications Limited, 2013.
5. S. Kumar, F. Morstatter and H. Liu, "*Twitter Data Analytics*", Springer Publications, 2013

**Course outcomes:**

1. Learn basic concepts in Social web
2. Work with Network features Visualizing approaches
3. Deal with Link predictions and recommendation systems
4. Analyze various types efficient network analysis algorithms
   Learn social influence and related statistics in influence maximization

# Open Electives-I

## Material Science

| | | | | |
|---|---|---|---|---|
| Course code | OEC-PHY-101G | | | |
| Category | Open Elective Course | | | |
| Course title | Material Science | | | |
| Scheme and Credits | L | T | P | Credits |
| | 3 | 0 | 0 | 3 |
| Class work | 25 Marks | | | |
| Exam | 75 Marks | | | |
| Total | 100 Marks | | | |
| Duration of exam | 03 Hours | | | |

**Course objectives:**

The course intends to provide the knowledge of

1. Crystal structure and defects in solids.
2. Classification of different solids.
3. Properties of semiconductor, dielectric and magnetic materials.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT - 1**

**Crystal Structure**

Space lattice and translation vectors, Unit cell, Bravais lattice, Closed packed structures, Miller indices, Diffraction of electromagnetic waves by crystals: X-rays, electrons and neutrons, Bragg's law, X-ray diffraction (Laue and Powder method), Point defects in solids - Schottky and Frenkel defects.

**UNIT - 2**

**Electrical Properties**

Classification of solids into conductors, semiconductors and insulators, Semiconductor Materials: intrinsic and extrinsic, Fermi level and electron & hole concentrations at equilibrium, Carrier transport: diffusion and drift, p-n junction, Zener and Avalanche breakdown.

**UNIT - 3**

**Magnetic Properties**

Atomic magnetic moments and origin of magnetization, Types of magnetic materials, Ferromagnetism: molecular field, Curie temperature, Domain theory, Hysteresis and its applications.

Superconductivity: Properties of superconductors, Meissner effect, London equations, Elements of BCS Theory, Applications of superconductors.

**UNIT - 4**

**Dielectric Properties**

Molecular theory, Polarization, Electric displacement vector, susceptibility, dielectric constant, permittivity and various relations between these parameters, Gauss's law in the presence of a dielectric, Energy stored in a uniform electric field, Concept of local molecular fields and Claussius - Mossotti relation.

**Course outcome:**

At the end of the course, the student should at least be able to:

1. Segregate crystals based on their structure and apply effects of defects on manipulating properties of solids.
2. Distinguish between insulator, conductor and semiconductor. They should know the difference between intrinsic and extrinsic semiconductors and about the fermi level position in these semiconductors.
3. Select various dielectric, magnetic materials for specific applications in different fields.

**Suggested reference books:**


1. Concepts of Modern Physics- Arthur Beiser (TMGH)
2. Solid State Physics- S.O. Pillai (New Age Int. Ltd. Pub.)
3. Modern Physics for Engineers- S.P. Taneja (R. Chand)
4. Engineering Physics- Satya Prakash (Pragati Prakashan)
5. Engineering Physics- Malik & Singh (McGraw Hill)
6. Charles Kittel, Introduction to Solid State Physics, $7^{th}$ Edition, John Wiley & Sons, 2008.
7. S O Pillai, Solid State Physics, $8^{th}$ edition, New Age international Publishers, 2018

**ELECTRONIC PRINCIPLES**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-ECE-451-G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Electronic Principles | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 7th |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Course Objective:**

1. Study the basic principles of electronic systems.
2. Understand working of Digital electronics.
3. Understand the working of Display devices.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

SEMICONDUCTOR DIODE: P-N junction and its V-I Characteristics, P-N junction as a rectifier, Switching characteristics of Diode. Diode as a circuit element, the load-line concept, half - wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

**UNIT 2**

ELECTRONIC DEVICES: LED, Zener Diode as voltage regulator, BJT, UJT, MOSFET, Thyristor, DIAC, TRIAC.

**UNIT 3**

DISPLAY DEVICES: LED, LCD, Seven Segment, Sixteen Segment.

**UNIT 4**

DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flipflops (S-R & J-K).

**Course Outcomes:**

At the end of the course, students will demonstrate the ability to:

1. Understand the working of electronic components.

2. Understand the Digital System and various displays.

**TEXT BOOK :**

1.Integrated Electronics: Millman & Halkias ; McGrawHill

2.Modren Digital Electronics: R.P. Jain; McGraw-Hill

**REFERENCE BOOKS:**

1. Electronics Principles: Malvino ; McGrawHill
2. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGrawHill
3. Electronics Devices & Circuits: Boylestad & Nashelsky ; Pearson.

**FUNDAMENTALS OF MANAGEMENT**

| | | | | | |
|---|---|---|---|---|---|
| Course code | HSMC-08G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Fundamentals of Management | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**
Students will be able to understand:

1. Evolution of Management and contribution of Management thinkers.
2. The importance of staffing and training
3. The concept of material management and inventory control
4. The components of marketing and advertising, various sources of finance and capital structure.

**UNIT 1**

Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession. Importance of Management.
Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions. Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

**UNIT 2**

Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

**UNIT 3**

Marketing Management - Definition of marketing, marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

**UNIT 4**

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

**Course outcomes:**

Students will be able to understand

1. Evolution of Management and contribution of Management thinkers.
2. Importance of staffing and training
3. The concept of material management and inventory control
4. The components of marketing and advertising
5. Various sources of finance and capital structure

**Suggested Books:**

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S.Bhalla.(Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

**Suggested Reference Books:**

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
5. Management - James A.F. Stoner & R.Edward Freeman, PHI.

**DISASTER MANAGEMENT**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-CE-451G | | | | |
| Category | Open elective courses | | | | |
| Course title | Disaster Management | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Course objectives:**

1. To provide basic conceptual understanding of disasters and its relationships with development.
2. Provide an understanding of the social nature of natural hazards and disasters
3. Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-1**

**Introduction:** Definition of Disaster, hazard, Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

**Unit-2**

**Natural Disaster:** Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion

**Man-made Disasters:** Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

**Unit -3**

**Case Studies:** Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kedarnath landslide, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

**Unit 4**

**Disaster Management:** Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

**Course Outcomes:**

After completing this course, students should be able:

1. To know natural as well as manmade disaster and their extent and possible effects on the economy.
2. To Plan national importance structures based upon the previous history.
3. To acquaint with government policies, acts and various organizational structures associated with an emergency.
4. To know the simple dos and don'ts in such extreme events and act accordingly.

**Reference Books**


1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423

2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

**ENGLISH FOR PROFESSIONALS**

| | | | | | |
|---|---|---|---|---|---|
| Course code | HSMC-10G | | | | |
| Category | Open Elective Course | | | | |
| Course title | English For Professionals | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Objectives:**

The course aims at developing the desired language (English) skills of students of engineering and technology so that they become proficient in communication to excel in their professional lives. The course aims at developing competence for report writing with a focus on its complex writing techniques and procedures.

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

Communication Process Types and Levels, Scopes and significance, Technical and Tools of Effective communication

**UNIT 2**

Speaking files and Personality Development Oral Presentation, Body Language, Voice Modulation, Negotiation, Group Discussion, Interview techniques

**UNIT 3**

Advanced Technical Writing Job Application, CV writing, Business Letters, Memos, Minutes, Notices, Report Writing and structure, Blog writing.

**UNIT 4**

Communication and Media Recent Developments in Media, Context of Communication

**SUGGESTED READING**

1. Borowick, Jerome. N. *Technical Communication and its Applications*. New Delhi: PHI, 2000
2. Guffey, Mary Ellen. *Business Communication: Process & Product*. USA: South western College Publishing, 2000.
3. Kumar, Sanjay and Pushp Lata. *Communication Skills*. Delhi: OUP, 2011

| Psychology for Everyday Living | | | | | |
|---|---|---|---|---|---|
| Course code | HSMC-20G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Psychology for Everyday Living | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Learning Course Objectives :**

1. Develop a foundational understanding of psychology, applying it to enhance everyday life by navigating challenges, fostering character strengths and making informed decisions for personal growth and well-being.
2. Analyse genetic and environmental factors shaping behaviour, master cognitive processes, employ memory enhancement techniques and apply strategies for overcoming biases.
3. Apply psychological principles to cultivate emotional intelligence, comprehend motivations, role in daily life, master goal-setting. explore social dynamics and implement strategies for building and maintaining healthy relationships.
4. Analyse Challenges to healthy living, identify sources of stress apply coping techniques, recognize the mentalphysical health model, and employ skills for enhancing interpersonal relationships, advancing cognitive understanding in healthy living. and Student will be able to apply psychology in their everyday life.

**Unit-1**

**Introduction :** Concept and meaning of Psychology, relevance of Psychology, Psychology in everyday life: formation and challenges, Character strength and virtues, Practice of everyday living.

**Unit-II**

**Understanding of Human Behaviour:** Exploration of genetics and environmental influences on behaviour, How we think, learn and remember information, Memory improvement techniques, Perception and interpretation of the world around us, Common cognitive biases affecting decision-making, strategies to overcome cognitive biases.

**Unit-III**

**Emotion, motivation and Social Psychology:** Understanding emotions and their impact, Developing emotional intelligence, Type of motivation and their role in everyday life, Goal-setting strategies, Exploring social dynamics, conformity and obedience, Building and maintaining healthy relationships.

**Unit-IV**

**Role of Psychology in Health**: Challenges to healthy living, Health behaviour: Diet Exercise, Sleep and Rest, Sources of stress in everyday life, coping mechanisms and stress reduction techniques, Model linking to psychology and physical health, Psychological skills for enhancing interpersonal skills.

**Conduct activity based on Psychology in everyday life**: Conduct group discussion based on present life style and psychological health, Observing yourself, family members and friends social interaction style and submit report.

**Books and References:**


1. Compton, W. C., & Hoffman, E. (2013). Positive Psychology The Science of Happiness and Flourishing (2nd ed.). Belmont, CA Wadsworth.
2. DeWall, C. N., & Myers, D. G. (2023). Psychology in everyday life (6th ed.). New York, NY: Worth.
3. Goleman, D. (1995). Emotional Intelligence: Why It Can Matter More Than IQ. Bantam Books. Peterson, C., & Seligman, M. (2004). Character strengths and virtues. Oxford University Press.
4. Plomin, R., DeFries, J. C., Knopik, V. S., & Neiderhiser, J. M. (2016). Behavioral Genetics (7th ed.). Worth Publishers.
5. Sarafino, E. P., & Smith, T. W. (2016). Health Psychology: Biopsychosocial Interactions. Wiley.
6. Sternberg, R. J., & Sternberg, K. (2016). Cognitive Psychology (7th ed.). Cengage Learning.
7. Suzanne C., de Janasz., Karen O., Dowd.., Beth Z., & Schneider. (2015). Interpersonal Skills in Organizations .(5th ed.). New York , McGraw-Hill Education.
8. Weiten, W. (1998). Psychology: Themes and variations (4th ed.). Thomson Brooks/Cole Publishing Co.

| Human Behaviour in Organizations | | | | | |
|---|---|---|---|---|---|
| Course code | HSMC-21G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Human Behaviour in Organizations | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Rationale:**

An understanding of how human Behaviour functions within an organization is central to establishing a business's goals and nurturing a workforce that can work effectively as a team to reach them. This helps create the cohesion and shared values that form the culture of an organization. By studying this course the students shall learn to empathize with what makes people behave the way they do. It will further help them understand their own Behaviour, attitudes, ethical views and performance

**Learning Course Objectives :**

1. Understand the process of Human Behaviour and the factors influencing human behavior
2. Understand the factors that form individual's values and attitudes and how these in turn influence human behaviour
3. Learn various theories of Motivation and understand how motivation plays a strong role in influencing human Behaviour at work
4. Learn various kinds of stresses that one can go through, the stressors thereof and how it can be managed for better human Behaviour and job satisfaction

**Unit-1**

**Human Behaviour :** Definition and Meaning of Human Behaviour at workplace, Human Behaviour Process, Foundations of Individual Behaviour: Biographical Characteristics : Age, gender, experience, family structure, etc , Abilities : Intellectual, Physical and Ability-Job Fit, Personalities within a person : Determinants of Personality, Personality Traits , Learning and shaping behaviours, Ego States of a person : Parent, Adult and Child , Life Positions , Perception : Factors influencing

**Unit-II**

**Values , Attitudes and Job Satisfaction :** Values : Definition, Meaning, Sources and Types and how they influence Behaviour, Attitudes : Sources, Types and their influence on Behaviours Job Satisfaction : Meaning, Job elements and satisfaction, job satisfaction and human Behaviour

**Unit-III**

**Motivation and Human Behaviour at Work :** Motivation – it's meaning, nature, features and types, Theory X and Theory Y, Maslow's Theory of Hierarchy of Needs, Herzberg's Two-Factor Theory , Elderfer's ERG Theory , McClelland's Theory of Needs.

**Unit-IV**

**Work Stress and Coping Strategies :** Definition, Meaning and Types, Consequences of Stress – Physiological, Psychological and Behavioural Symptoms, Potential Sources of Stress – Environmental and Organisational, Stress Management – Importance and Strategies of Managing Stresses, Implication on Satisfaction, Behaviour, and Performance.

**References/Suggested Learning Resources:**

1. Organisational Behaviour, Stephen Robbins, PHI
2. Organisational Behaviour – Text, Cases and Games, P Subba Rao, Himalaya Publishing House
3. Organisational Behaviour, B Hiriyappa, New Age International Publishers

NOTE: Students should Observe themselves as well as employees of any organization and analyse why they are such. what they are, how their behaviours have changed over time, and what could be the factors leading to the change. Reflect and reproduce few incidences in your life on the following aspects:

i) The new personality traits that you added to yourself and how it impacted your behavior.
ii) How a certain set of perceptions led you to behave the way you did and your realization on the same.
iii) What new learning and how did it change your behavior at home and with your friends.
iv) Describe your values and attitude that led you to behave the way you did while working on some team assignment.
v) What are your current motivational needs? When, why and how will they change and how will they in turn affect your behavior.

# Semster-8

| AI Ethics( Artificial Intelligence Ethics) | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-CSE-452G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Artificial Intelligence Ethics | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**COURSE OBJECTIVES:**

1. Understand the fundamentals of AI Ethics
2. Learn the fundamentals & various terminology in creating a safer AI
3. Understand the principles and fundamentals of Singularity
4. Understand the Superintelligent AI
5. Understand the basic concepts and techniques of Algorithm Bias
6. Utilize the understanding to develop Algorithms for safer AI development

**Unit 1:**

**Introduction:**
Ethics of AI, Benefits & risks of artificial intelligence, The singularity, Three Major Singularity Schools, The value alignment problem, Principles for creating safer AI, Algorithmic bias: From discrimination discovery to fairness-aware data mining,

**Unit 2:**

**AI and State: Data, Individuals, and Society:**
Individuals and society, Fairness and bias, ethics, legality, data collection and public use, Democracy Killer robots, Love Robots, Automation, Self Driving cars, Robots rights, Living with Alien minds, Selfconciousness and superintelligence, Case Study: Rethinking AI Ethics with Data Activism

**Unit 3:**

**AI and Business: Algorithm Bias**
Data biases, Word Embeddings, facial recognition, prediction algorithm, Disinformation, overfitting, causation vs correlation, Fairness in facial recognition, natural language processing, Case study: Algorithmic Transparency in the Public Sector, Law and Regulation of AI: Global Perspective

**Unit 4:**

**AI and Society: Applications, Challenges and Opportunities**

Understand conceptions of global governance, corporate social responsibility, decision-making under risk, and market failures to investigate issues of global justice raised by AI. Case Study: AI and Nigeria: Exploring Threats to Human Rights, AI Ethics in the LAC Region,

**References:**


1.Bostrom, N. (2014), Superintelligence: Paths, Dangers, Strategies, Oxford University Press.

2. Wallach, W., Allen, C. (2008), Moral Machines, Oxford University Press.

3. N. Bostrom and E. Yudkowsky. 'The ethics of artiûcial intelligence'. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artiûcial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.

4.'Benifits & risks of artificial intelligence', Future of Life Institute

5. 'Top 9 ethical issues in artiûcial intelligence', World Economic Forum, 21 Oct 2016

6. E. Yudkowsky. 'Artiûcial intelligence as a positive and negative factor in global risk' In Global Catastrophic Risks, edited by Nick Bostrom and Milan M. Cirkovic, 308—345. New York

7. Chalmers, D. (2010). he singularity: A philosophical analysis. Journal of Consciousness Studies, 17(9-1), 7-65.

8. Bostrom, N. (2012). he Superintelligent Will: Motivation and Instrumental Rationality in Advanced Artiûcial Agents. Minds & Machines 22: 71–85.

9. Binns, R. (2017). 'Algorithmic Accountability and Public Reason', Philosophy & Technology

10. https://www.ed.ac.uk/files/atoms/files/ethics_of_ai_course_guide_002.pdf

11.https://www.lse.ac.uk/study-at-lse/online-learning/courses/ethics-of-ai

| Soft Computing | | | | | |
|---|---|---|---|---|---|
| Course code | PCC-AIML-454G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Soft Computing | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**COURSE OBJECTIVES:**

1. Understand the fundamentals of Soft Computing Methods
2. Learn the fundamentals & various topologies and learning algorithms of ANN
3. Understand the principles and fundamentals of Fuzzy Logic
4. Understand the Fuzzy Rule based systems
5. Understand the basic concepts and techniques of Genetic Algorithms
6. Utilize the Neural, Fuzzy and Genetic Algorithms for real-time application development

**UNIT 1**

**Introduction to Soft Computing**: Concept of Computing Systems, Soft Computing Versus Hard Computing, Characteristics of Soft Computing, Different Techniques of Soft Computing Basic of Neural Networks, its working and classifications, and Some Applications of Soft Computing Techniques;

**UNIT 2**

Fuzzy Logic: Introduction to fuzzy Logic, Classical and Fuzzy Sets, fuzzy and Probabilistic approach Overview of Classical Sets, Membership Function, Operations on Fuzzy Sets: Compliment, Intersection, Union, Combination of Operations, Aggregation Operation.

**UNIT 3**

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations Numbers, Multi-Valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

## UNIT 4

Genetic Algorithm: Introduction to Genetic Algorithm, Why Genetic Algorithm, and Biological Background Related to GA: The Cell, Chromosomes, Genetics, Reproduction, Natural Selection, and Basic Termologies in GA: Individuals, Genes, Fitness, Population, General Genetic Algorithm, Operation in Genetic Algorithm: Encoding, Selection, Crossover, Mutation, Stopping Condition for GA

**Suggested References Books:**


1. F. Martin et al., *Fuzzy Logic: A Practical approach*, (1e), AP Professional, 2014.
2. T J. Ross, *Fuzzy Logic with Engineering Applications*, (4e), Willey India, 2016.
3. S. Rajasekaran and G.A.V Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications*, (1e), Prentice Hall India, 2011
4. S. Haykin, *Neural Networks and Learning Machines*, (3e), PHI Learning, 2011
5. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms", Pearson Education, 2013.


**Course outcomes:**

1. Acquire the knowledge on soft computing methods.
2. Acquire the knowledge on constructing a neural network , Identify the basic Neural net and learning algorithm to apply for a real time problem
3. Acquire the ability to use Fuzzy operators, membership functions, Fuzzification and Defuzzification Techniques
4. Gain Knowledge on applying the Fuzzy rules to different applications
5. Acquire the knowledge of fitness functions and Genetic operators
6. Apply the Genetic Algorithm to real-time applications

| Artificial Intelligence Ethics Lab | | | | | |
|---|---|---|---|---|---|
| Course code | LC-CSE-470G | | | | |
| Category | Laboratory Course | | | | |
| Course title | Artificial Intelligence Ethics Lab | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 0 | 0 | 2 | 1 | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**NOTE:**

1. **Lab programs/activities can be designed and developed by the subject faculty using Python or any suitable Open Source tools/ software.**
2. **Min 15 Lab activities will be carried out from the offered course contents of AI Ethics Course in the semester.**

| Soft Computing Lab | | | | | |
|---|---|---|---|---|---|
| Course code | LC-CSE-472G | | | | |
| Category | Laboratory Course | | | | |
| Course title | Soft Computing Lab | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 0 | 0 | 2 | 1 | |
| Branches (B. Tech.) | Computer Science and Engineering | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

NOTE: Minimum 15 Lab activities / programs related to the course contents of Soft Computing Methods can be designed and developed by the subject faculty using MATLab/Python / any suitable Open Source tools/ software.

Plotting different activation functions

Practice of Neural Network tool for : Simple Logic functions , AND/OR Problems,

Practice of Fuzzy Logic tool for : Fuzzy functions, Fuzzy operations,

**Project-III**

| | | | | | |
|---|---|---|---|---|---|
| Course code | PROJ-CSE-422G | | | | |
| Category | Professional Core Course | | | | |
| Course title | Project-III | | | | |
| Scheme and Credits | L | T | P | Credits | Semester 8 |
| | 0 | 0 | 8 | 4 | |
| Class work | 50 Marks | | | | |
| Exam | 50 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hrs | | | | |

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks),
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

# OPEN ELECTIVES-II

## QUALITY ENGINEERING

| | | | | | |
|---|---|---|---|---|---|
| Course code | PEC-ME-410G | | | | |
| Category | Open Elective Courses | | | | |
| Course title | QUALITY ENGINEERING | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-8 |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT 1**

**Basic Concepts of Quality:** Definitions of Quality and its importance in industry, Quality function, Quality Characteristics, Quality process, Quality Traits, Applications of Quality Concept, Introduction to quality control, Computer aided quality control, Total quality control(TQC) and its implementation, Elements of TQC, Quality Circle, Objectives of quality circle, Role of management in quality circle, Quality in service organizations, characteristics of a service organization, Important service dimensions, Design of service quality.

**UNIT2**

**Basic Statistical Concepts:** The Concept of variation, Distinction between variables and attributes data, The frequency distribution, graphical representation of frequency distribution, Quantitative description of distribution, the normal curve, concept of probability, laws of probability, probability distributions, hyper geometric distribution, binomial distribution, The Poisson distribution.

**UNIT3**

**Quality systems:** Quality systems, Need for quality System, Need for standardization, History of ISO:9000 series standards and its features, steps to registration, India and ISO:9000, Automated inspection systems technologies, Different forms of Inspection, Industrial inspection,

**UNIT4**

**Total Quality Management:** Introduction o TQM, Concepts, Characteristics of TQM, Relevance of TQM, Approaches to TQM Implementation, TQM philosophies, Taguchi Philosphy, JIT, Kaizen, Six Sigma approach, 5-S approach

**Course Outcomes**: Upon completion of this course the student will be able to:

1. Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability
2. Use control charts to analyze for improving the process quality.
3. Describe different sampling plans
4. Acquire basic knowledge of total quality management
5. Understand the modern quality management techniques

**Text Books:**


1. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi
2. Quality Management, Kanishka Bed, Oxford University Press, New Delhi
3. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi
4. Fundamentals of quality control and improvement, A Mitra, Mcmillan pub. Company, NY


**Reference Books:**


1. Fundamentals of Applied Statistics, Gupta and Kapoor, Sultan Chand and Sons, New Delhi.

**WIRELESS ADHOC AND SENSOR NETWORKS**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-ECE-430G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Wireless Adhoc and Sensor Networks | | | | |
| Scheme and Credits | L | T | P | Credits | SEMESTER 8 |
| | 3 | 0 | | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Objectives of the course**

2. Learn Ad hoc network and Sensor Network fundamentals
3. Understand the different routing protocol
4. Have an in-depth knowledge on sensor network architecture and design issue.
5. Understand the transport layer and security issues possible in Ad hoc and Sensor networks
6. Have an exposure to mote programming platforms and tool.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT- I**

**Introduction to Ad Hoc Networks**: Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

**UNIT- II**

**Data Transmission:** Broadcast storm problem, Broadcasting, Multicasting and Geocasting TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT- III**

Basics of Wireless, Sensors and Applications: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

**UNIT- IV**

**Data Retrieval in Sensor Networks**: Routing layer, Transport layer, High-level application

layer support; Adapting to the inherent; dynamic nature of WSNs; Sensor Networks and mobile robots. Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

**Sensor Network Platforms and Tools:** Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms - Operating System: TinyOS– Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns2 and its sensor network extension, TOSSIM.

**Suggested Books:**

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3

2.Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 ( Morgan Kauffman

**Course Outcomes:**

1. Understand the needs of Wireless Adhoc and Sensor Network in current scenario.
2. Describe current technology trends for the implementation and deployment of wireless Adhoc/sensor networks.
3. Discuss the challenges in designing MAC, routing.
4. Transport protocols for wireless Ad-hoc/sensor networks.
5. Explain the principles and characteristics of wireless sensor networks.

**TRAFFIC ENGINEERING AND ROAD SAFETY**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-CE- 448G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Traffic Engineering and Road Safety | | | | |
| Scheme and Credits | L | T | P | Credits | SEMESTER 8 |
| | **3** | **0** | 0 | **3** | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**COURSE OBJECTIVES:**

1. Acquaint the students to basic concepts of Traffic and their significance.
2. To stimulate the students to think systematically and objectively about various traffic problems

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT1**

**Traffic Characteristics**: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India.

**Traffic Studies:** Traffic volume study, speed study and origin and destination study. Speed and delay study.

**UNIT2**

**Traffic Accidents**: Accident surveys. Causes of road accidents and preventive measures. Capacity and Level of Service.

Relationship between speed, volume and density, PCU, Design service volume, Capacity of non-urban roads. IRC recommendations, Brief review of capacity of urban roads.

**UNIT3**

**Traffic Control Devices**: Signs, Signals, markings and islands. Types of signs, Types of signals, Design of Signal, Intersections at grade and grade separated intersections. Types of grades separated intersections, Parking surveys: On street parking, off street parking.

**UNIT-4**

Road safety audit, RSA team, RSA Report, Elements of RSA, Vehicular air pollution and Situation in India, Motor vehicle act, Vehicular emission norms in India and abroad, Alternate fuels, Factors affecting fuel consumption.

**COURSE OUTCOMES:**

After completing this course, students should be able:

- To realize the significance of traffic engineering in today life.
- To understand the processes involved in traffic studies.
- To appreciate the role of Traffic regulations.

**RECOMMENDED BOOKS:**


- Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.
- Highway Engg by S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
- Traffic Engg and Transport Planning by L.R.Kadiyali, Khanna Publishers, Delhi.
- Principles of Transportation and Highway Engineering by G.V.Rao, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.

**INTELLIGENT INSTRUMENTATION FOR ENGINEERS**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-ECE-452-G | | | | |
| Category | Open Elective Course | | | | |
| Course title | INTELLIGENT INSTRUMENTATION FOR ENGINEERS | | | | |
| Scheme and Credits | L | T | P | Credits | SEMESTER 8 |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Course Objective:**

1. Study the basic principles of intelligent instrumentation.
2. Understand Interfacing of Instruments with computer.
3. Understand the software filters.

## Section-A

**INTRODUCTION:** Definition of an intelligent instrumentation system; feature of intelligent instrumentation; components of intelligent instrumentation; Block diagram of an intelligent instrumentation.

## Section-B

**INTERFACING INSTRUMENTS & COMPUTERS:** Basic issue of interfacing; Address decoding; Data transfer control; A/D converter; D/A converter; Other interface consideration.

## Section-C

**INSTRUMENTATION/ COMPUTER NETWORKS:** Serial & parallel interfaces; Serial communication lines; Parallel data bus; EEE 488bus; Local area networks (LANs): Star networks, Ring & bus networks, Fiber optic distributed networks, Field bus; Communication Protocols for very large systems: communication network rationalization.

## Section-D

**SOFTWARE FILTERS:** Description of Spike Filter, Low pass filter, High pass filter etc.

**TEXT BOOK:**

Principles of measurement & Instrumentation: Alan S. Moris; PHI

**Course Outcomes:**

At the end of the course, students will demonstrate the ability to:

1. Understand the intelligent instrumentation.
2. Can Interface the Instruments with computer.

**CONVENTIONAL AND RENEWABLE ENERGY RESOURCES**

| | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-EE- 08G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Conventional And Renewable Energy Resources | | | | |
| Scheme and Credits | L | T | P | Credits | SEMESTER 8 |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objective:**

1. The course will provide understanding of power generation technology using conventional and non-conventional energy sources which will be useful for understanding the operation and working of power plants.
2. Students will learn basics of Tariff structure for energy production.
3. Students will understand the operation, maintenance and working of substations.

**UNIT1**

INTRODUCTION: Energy sources, their availability, recent trends in Power Generation, Amount of generation of electric power from Conventional and non-conventional sources of energy in Haryana, India and some developed countries of the world. Interconnected Generation of Power Plants.

**UNIT2**

POWER GENERATION PLANNING: Load forecasting, load curves, load duration curve, Base load and Peak load Power Plants, connected Load, maximum demand, demand factor, Group diversity factor, load factor, significance of load factor, plant factor, capacity factor, selection of unit size, No. of Units, reserves, cost of power generation, Depreciation, tariff.

**UNIT3**

CONVENTIONAL ENERGY SOURCES: Selection of site, capacity calculations, classification, Schematic diagram and working of Thermal Power Stations(TPS), Hydro Electric Plant and Nuclear Power Plant .

NON-CONVENTIONAL ENERGY SOURCES: Selection of site, capacity calculations, Schematic diagram and working of Wind, Solar, fuel cell, Magneto Hydro Dynamic (MHD) system.

**UNIT4**

ELECTRIC ENERGY CONSERVATION & MANAGEMENT: Energy management, Energy Audit, Energy Efficient Motors, Co-generation.

**Course Outcomes:**

After learning the course the students should be able to:

1. Describe the working of thermal power station using single line diagram and state the functions of the major equipment and auxiliaries of a TPS.
2. Explain hydro energy conversion process with block diagrams and identify the appropriate site for it.
3. Explain the working of Nuclear power station.
4. Describe the working of Solar Power station and wind power plant.
5. Compare various economic aspects of different types of Tariffs.
6. Classify various substations and describe working of its equipments.
7. Compare various generating systems.

**REFERENCES:**

1. Renewable Energy Sources and Emerging Technologies : D.P Kothari, K.C.Singla, Rakesh Ranjan- PHI Publications, 'Latest Edition'.
2.Electric Power Generation, B.R.Gupta, 'Latest Edition'.
3. Power Generation, Operation and Control, Wood and Wollenberg, John Wiley & Sons,'Latest Edition'.
4. A Course in Electric Power System, Soni, Gupta, Bhatnagar, Dhanpat Rai & Sons, 'Latest Edition'.
5. Power System Engineering, Nagrath & Kothari, Tata Mc-Graw Hill, New Delhi, 'Latest Edition'.
6. Power Plant Engg: G.D. Rai, 'Latest Edition'.
7. Electric Power: S.L. Uppal (Khanna Publishing), 'Latest Edition'.

| Open Source Programming | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-DS-431G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Open Source Programming | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objectives of the course:**

The objective of this course are:

1. To comprehend and analyze the basic concepts of web frameworks
2. To describe how different frameworks work and to choose the framework depending on the application.
3. To demonstrates the uses of different web frameworks.

**Detailed Course**

**Unit-I**

**Django Framework:** Introduction and Installation – MVT Structure – Creating a project and app in Django – Django, Forms – creation of forms – render forms - form fields – form fields widgets – formsets – Django Templates– Template filters – Template Tags – Variables – Operators – for loop- If-Django Templates – Template inheritance
**Django Model:** Django Views – Function based views – Class based generic views – Models – ORM – Basic App Model – Intermediate fields - Uploading Images – Render Model – Build-in and custom field validations – Handling Ajax Request – Django Admin interface

**Unit-II**

**Ruby on Rails Framework :** Ruby of Rails introduction – Installation – MVC architecture - IDE – Rails scripts - Directory structure- Database setup – Active records - RVM – Bundler - Rails Migration – controllers –routes – views – layouts - scaffolding – sessions – file upload – filters - Ajax

**ExpressJS:** Introduction – installation – Node JS Environment Setup – Routing – HTTP Methods – URL Building – Middleware – Templating – Different template Engines– Static Files – Form Data

**Unit-III**

**ExpressJS & Database:** Database– Mongo DB – Mongoose – Cookies, sessions – Authentication – RESTFUL APIs – Scaffolding – Error Handling – File upload
**Angular JS:** Introduction – Environment setup – First application – Data binding & Directives – Expressions – Controllers – Scopes – Events – Services – Filters - Modules

**Unit-IV**

**Angular JS – Routing:** HTML DOM -Forms – Validation – Routing – Includes – AJAX – Views – Dependency Injection- Custom Directives – Single Page applications
**Recent Trends and contemporary issues**

**References Books:**


1. Aidas Bendoraitis, Jake Kronika, Django 3 Web Development Cookbook: Actionable solutions to common, Packt Publishing; 4th edition, 2020.
2. Michael Hartl, Ruby on Rails Tutorial, Addison-Wesley Professional; 6th edition, 2020.
3. Adam Freeman, Pro Angular 9: Build Powerful and Dynamic Web Apps, Apress, 4th Edition,2020.
4. Ethan Brown, Web Development with Node and Express, 2e: Leveraging the JavaScript Stack, O′Reilly; 2nd edition, 2019.
5. Lopatin, Ben, Django Standalone Apps, Apress, 1st Edition, 2020.
6. Simon D. Holmes and Clive Harbe, Getting MEAN with Mongo, Express, Angular, and Node, Second Edition, Manning Publications,2017.


**Course Outcomes:**

After successfully completing the course the student should be able to

1. Use Django framework to create basic website.
2. Use Ruby on Rails framework to quickly develop websites.
3. Use Express framework along with Node JS to render webpages effectively
4. Use Mongo DB along with Express to display dynamic web content
5. Use Angular JS to extend an enhance HTML pages
6. Implementing web-based solution effectively using different web frameworks.

| Essentials of Hadoop | | | | | |
|---|---|---|---|---|---|
| Course code | OEC-AI-436G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Essentials of Hadoop | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Objectives of the course:**

Provide the skills needed for building computer system for various applications in a career in Computer Science field.

1) Explain the characteristics of Big Data
2) Describe the basics of Hadoop and HDFS architecture
3) List the features and processes of MapReduce
4) Describe the basics of Pig

**Unit-I**

What is Big Data and where it is produced? Rise of Big Data, Compare Hadoop vs traditional systems, Limitations and Solutions of existing Data Analytics Architecture, Attributes of Big Data, Types of data, other technologies vs Big Data.

**Hadoop Architecture and HDFS** - What is Hadoop? Hadoop History, Distributing Processing System, Core Components of Hadoop, HDFS Architecture, Hadoop Master – Slave Architecture, Daemon types - Learn Name node, Data node, Secondary Name node.

**Unit-II**

Hadoop Clusters and the Hadoop Ecosystem- What is Hadoop Cluster? Pseudo Distributed mode, Type of clusters, Hadoop Ecosystem, Pig, Hive, Oozie, Flume, SQOOP. Hadoop MapReduce Framework - Overview of MapReduce Framework, MapReduce Architecture, Learn about Job tracker and Task tracker, Use cases of MapReduce, Anatomy of MapReduce Program.

**Unit-III**

MapReduce programs in Java- Basic MapReduce API Concepts, Writing MapReduce Driver, Mappers, and Reducers in Java, Speeding up Hadoop Development by Using Eclipse, Unit Testing MapReduce Programs, and Demo on word count example.

Hive and HiveQL- What is Hive?, Hive vs MapReduce, Hive DDL – Create/Show/Drop Tables, Internal and External Tables, Hive DML – Load Files & Insert Data, Hive Architecture & Components, Difference between Hive and RDBMS, Partitions in Hive.

**Unit-IV**

PIG vs MapReduce, PIG Architecture & Data types, Shell and Utility components, PIG Latin Relational Operators, PIG Latin: File Loaders and UDF, Programming structure in UDF, PIG Jars Import, limitations of PIG. Apache SQOOP, Flume
- Why and what is SQOOP? SQOOP Architecture, Benefits of SQOOP, Importing Data Using SQOOP, Apache Flume Introduction, Flume Model and Goals, Features of Flume, Flume Use Case.

HBase- What is HBase? HBase Architecture, HBase Components, Storage Model of HBase, HBase vs RDBMS, Introduction to Mongo DB, CRUD, Advantages of MongoDB over RDBMS, Use case.
Oozie and Zookeeper
Topics - Oozie – Simple/Complex Flow, Oozie Workflow, Oozie Components, Demo on Oozie Workflow in XML, What is Zookeeper? Features of Zookeeper, Zookeeper Data Model

**Reference Books:**


1. Hadoop – The Definitive Guide by Tom White, 4th EditionO Relly, 2015

2. Expert Hadoop Administration: Managing, Tuning, and Securing Spark, YARN, and HDFS by Alapati Sam R.,2017

3. Big Data and Hadoop- Learn by Example by Mayank Bhushan,BPB Pub,2018

4. Big Data and Hadoop by V. K. Jain, Khana Pub., 2017


**Course Outcomes:**

1. Understanding of Big Data problems with easy to understand examples.
2. History and advent of Hadoop right from when Hadoop wasn't even named Hadoop.
3. What is Hadoop Magic which makes it so unique and powerful.
4. Understanding the difference between Data science and data engineering, which is one of the big confusions in selecting a carrier or understanding a job role.
5. And most importantly, demystifying Hadoop vendors like Cloudera, MapR and Hortonworks by understanding about them.

| Industrial Psychology | | | | | |
|---|---|---|---|---|---|
| Course code | HSMC-22G | | | | |
| Category | Open Elective Course | | | | |
| Course title | Industrial Psychology | | | | |
| Scheme and Credits | L | T | P | Credits | |
| | 3 | 0 | 0 | 3 | |
| Class work | 25 Marks | | | | |
| Exam | 75 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Learning Objectives :**

1. To help learners understand and build knowledge about the basic concepts in the field of Industrial/ Organizational Psychology.
2. To help learners learn about the role and importance of psychological factors and processes in the world of work.
3. To facilitate in learners a foundation for higher education and a professional career in Industrial Psychology and Organizational Behaviour.

## Unit- I

**Introduction to Industrial/Organizational Psychology**

Introduction to Industrial/Organizational Psychology : What Is I/O Psychology?, I/O Psychology as a profession & as a science, History of the field of I/O Psychology.

Industrial- Organizational Psychology on the Job: Challenges and I-O psychology as a career, Problems for I-O Psychologists.

Industrial Psychology: Methods and basic Research strategies: Experimental method, Naturalistic observation, Survey and opinion polls; Statistical Analyses in Research: Descriptive, Inferential statistics.

## Unit-II

**Job Analysis:** What is job analysis: The job-oriented approach & the person-oriented approach, Purposes of job analysis, How job analysis information is collected; approaches to collecting job analysis information, Methods of job analysis , Job evaluation: setting salary levels

**Performance Appraisal**: Why do we appraise employees?, Performance criteria.

Methods for assessing job performance: Objective and subjective methods for assessing job performance; 360-degree feedback

## Unit-III

**Assessment Methods for Selection and Placement:** Job-Related characteristics; Different types of psychological tests based on format: group vs. individual, close-ended vs. open-ended; paper-and-pencil vs. performance; power vs. speed;

Different types of psychological tests based on what is measured: cognitive ability tests, psychomotor ability tests, knowledge and skills tests, personality tests, emotional intelligence tests, integrity tests, vocational interest tests;

Biographical information, interviews, work samples, assessment centers & electronic assessment.

**Placement/Recruitment:** Recruiting applicants; Getting applicants to accept and keep jobs offered ; Policies and issues with regard to selection: Reservation policy; gender and disability status of applicant.

## Unit-IV

**Training**

Needs assessment, Objectives, Training design: trainee characteristics; design factors; work environment;

**Training methods:** Traditional Training Methods- Presentation, Group Building Method; Advanced Training methods- Audiovisual instruction, autoinstruction, conference/lecture, on-the-job training, modeling/role-playing/simulation, e-learning, mentoring/executive coaching; Brief overview of delivery and evaluation of a training program

**Text Book:**

Spector, P. E. (2012). Industrial and Organizational Psychology: Research and practice. Singapore: Wiley. (Indian reprint 2016)

Books for reference:


1) Aamodt, M.G. (2016). Industrial/Organizational Psychology: An applied approach (8thed.). Boston, MA: Cengage Learning.
2) Aamodt, M.G. (2013). Industrial Psychology (7thed.). Boston, MA: Cengage Learning.
3) Aswathappa, K. (2013). Human resource management: Text and cases (8thed.). Chennai, India: McGraw Hill Education India.
4) Conte, J. M., & Landy, F. J. (2019). Work in the 21st century: An introduction to Industrial and Organizational Psychology (6th ed.). New York, NY: Wiley. (earlier editions: 2016, 2013, 2010, 2007, & 2004)
5) Levy, P. E. (2005). Industrial/Organizational Psychology: Understanding the workplace. Houghton Mifflin. (2019 edition published by Worth)
6) Luthans, F. (2017). Organizational behavior: An evidence-based approach (12th ed.). McGraw Hill Education.
7) Muchinsky, P. M. (2011). Psychology applied to work (10th ed.). Hypergraphic Press. (12th ed. published in 2018)
8) Newstrom, J. W. (2017). Organizational behavior: Human behavior at work (12th ed.). McGraw Hill Education.
9) Pareek, U., & Khanna, S. (2018). Understanding organizational behaviour(4th ed.). Oxford University Press.
10) Riggio, R. E. (2017). Introduction to Industrial/Organizational Psychology (7th ed.). New York, NY: Routledge.
11) Sinha, J. B. P. (2008). Culture and organizational behaviour. New Delhi: Sage.
12) Spector, P. E. (2016). Industrial and Organizational Psychology: Research and practice (7th ed.). New York: Wiley.
13) Vohra, N., Robbins, S. P., & Judge, T. A. (2018)Organizational behavior (18thed.). Noida, India: Pearson India Education Services.