M.D. UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

B. TECH (Computer Science and Engineering)

SEMESTER 7th & 8th

'G' Scheme effective from 2021-22

COURSE CODE AND DEFINITIONS

Course Code	Definition
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
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar

General Notes:

1. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

2. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

B.Tech (COMPUTER SCIENCE & ENGINEERING)
Scheme of Studies/Examination
Semester 7th
w.e.f. 2021-2022

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assesment	Theory	Practical	Total	
1	Professional Core Course	PCC-CSE-401G	Neural Networks	3	0	0	3	3	25	75		100	3
2	Professional Elective Course	Refer to Annexure IV	Professional Elective –IV	3	0	0	3	3	25	75		100	3
3	Professional Elective Course	Refer to Annexure V	Professional Elective –V	3	0	0	3	3	25	75		100	3
4	Open Elective Course	Refer to Annexure OEC-I	Open Elective –I	3	0	0	3	3	25	75		100	3
5	Professional Core Course	LC-CSE-421G	Neural Networks Lab	0	0	2	2	1	25	-	25	50	3
6	Project	PROJ-CSE-423G	Project-II	0	0	6	6	3	50	-	50	100	3
7	Professional Core Course	PT-CSE-425G	Practical Training-II	0	0	0	1	-	-	-	-	-	-
		TOTAL CREDIT						**16**	**175**	**300**	**75**	**550**	

NOTE:

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.

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

Annexure IV: Professional Elective -IV

1. PEC-CSE-403G: Software Project Management
2. PEC-CSE-405G: Web Mining
3. PEC-CSE-407G: Predictive Analysis
4. PEC-CSE-409G: Information Hiding Techniques

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. PEC-CSE-417G: Advanced Computer Architecture

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

B.Tech (COMPUTER SCIENCE & ENGINEERING)
Scheme of Studies/Examination
Semester 8th
w.e.f. 2021-2022

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assesment	Theory	Practical	Total	
1	Professional Core Course	PCC-CSE-402G	Machine Learning	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-CSE-404G	Big Data Analytics	3	0	0	3	3	25	75		100	3
3	Open Elective Course	Refer to Annexure OEC-III	Open Elective-II	3	0	0	3	3	25	75		100	3
4	Professional Core Course	LC-CSE-410G	Big Data Analytics Lab	0	0	0	2	1	25		25	50	3
5	Professional Core Course	LC-CSE-412G	Machine Learning with Python Lab	0	0	2	2	1	25		25	50	3
6	Project	PROJ-CSE-422G	Project-III	0	0	8	4	4	50		50	100	3
		TOTAL CREDIT						**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-452-G: Intelligent Instrumentation for Engineers
4. OEC-CE- 448G: Traffic Engineering and Road Safety
5. OEC-EE-08G: Conventional and Renewable Energy Resources

NEURAL NETWORK

Course code	PCC-CSE-401G				
Category	Professional Core Course				
Course title	Neural Networks				
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 a Neural Networks.
2. To study the basic of neural network and its activation functions.
3. To understand and use of perceptron and its application in real world
4. To develop an understanding of essential NN concepts such as: learning, feed forward and feed backward
5. To design and build a simple NN model to solve a 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

Overview of biological neurons: Structure of biological neuron, neurobiological analogy, Biological neuron equivalencies to artificial neuron model, Evolution of neural network.

Activation Functions: Threshold functions, Signum function, Sigmoid function, Tan-hyperbolic function, Stochastic function, Ramp function, , Linear function, Identity function.

ANN Architecture: Feed forward network, Feed backward network, single and multilayer network, fully recurrent network,

UNIT 2

McCulloch and Pits Neural Network (MCP Model): Architecture, Solution of AND, OR function using MCP model, Hebb Model: Architecture, training and testing, Hebb network for AND function.

Perceptron Network: Architecture, training, Testing, single and multi-output model, Perceptron for AND function

Linear function, application of linear model, linear seperatablity, solution of OR function using liner seperatablity model.

UNIT 3

Learning: Supervised, Unsupervised, reinforcement learning, Gradient Decent algorithm, generalized delta learning rule, Habbian learning, Competitive learning, Back propogation Network: Architecture, training and testing,

UNIT 4

Associative memory: Auto associative and Hetro associative memory and their architecture, training (insertion) and testing (Retrieval) algorithm using Hebb rule and Outer Product rule. Storage capacity, Testing of associative memory for missing and mistaken data, Bidirectional memory

Course Outcomes:

1. For a given conceptual problem student will able to analyze the problem and able to visualize in NN
2. Students will be familiar with different NN models.
3. Students will be able to understand the concept of learning in NN.

Text Books:

1. Introduction to artificial Neural systems by Jacek M. Zurada, 1994, Jaico Publ. House.
2. Principles of Soft Computing by S.N. Deepa, S.N. Sivanandam., Weley publication

Reference Books:

1. “Neural Networks :A Comprehensive formulation”, Simon Haykin, 1998, AW
2. “Neural Networks”, Kosko, 1992, PHI.
3. “Neural Network Fundamentals” – N.K. Bose , P. Liang, 2002, T.M.H
4. Neural Network , T.N.Shankar, University Science Press
5. Neuro Fuzzy Systems, Lamba, V.K., University Science Press

NEURAL NETWORKS LAB

Course code	LC-CSE-421G				
Category	Professional Core Course				
Course title	Neural Networks 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					

Objectives of the course

1. To understand the different issues involved in the design and implementation of a Neural Networks.
2. To implement the basic of neural network and its activation functions.
3. To develop an understanding of essential NN concepts such as: learning, feed forward and feed backward
4. To design and implement a simple NN model to solve a problem

Practical problems:

1. Introduction to Matlab in context with NN.
2. Plotting of Activation Functions: Threshold functions, Signum function, Sigmoid function, Tan-hyperbolic function, Ramp function, Identity function using matlab
3. Implementation of some basic model like MCP with suitable example.
4. Implementation of Hebb model with suitable example.
5. How the weights and bias values affect the output of a neuron.
6. How the choice of activation function (or transfer function) affects the output of a neuron. Experiment with
7. Implementation of linearly separable concept for a problem.
8. To study some basic neuron models and learning algorithms by using Matlab's neural network toolbox.

Outcomes of the course

1. For a given conceptual problem student will be able to analyze the problem and able to visualize using NN
2. Students will be familiar with different NN models and its implementation.
3. Students will be able to understand the concept of learning in NN and its implementation.

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.

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.

Web Mining

Course code	PEC-CSE-405G				
Category	Professional Elective Course				
Coursetitle	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:

pages
power of web search engine by classifying the web documents and identifying the web

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)

INFORMATION HIDING TECHNIQUES

Course code	PEC-CSE-409G				
Category	Professional Elective Course				
Course title	Information Hiding Techniques				
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 learn about data hiding applications and their techniques.
2. To learn about hacking.
3. To learn security based protocols, attacks and intrusions.
4. To work with advance data hiding techniques.

UNIT 1

Introduction to Information Hiding: Types of Information Hiding, Applications, Importance & Significances. Differences between cryptography and steganography, Wisdom from Cryptography, types of steganography their application and significances. Past present and future of steganography

UNIT 2

Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data, Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text, Steganographic system, Study of Different methods of insertion and retrieval of message using image steganography, Study of histrogram analysis using MATLAB of original image and stegno image

UNIT 3

Basics of watermarking, Watermarking process, Watermarking applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking, Bit plane of an Image, study of noises in stego images and their

comparisons, Robustness of watermarking schemes on different attacks like blurring, cropping , compression of theimage. PSNR calculation of the images.

UNIT 4

Use of image steganography in biometric sciences, Study of security enhancement of biometric template using steganographic Frame proof codes:-Definition, Introduction of frame proof codes, Methods to obtain 2- frame proof codes using mutually orthogonal latin squares. Use of frame proof codes in ownership and software piracy.

Course Outcomes:

After completing the course the student will be able to:

1. Explain information security.
2. Give an overview of access control of relational databases.
3. State the basic concept in information systems security, including security technology and principles, software security and trusted systems and IT security management.
4. Learn advance data hiding techniques.

Suggested Books:

1. Recent Advances in Information Hiding and Applications, Pan, J.-S., Huang, H.-C., Jain, L.C., Zhao, Y., Springer (2013).
2. Information Hiding Techniques for Steganography and Digital Watermarking, StefanKatzenbeisser, Fabien A. P. Petitcolas, Artech House, 2000.

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		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.

ADVANCED COMPUTER ARCHITECTURE

Course code	PCC-CSE-417G				
Category	Professional Elective Course				
Course title	Advanced Computer Architecture				
Scheme and Credits	L	T	P	Credits	
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

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.

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

Architecture And Machines: Some definition and terms, interpretation and microprogramming. The instruction set, Basic data types, Instructions, Addressing and Memory. Virtual to real mapping. Basic Instruction Timing.

Unit 2

Cache Memory Notion: Basic Notion, Cache Organization, Cache Data, adjusting the data for cache organization, write policies, strategies for line replacement at miss time, Cache Environment, other types of Cache. Split I and D-Caches, on chip caches, Two level Caches, write assembly Cache, Cache references per instruction, technology dependent Cache considerations, virtual to real translation, overlapping the Tcycle in V-R Translation, studies. Design summary.

Unit 3

Memory System Design: The physical memory, models of simple processor memory interaction, processor memory modeling using queuing theory, open, closed and mixed-queue models, waiting time, performance, and buffer size, review and selection of queuing models, processors with cache.

Unit 4

Concurrent Processors: Vector Processors, Vector Memory, Multiple Issue Machines, Comparing vector and Multiple Issue processors.

Shared Memory Multiprocessors: Basic issues, partitioning, synchronization and coherency, Type of shared Memory multiprocessors, Memory Coherence in shared Memory Multiprocessors.

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.

Text Book:

Advance computer architecture by Hwang & Briggs, 1993, TMH.

Reference Books:

Pipelined and Parallel processor design by Michael J. Fiynn – 1995, Narosa

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

BASICS OF MACHINE LEARNING

Course code	PCC-CSE-402G				
Category	Professional Core Course				
Course title	Basics of Machine Learning				
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

1. To learn the basic concept of machine learning and types of machine learning.
2. To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.

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

Machine Learning: Definition, History, Need, Features, Block diagrammatic representation of learning machines, Classification of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement Learning, Machine Learning life cycle, Applications of Machine Learning.

Unit-2

Dimensionality Reduction

Dimensionality reduction: Definition, Row vector and Column vector, how to represent a dataset, how to represent a dataset as a Matrix, Data preprocessing in Machine Learning: Feature Normalization, Mean of a data matrix, Column Standardization**,** Co-variance of a Data Matrix, Principal Component Analysis for Dimensionality reduction.

Unit-3

Supervised Learning

Supervised Learning: Definition, how it works. Types of Supervised learning algorithms k-Nearest Neighbours, Naïve Bayes, Decision Trees, Naive Bayes, Linear Regression, Logistic Regression, Support Vector Machines.

Unit-4

Unsupervised Learning

Unsupervised Learning: Clustering: K-means. Ensemble Methods: Boosting, Bagging, Random Forests.

Evaluation: Performance measurement of models in terms of accuracy, confusion matrix, precision & recall, F1-score, receiver Operating Characteristic Curve (ROC) curve and AUC, Median absolute deviation (MAD), Distribution of errors

Suggested books

1. E. Alpaydin, Introduction to
2. Machine Learning, Prentice Hall of India, 2006.
2. T Hastie, R Tibshirani and J Friedman, The Elements of Statistical Learning Data Mining, Inference, and Prediction, 2nd Edition, Springer, 2009.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2010.

Suggested reference books

1. R. O. Duda, P. E. Hart, and D.G. Stork, Pattern Classification, John Wiley and Sons, 2012.
2. Simon O. Haykin, Neural Networks and Learning Machines, Pearson Education, 2016

Course Outcomes

1. Understand fundamental issues and challenges of supervised and unsupervised learning techniques.
2. Extract features that can be used for a particular machine learning approach
3. To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
4. To mathematically analyse various machine learning approaches and paradigms.

BIG DATA ANALYTICS

Course code	PCC-CSE-404G				
Category	Professional Core Course				
Course title	Big Data Analytics				
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

1. To Provide an explanation of the architectural components and programming models used for scalable big data analysis.
2. To Identify the frequent data operations required for various types of data and Apply techniques to handle streaming data
3. To describe the connections between data management operations and the big data processing patterns needed to utilize them in large-scale analytical applications
4. To Identify describe and differentiate between relational and non-relational database and how Data Warehouses, Data Marts, Data Lakes, and Data Pipelines work.
5. Explain how the Extract, Transform, and Load process works to make raw data ready for analysis.

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 Big Data: Big Data: Why and Where, Application and Challenges, Characteristics of Big Data and Dimensions of Scalability, The Six V, Data Science: Getting Value out of Big Data, Steps in the Data science process, Foundations for Big Data Systems and Programming, Distributed file systems

Unit: 2

Data Repositories and Big Data Platforms: RDBMS, NoSQL, Data Marts, Data Lakes, ETL, and Data Pipelines, Foundations of Big Data, Big Data Processing Tools, Modern Data Ecosystem, Key Players, Types of Data, Understanding Different Types of File Formats, Sources of Data Using Service Bindings

Unit: 3

Introduction to Big Data Modeling and Management: Data Storage, Data Quality, Data Operations, Data Ingestion, Scalability and Security Traditional DBMS and Big Data Management Systems, Real Life Applications, Data Model: Structure, Operations, Constraints, Types of Big Data Model

Unit: 4

Big Data Integration and processing: Big Data Processing, Retrieving: Data Query and retrieval, Information Integration, Big Data Processing pipelines, Analytical operations, Aggregation operation, High level Operation, Tools and Systems: Big Data workflow Management

Suggested books:

Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Suggested reference books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
7. Pete Warden, "Big Data Glossary", O'Reily, 2011.
8. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012
10. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

Course Outcomes

1. For a given query Describe the Big Data landscape including examples of real world big data problems including the three key sources of Big Data: people, organizations, and sensor.
2. For a given specification, Recognize different data elements in your own work and in everyday life problems
3. For a given specification select a data model to suit the characteristics of your data
4. For a given problem one will be able to Retrieve data from example database and big data management systems and identify when a big data problem needs data integration
5. For a given problem one will be able to design an approach to leverage data using the steps in the machine learning process and apply them to explore and prepare data for modelling.

BIG DATA ANALYTICS LAB

Course code	LC-CSE-421G				
Category	Big Data Analytics				
Course title	Neural Networks Lab				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	0		3	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

A student has to attempt 12-15 practicals based on theory on an open-source tool.

MACHINE LEARNING WITH PYTHON

Course code	LC-CSE-421G				
Category	MACHINE LEARNING WITH PYTHON				
Course title	MACHINE LEARNING WITH PYTHON LAB				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	0		3	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

A student has to attempt 12-15 practicals based on theory on an open-source tool.

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.

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 GeocastingTCP 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.

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'.