Bachelor of Technology (Computer Science and Engineering)Credit Based Scheme of Studies/Examination

Semester IV (w.e.f Session 2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	PC-CS-202	Discrete Mathematics	3:0:0	3	3	75	25	0	100	3
2	PC-CS-204	Internet Technology and Management	3:0:0	3	3	75	25	0	100	3
3	PC-CS-206	Operating Systems	3:0:0	3	3	75	25	0	100	3
4	PC-CS-208	Design and Analysis of Algorithms	3:0:0	3	3	75	25	0	100	3
5	HTM-901	Universal Human Values II : Understanding Harmony	3:0:0	3	3	75	25	0	100	3
6	PC-CS-210L	Internet Technology and Management Lab	0:0:4	4	2	0	40	60	100	3
7	PC-CS-212L	Operating Systems Lab	0:0:4	4	2	0	40	60	100	3
8	PC-CS-214L	Design and Analysis of Algorithms Lab	0:0:4	4	2	0	40	60	100	3
		Total		**27**	**21**	**375**	**245**	**180**	**800**	
9	MC-901 *	Environmental Sciences	3:0:0	3	0	75	25	0	100	3

***MC-901 is a mandatory credit-less course and student has to get passing marks in order to qualify for theaward of B.Tech. Degree.**

HTM-901	Universal Human Values II: Understanding Harmony						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3.0**	**75**	**25**	**100**	**3 Hours**
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
Course Outcomes (CO)							
CO 1	Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.						
CO 2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.						
CO 3	Strengthening of self-reflection.						
CO 4	Development of commitment and courage to act.						

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' andExperiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment ofaspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrarinessin choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as thefoundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- fromfamily to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value inrelationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels ofexistence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on ProfessionalEthics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and

characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. todiscuss the conduct as an engineer or scientist etc.

READINGS:

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for lecture/practice sessions.

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at handand motivating students to reflect, explore and verify them.

Practice hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-

exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Practice experiments are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based onbasic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemedessential.

ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by

faculty mentor: 5 marks

Self-assessment: 5 marks

Assessment by peers: 5 marks

Socially relevant project/Group Activities/Assignments: 10 marks

Semester End Examination: 75 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Bachelor of Technology (Computer Science & Engineering)										
Credit-Based Scheme of Studies/Examination										
Semester V (w.e.f. session 2020-2021)										
S. No.	**Course Code**	**Subject**	**L:T:P**	**Hours/ Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of Exam (Hrs)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	ES-301	Microprocessor & Interfacing	3:0:0	3	3	75	25	0	100	3
2	PC-CS-301	Database Management Systems	3:0:0	3	3	75	25	0	100	3
3	PC-CS-303	Formal Language & Automata Theory	3:0:0	3	3	75	25	0	100	3
4	PC-CS-305	Essential of Information Technology	3:0:0	3	3	75	25	0	100	3
5	PC-CS-307	Computer Organization & Architecture	2:0:0	2	2	75	25	0	100	3
6	PEC	Elective-I	3:0:0	3	3	75	25	0	100	3
7	PC-CS-309L	Database Management Systems Lab	0:0:4	4	2	0	40	60	100	3
8	PC-CS-311L	Essential of Information Technology Lab	0:0:4	4	2	0	40	60	100	3
Total				**25**	**21**	**450**	**230**	**120**	**800**	
9	MC-904	Energy Resources & Management	3:0:0	3	0	75	25	0	100	3
10	SIM-301*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

PEC Elective-I
Digital Data Communication: PE-CS-T301
Parallel and Distributed Computing: PE-CS-T303
Information Theory and Coding: PE-CS-T305
Advanced Algorithms: PE-CS-T307

***Note:** SIM-301* is a mandatory credit-less course in which the students will be evaluated for the Summer Internship undergone after 4th semester and students will be required to get passing marks to qualify.

MC-904	ENERGY RESOURCES & MANAGEMENT						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**0**	**75**	**25**	**100**	**3**
Purpose	To make the students conversant with the basics concepts and conversion of various form of Energy						
COURSE OUTCOMES							
CO1	An overview about Energy Resources, Conventional and Non-conventional sources						
CO2	Understand the Layout and working of Conventional Power Plants						
CO3	Understand the Layout and working of Non-Conventional Power Plants						
CO4	To understand the Energy Management, Audit and tariffs, Role of Energy in Economic development and Energy Scenario in India						

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.

UNIT-II

Conventional Energy sources: Types of Conventional Energy sources, Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages/ disadvantages.

UNIT-III

Non-Conventional Energy sources: Types of Non-Conventional Energy sources , Basic principle, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant , Bio energy plants ,Geothermal energy plants and Tidal energy plants.

UNIT-IV

Energy Management: General Principles of Energy Management, Energy Management Strategy, Modern trends and developments towards Computerizations of Power System.

Energy Audit: Need, Types, Methodology and Approach.

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Indian energy scenario, long term energy scenario, energy sector reforms in India, energy strategy for the future.

References:

1. Energy Studies-Wiley Dream Tech India.
2. Non-conventional energy resources- Shobhnath Singh, Pearson.
3. Electrical Power Systems : Soni, Gupta, Bhatnagar – Dhanpat Rai & Sons
4. NEDCAP: Non Conventional Energy Guide Lines
5. Non conventional energy sources : G.D. Roy
6. Non Conventional energy resources :B H Khan - McGraw Hill
7. Applied Solar Energy : Meinel A B - Addison Wesley Publications
8. Direct Energy Conversion George: Sutton -McGraw

Bachelor of Technology (Computer Science & Engineering)										
Credit-Based Scheme of Studies/Examination										
Semester VII (w.e.f. session 2021-2022)										
S. No.	**Course Code**	**Subject**	**L:T:P**	**Hours/Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of Exam (Hrs)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	PE	Elective-IV	3:0:0	3	3	75	25	0	100	3
2	PE	Elective-V	3:0:0	3	3	75	25	0	100	3
3	OE	Open Elective-II	3:0:0	3	3	75	25	0	100	3
4	PROJ-CS-401	Project-II	0:0:12	12	6	0	40	60	100	3
5	PE-L	Elective-IV Lab	0:0:2	2	1	0	40	60	100	3
6	PE-L	Elective-V Lab	0:0:2	2	1	0	40	60	100	3
Total				**21**	**17**	**225**	**115**	**60**	**400**	
7	SIM-401*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

PE Elective-IV	**PE Elective-V**
Data Mining: PE-CS-D401	Soft Computing: PE-CS-D407
Software Verification and Validation and Testing:: PE-CS-D403	Neural Networks and Deep Learning: PE-CS-D409
Information Retrieval: PE-CS-D405	Object Oriented Software Engineering: PE-CS-D411
	Expert Systems: PE-CS-D413

OE Elective-II
Cyber Law and Ethics: OE-CS-401
Bioinformatics: OE-CS-403
Fiber Optic Communications: OE-CS-405
Industrial Electrical Systems: OE-CS-407

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

***Note:** SIM-401* is a mandatory credit-less course in which the students will be evaluated for Summer Internship undergone after 6th semester and students will be required to get passing marks to qualify.

PE-CS-D401	Data Mining						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	Data mining techniques discover the knowledge intelligently by extracting the desired patterns from data warehouses or web repositories data streams.						
Course Outcomes (CO)							
CO1	Learn about various Data Mining concepts						
CO2	Apply Frequent Itemsets Associations Rules to discover the knowledge						
CO3	Analyze the desired information using Classification Methods						
CO4	Evaluating knowledge from specific data sources using data mining trends						

Unit I: Basics of Data Mining

Need for data mining, Data Mining as the Evolution of Information Technology, Data mining as a step in the process of knowledge discovery, Transactional Database, Major issues in data mining, Data Preprocessing, Data cleaning, Data integration, Data reduction, Data transformation, Data Warehousing and Online Analytical Processing (OLAP).

Unit II: Mining Frequent Itemsets with Associations and Correlations

Data cube technology, Multidimensional data mining, Multidimensional data analysis, Mining Frequent Patterns, Associations, and Correlations : Basic Concepts and Methods, Market Basket Analysis Example with rule of Support and Confidence, Frequent Itemsets, Closed Itemsets, and association Rules, Frequent Itemset Mining Methods – Apriori Algorithm.

Unit III: Classification Methods and Cluster Analysis

Advanced pattern mining, Mining multilevel patterns, multidimensional patterns, Classification : Basic Concepts, Decision Tree Induction, Naïve Bayesian Classification Methods, Rule-Based Classification, Cluster Analysis : Basic Concepts and Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods.

Unit IV: Data Mining Trends

Mining Spatial Data, Mining Spatiotemporal Data, Mining Multimedia Data, Mining Text Data, Mining Web Data, Statistical Data Mining, Data Mining Applications – Data Mining for Financial Data Analysis, Intrusion Detection and Prevention, Retail and Telecommunication Industries, Science and Engineering, Privacy, Security and Social Impacts of Data Mining, Data Mining Trends.

Text Books:

1. "Data Mining" Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei, 3rd. Edition Elsevier Morgan Kaufmann Series USA 2012, ISBN 978-0-12-381479-1
2. "Datawarehousing: Concepts, Techniques, Products and Applications", by C.S.R. Prabhu PHI
3. "Data Mining with Microsoft SQL Server", by Seidman, Prentice Hall of India.

PE-CS-D403	Software Verification and Validation and Testing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Program Objective (PO)	**The objective of this course is to provide the in-depth coverage of software quality models and software testing strategies. It focuses on test case generation techniques and testing levels. It also focuses on testing different kinds of software.**						
Course Outcomes (CO)							
CO1	To develop test cases for any problem						
CO2	To pursue testing on any level of software design by using different testing strategies						
CO3	To learn the test management and testing activities by using different testing methods.						
CO4	To apply testing and quality model of software testing in achieving high-quality software.						

UNIT – I

Introduction: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Definition of software testing, Test Cases, Test Oracles, Testing Process, Limitations of Testing.

UNIT - II

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

UNIT - III

Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, and Slice based testing

Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

UNIT - IV

Overview of SQM: Concepts of Software Quality, Quality Attributes, Software Quality Models: McCall, Boehm, ISO-9000, CMM.

Miscellaneous topics: Stress Testing, Ad hoc testing: Buddy testing, Exploratory testing, Agile and extreme testing.

Suggested Books:

1. Naresh Chauhan "Software Testing Principles and Practices" Oxford Publications, 2012
2. Louise Tamres, "Software Testing", Pearson Education Asia, 2002
3. Robert V. Binder, "Testing Object-Oriented Systems-Models, Patterns and Tools", Addison Wesley.
4. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York.
5. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York.
6. K.K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International Publishers, New Delhi, 2005
7. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York.

PE-CS-D405	Information Retrieval						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	3	75	25	100	**3 Hour**
Purpose	To provide an overview of Information Retrieval and implementation insight about various evaluation methods.						
Course Outcomes							
CO 1	To make understanding about different Information retrieval model.						
CO 2	To understand the experimental evaluation of performance metrics.						
CO 3	To gain knowledge about various web search engines.						
CO 4	To understand the application of appropriate text classification and clustering.						

Unit I

Introduction: Goals and history of IR. The impact of the web on IR. The role of artificial intelligence (AI) in IR. Basic IR Models: Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity.

Basic Tokenizing Indexing, and Implementation of Vector-Space Retrieval: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; python implementation.

UNIT-II

Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections.

Query Operations and Languages: Relevance feedback; Query expansion; Query languages.

UNIT-III

Text Representation: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML).

Web Search: Search engines; spidering ; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents.

UNIT-IV

Text Categorization and Clustering: Categorization algorithms: naive Bayes; decision trees; and nearest neighbor. Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to information filtering; organization; and relevance feedback.

Recommender Systems: Collaborative filtering and content-based recommendation of documents and products

Suggested Books:

1. Introduction to Information Retrieval Manning, Raghavan and Schutze, Cambridge University Press, 2008.
2. R. Baeza-Yates and B. Ribeiro Neto,"Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, Addison Wesley, 2011.
3. David A. Grossman and Ophir Frieder "Information Retrieval: Algorithms and Heuristics", Second Edition, Springer 2004.
4. Mining the Web, Soumen Charabarti, Morgan-Kaufmann, 2002.
5. Ricci, F, Rokach, L. Shapira, B.Kantor, Recommender Systems Handbook, First Edition, 2011.

PE-CS-D407	Soft Computing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	Soft Computing deals with imprecision, uncertainty, partial truth, approximation to achieve practicability, robustness, and low cost solution for complex problems in real world using neural networks, fuzzy systems, evolutionary computation with optimization approaches to design intelligent systems.						
Course Outcomes (CO)							
CO1	Learn about various supervised and unsupervised Artificial Neural Networks.						
CO2	Apply the concepts of Fuzzy Logic for decision making in Fuzzy based Systems						
CO3	Analyze Nature-Inspired Algorithms like Genetic, Differential Evolution, PSO, ABC.						
CO4	Evaluate the values of new ideas by creating a new solution using Optimization.						

Unit I: Artificial Neural Networks

Fundamentals of Biological Neural Network and Artificial Neural Network, Evolution of Neural Networks, Learning – supervised, unsupervised and reinforcement, Terminologies – weights, bias, threshold, learning rate, Hebb Network, Perceptron Networks, Backpropagation Network, Associative Memory Network, Hopfield Networks, Counter propagation Networks, Adaptive Resonance Theory Network, Optical Neural Networks, Applications of Neural Networks.

Unit II: Fuzzy Systems

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets, Operations on Crisp Sets and Fuzzy Sets, Classical Relation and Fuzzy Relations, Membership Functions, Methods of Membership Value Assignments, Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning, Fuzzy Decision Making, Fuzzy Logic Control Systems, Applications of Fuzzy Logic based systems.

Unit III: Nature-Inspired Algorithms

Introduction to Nature-Inspired algorithms, Swarm Intelligence, Genetic Algorithm (GA), Operators in Genetic Algorithm – Encoding, Selection, Crossover, Mutation, Stopping Condition for GA, Differential Evolution (DE) Algorithm, Particle Swarm Optimization (PSO) Algorithm, Ant Bee Colony (ABC) Algorithm, Flower Pollination Algorithm, Solution of Real World Problems using Nature-Inspired Algorithms.

Unit IV: Optimization

Objective of Optimization, Single-objective Optimization, Multi-objective Optimization, Pareto-optimal solutions, Travelling Salesman Problem solution using any optimization technique, Engineering problems solution using any Soft Computing approach, Architecture of Neuro-Fuzzy Systems and Genetic Neuro-Fuzzy Hybrid Systems, Applications of Soft Computing.

Text Books:

4. "Principle of Soft Computing" by Dr. S.N. Sivanandam and Dr. S.N Deepa, 2nd. Edition

Wiley India 2012, ISBN: 978-81-265-2741-0
5. “Soft Computing” Fundamentals, Techniques and Applications by Dr. Saroj Kaushik and Dr. Sunita Tiwari, McGraw Hill Education 2018, ISBN: 10:93-5316-066-9
6. “Neuro-Fuzzy and Soft Computing” A Computational Approach to Learning and Machine Intelligence by Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani Pearson 2018, ISBN: 978-93-325-4988-3
7. “Neural Networks, Fuzzy Logic and Genetic Algorithms” Synthesis and Applications by S. Rajasekaran and G.A Vijayalakshmi Pai PHI 2012, ISBN: 978-81-203-2186-1
8. “Nature-Inspired Optimization Algorithms” Xin-She Yang Elsevier USA 2014, ISBN: 978-0-12-416743-8

PE-CS-D409	Neural Networks and Deep Learning						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	Neural network solves complex problems that require analytical calculations similar to those of the human brain. Deep learning is an artificial intelligence (AI) function that imitates human brain in processing data and creating patterns for decision making.						
Course Outcomes (CO)							
CO1	Learn about various concepts related to Neural Networks and Deep Learning.						
CO2	Understand about various supervised and unsupervised neural networks.						
CO3	Explore the knowledge about advanced types of Neural Networks.						
CO4	Apply biologically-inspired deep learning for expert systems in AI.						

Unit I: Artificial Neural Networks

Human Brain, Model of an artificial Neuron, Basic concepts of Neural Networks, Fundamentals of Biological Neural Network and Artificial Neural Network, Evolution of Neural Networks, Characteristics of Neural Networks, Learning Methods – supervised, unsupervised and reinforcement, Taxonomy of Neural Network Architectures, Terminologies – weights, bias, threshold, learning rate, Applications of Neural Networks.

Unit II: Supervised and Unsupervised Neural Networks

Hebb Network theory and training algorithm, Perceptron Networks architecture and training algorithm, Backpropagation Network architecture and training algorithm, Associative Memory Network architecture and training algorithm, Hopfield Networks architecture and training algorithm, Counterpropagation Networks architecture and training algorithm, Adaptive Resonance Theory Network architecture and training algorithm.

Unit III: Advanced Neural Networks

Kohonen Self-Organising Feature Maps architecture and training algorithm, Learning Vector Quantization architecture and training algorithm, Boltzmann Machine, Cognitron Network, Neocognitron Network, Optical Neural Networks Electro-optical Multipliers and Holographic Correlators.

Unit IV: Deep Learning

Machine learning basics, Simple Machine Learning Algorithm -- Linear Regression, underfitting and overfitting challenges in Machine Learning, Supervised Learning approach for Support Vector Machine, Deep Feedforward Networks, Convolutional Networks, Deep Recurrent Networks, Deep Boltzmann Machine, Applications in Speech Recognition and Natural Language Processing.

Suggested Books:

1. "Neural Networks and Deep Learning" by Michaeil Nielsen, Online Book
2. "Principle of Soft Computing" by Dr. S.N. Sivanandam and Dr. S.N Deepa, 2nd. Edition
   Wiley India 2012, ISBN: 978-81-265-2741-0
3. "Soft Computing" Fundamentals, Techniques and Applications by Dr. Saroj Kaushik and Dr. Sunita Tiwari, McGraw Hill Education 2018, ISBN: 10:93-5316-066-9
4. "Neuro-Fuzzy and Soft Computing" A Computational Approach to Learning and Machine Intelligence by Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani Pearson 2018, ISBN: 978-93-325-4988-3

5. "Deep Learning" by Yoshua Bengio and Aaron Courville, Online Book

PE-CS-D411	Object Oriented Software Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To provide the thorough knowledge to use the concepts and their design attributes for Object Oriented Software Engineering approaches and platforms to solve real time problems.**						
	Course Outcomes (CO)						
CO1	To learn the basic concepts of object oriented systems and software engineering.						
CO2	To get exposure of various object modeling methodologies, tools for analyzing and designing software based systems using UML.						
CO3	To explore problems using Use Cases, analyzing relations, responsibilities and collaborations among classes and their behavior in problem domain.						
CO4	To evaluate object oriented design processes using models, design patterns, interfaces designs and communication mechanisms for performing required tasks.						

Unit - I

An Overview of Object-Oriented system Development, Objects Basis, Class Hierarchy, Inheritance, Polymorphism, Object Relationships and Associations, Aggregations and Object Containment, Object Persistence, Meta-Classes, Object Oriented Systems Development Life Cycle: Software Development Process, Object Oriented Systems Development: A Use-Case Driven Approach.

Unit - II

Object Oriented Methodologies: Rumbaugh Methodology, Jacobson Methodology, Booch Methodology, Patterns, Frameworks, The Unified approach, Unified Modeling Language (UML)

Unit - III

Object Oriented Analysis Process, Use Case Driven Object Oriented Analysis, Use Case Model, Object Analysis: Classification, Classification Theory, Approaches for identifying classes, Responsibilities and Collaborators, Identifying Object Relationships, Attributes and Methods: Associations, Super-Sub Class relationships, A-Part-of-Relationships-Aggregation, Class Responsibilities, Object Responsibilities.

Unit - IV

Object Oriented Design process and Design Axioms, Corollaries, Design Patterns, Designing Classes: Object Oriented Design Philosophy, UML Object Constraint Language, Designing Classes: The Process, Class Visibility, Refining Attributes, Designing Methods and Protocols, Packages and Managing classes, View Layer: Designing Interface objects, Designing View layer Classes, Macro and Micro Level Interface Design Process.

Suggested Books:

1. Ali Bahrami, Object Oriented Systems Development, McGraw HillPublishing Company Limited, New Delhi, 2013.
2. Rumbaugh *et al.*, Object Oriented Modeling and Design, PHI, 2006.
3. Robert Laganière and Timothy C. Lethbridge, Object-Oriented Software Engineering: Practical Software Development, McGraw-Hill Publishing Company Limited, New Delhi, Sixth Print 2008.
4. Ivar Jacobson, MagnosChristerson, Patrick Jonsson, Gunnar Overgaard, Object-oriented Software Engineering: A Use Case Driven Approach, Pearson Education, New Delhi, Seventh Edition Reprint, 2009.

5. Bernd Bruegge, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java: Pearson New International, Third Edition, 2013.

PE-CS-D413	Expert Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	In this course the student will learn the methodologies used to transfer the knowledge of a human expert into an intelligent program that can be used to solve real-time problems.						
Course Outcomes(CO)							
CO1	Examining the fundamentals and terminologies of expert system.						
CO2	To facilitate students to implement various knowledge representation techniques for acquisition and validate various structures in experts system domain.						
CO3	Signifying AI techniques to solve social, industrial and environmental problems.						
CO4	Design and implement expert systems for real life problem						

UNIT I

Introduction to Expert System Features of expert system, Representation and organization of knowledge, Basic characteristics, Types of problems handled by expert systems, Case study of PROSPECTOR.

UNIT II

Expert System Tools Techniques of knowledge representation in expert systems, knowledge engineering, System-building aids, support facilities, stages in the development of expert systems.

UNIT III

Building an Expert System Expert system development, Selection of tool, Acquiring knowledge, Building process

UNIT IV

Problems with Expert Systems Difficulties, common pitfalls in planning, Dealing with domain expert, Difficulties during development.

Suggested Books

1.Waterman D.A.: A Guide to Expert Systems, Addison Wesley Longman
2.Hayes-Roth, Lenat and Waterman: Building Expert Systems, Addison Wesley
3.Weiss S.M. and Kulikowski C.A.: A Practical Guide to Designing Expert Systems, Rowman & Allanheld, New Jersey

OE-CS-401	Cyber Law and Ethics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	To gain a broad understanding in order to get cyber law and ethics.						
Course Outcomes							
CO1	To facilitate the basic knowledge of cyber Law.						
CO2	To learn about how to maintain the Confidentiality, Integrity and Availability of information technology act.						
CO3	To get enable to fix the various Cyber Law and Related Legislation.						
CO4	To deal with the Cyber Ethics.						

Unit-1: Introduction to Cyber Law

Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit-2: Information Technology Act

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit-3: Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Unit-4: Cyber Ethics

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Suggested Books:

1. Cyber Security : Understanding Cyber Crimes , Computer Forensics and Legal Perspectives By Nina Godbole, Sunit Belapur , Wiley
2. Understanding cybercrime: phenomena , and legal challenges response, ITU 2012.

OE-CS-403	Bioinformatics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To familiarize the students with the basics of Bioinformatics**						
Course Outcomes							
CO1	Students will learn basic principles of various types of databases						
CO2	Students will come to know about various tools related to sequence alignment and statistical significance of alignment						
CO3	This unit will enable the students to learn various software tools for sequence analysis and primer designing						
CO4	Students will be able to learn predictive methods for nucleotides and protein sequence analysis						

UNIT I : Databases

Sequence Databases: introduction of Databases, primary and secondary databases, nucleotide and protein sequence databases: Genbank, EMBL, DDBJ, Swissprot, pfam, Block, PRI
Structure Databases: Introduction to structures. PDB (Protein Data bank) Molecular Modeling database at NCBI. , visualizing structural information, database structure viewers. Sequence and Structure File Formats; **The Entrez system**: Integrated information axis, Information retrieval from biological database, sequence database beyond NCBI. Medical databases.

UNIT II: Sequence Alignment AND Database Searches

Introduction, the evolutionary basis of sequence alignment, Type of Aligmnents, Pair-wise Alignment, Multiple Alignment, The modular nature of proteins, Optimal alignment methods, substitution scores and gap penalties, statistical significance of alignment. FASTA, BLAST, low-complexity regions, repetitive elements, Tool of multiple sequence alignment: CLUSTAL W/X, progressive alignment method.
Phylogenetic Analysis: Elements of phylogenetic models, phylogenetic data analysis: alignment, substitution model building, tree building and tree evaluation, building the data model (alignment), determining the substitution model, tree- building methods, searching for trees, rooting trees, evaluation trees and data, phylogenic software (PHYLIP). phylogenetics online tool.

UNIT III: Sequence Analysis Using Software Resources :

Introduction. The Wisconsin package, the Seq Lab environment, analyzing sequences with operations and Wisconsin package programmes, viewing output, monitoring programme progress and troubleshooting problems, annotating sequences and graphically displaying annotations in the Seqlab Editor, saving sequences in the Seq Lab Editor, Example of analysis that can be undertaken in Seqlab, extending Seqlab by including programmes that are not part of the Wiscosin package.

Unit-IV : Plasmid Mapping And Primer Design

Restriction mapping, Mac Vector and OMIGA. Gene construction kit. Vector NTI, primer design for PCR Sequencing, primer design programs and software.

Suggested Books-

1. Bioinformatics by Andreas D.Boxevanis. Wiley Interscience, 4th edition 2020.
2. Bioinformatics: Sequence and genome analysis by David W.Mount, Cold Spring Harbor, 2004.
3. Biocomputing Informatics And The Genome Projects by Smith D.W., Academic Press, 2014.
4. Bioinformatics: A Biologists Guide to Computing and the Internet. by Stuart M.

Brown, NKU Medical Center, NY USA, 2000.

OE-CS-405	Fiber Optic Communications						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	**To familiarize the students with the concepts of Optical communication covering the contents of optical fibers, losses in fibers, optical sources, detectors etc.**						
	Course Outcomes (CO)						
CO1	Students will be able to understand the structure of fiber and the mechanism of light travelling in the fiber.						
CO2	Students will be able to analyze various losses associated with fibers.						
CO3	Students will learn about the optical sources and optical detecters.						
CO4	Students will be able to understand the various components and devices required in making optical networks						

UNIT – I

INTRODUCTION : Optical Fibers: Structure, Propagation within the fiber, Numerical aperture of fiber, acceptance angle, step index and graded index fiber, Modes of propagation in the fiber, Single mode and multi mode fibers. Splices and connectors. Optical Power Launching and Coupling. Fiber-to-fiber joints.

UNIT –II

LOSSES IN OPTICAL FIBER : Attenuation, Absorption Losses, Scattering Losses, Leaky modes, Mode coupling losses, Bending Losses, Combined Losses in the fiber.

DISPERSION EFFECT : Effect of dispersion on the pulse transmission Intermodal dispersion, Material dispersion, Wave guide dispersion, Polarization Mode Dispersion, Total dispersion, Transmission rate. Dispersion Shifted Fibers, Dispersion Compensating Fibers.

UNIT – III

LIGHT SOURCES : LEDS, Laser Action in semiconductor Lasers, Semiconductor Lasers for optical communication – Laser modes, Spectral Characteristics, Power Voltage Characteristics, Frequency response.

DETECTORS : P-I-N Photodiode, APD, Noise Analysis in detectors, Coherent and non-coherent detection, Infrared sensors. Bit error rate.

UNIT – IV

The fiber-optic Communication System: Design considerations of fiber optic systems: Analog and digital modulation. Optical Devices: Optical coupler, space switches, linear divider-combiners, WDM: strategy, wavelength division multiplexer and demultiplexer, optical amplifier

OPTICAL NETWORKS: Elements and Architecture of Fiber-Optic Network, Optical link network-single hop, multihop, hybrid and photonic networks.

Suggested Books:

1. John Power, An Introduction to Fiber optic systems, McGraw Hill International.
2. John Gowar , Optical communication Systems.
3. R. Ramaswamy, Optical Networks, Narosa Publication
4. John M. Senior,Optical Fiber Communication
5. Gerd Keiser, Optical Fiber Communication

OE-CS-407	Industrial Electrical Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**		**75**	**25**	**100**	**3**
Purpose	**To provide the conceptual knowledge of various Industrial Electrical Systems.**						
Course Outcomes							
CO 1	To study various fundamental concepts of Electrical Components.						
CO 2	To study and understand the Residential and Commercial Electrical Systems						
CO 3	To study the functions and selection of Industrial Electrical Components						
CO 4	To study the basics and role of PLC & SCADA in automation						

UNIT-1

Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, Relays, MPCB, Electric shock and Electrical safety Practices.

UNIT-11

Residential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, protection devices, requirements of commercial installation, earthing of commercial installation, selection and sizing of components.

UNIT-I11

Industrial Electrical Systems

HT connection, industrial substation, Transformer selection, Power factor correction–kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers

DG Systems, UPS System, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

UNIT-1V

Industrial Electrical System Automation

Study of basic PLC, Role of automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation

Suggested Books

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating &Costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
3. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997. Web site for IS Standards.
4. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008

PE-CS-D401L	Data Mining Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	Learning of data mining tools and extracting knowledge by applying various data mining techniques. Also explore the different validation techniques on the given training data set to get output metrics.						
Course Outcomes(CO)							
CO1	Learning of Data Mining tools.						
CO2	Understanding of various Data Mining Algorithms.						
CO3	Developing the application for association mining, classification and clustering.						
CO4	Providing solutions for real world problems using various data mining techniques.						

List of Practicals

1. Study of WEKA data mining tool.
2. Study of ORANGE and KNIME open source data mining tools.
3. Develop an application to identify underlying relations between different items by extracting association rule mining.
4. Develop an application for distinguishing the data classes using classification technique.
5. Develop an application for partitioning a set of data objects using clustering technique.
6. Develop an application by implementing Naive Bayes Classifier.
7. Develop an application by implementing Association Mining Rule based Apriori Algorithm.
8. Develop an application for Decision Tree from class-labeled training tuples.
9. Develop a Decision Tree from a given training data set.
10. Develop a Decision Tree with cross validation training data set.
11. Develop a Decision Tree by using prune method and reduced error pruning. Also show the accuracy for cross validation trained data set.

PE-CS-D403L	Software Verification and Validation and Testing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	To gain a broad understanding of the discipline of software engineering implementation.						
Course Outcomes(CO)							
CO1	To understand the basic concepts of Software Engineering.						
CO2	To understand the different design techniques.						
CO3	To understand different software development models.						
CO4	To understand different types of Testing.						

List of Practicals

1. To identify the role of the software in today's world across a few significant domains related to day to day life.
2. To identify any scenario and identify suitable software development model for the given scenario.
3. To classify the requirement into functional and non-functional requirements and list four functional and non functional requirements for any scenario.
4. Do comparative study of various software development models.
5. Preparation of requirement document for standard application problems in standard format.(e.g Library Management System, Railway Reservation system, Hospital management System, University Admission system)
6. To identify the usage of Regression Testing.
7. To identify the usage of Agile Testing.
8. To understand the importance of SDLC and STLC process.

PE-CS-D405L	Information Retrieval Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	To provide an overview of Information Retrieval and implementation insight about various evaluation methods.						
Course Outcomes(CO)							
CO1	Understanding about Information Retrieval models.						
CO2	Learn experimental evaluation of performance matrices.						
CO3	Learn implementation of web search engines.						
CO4	Learn the implementation of text clustering and classification algorithms.						

List of Practicals

1. Implementation of Simple tokenization and Stop-word removal on a document.
2. Write a program to compute similarity between two text documents.
3. Write a map reduce program to count the number of occurrence of each alphabetic character in a document. The count for each letter should be case-insensitive.
4. Write a program to parse XML text, generate web graph and compute topic specific page rank.
5. Write a program to implement Simple web crawler.
6. Implementation of Naïve Bayes algorithm.
7. Implementation of Decision tree algorithm.
8. Implementation of K-nearest neighbour algorithm.
9. Implementation of K- means algorithm.
10. Evaluate the performance matrix using any algorithm.

PE-CS-D407L	Soft Computing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	Soft Computing achieves practicability, robustness, and low cost solution for complex problems in real world using neural network, fuzzy systems ,optimization approaches.						
Course Outcomes(CO)							
CO1	Understand Fuzzy Concepts.						
CO2	Learn Neural Network with back propagation and without back propagation.						
CO3	Learn the operators of Genetic algorithms.						
CO4	Learn the implementation of Optimization algorithms.						

List of Practicals

1. Write a program to implement artificial neural network with back propagation.
2. Write a program to implement artificial neural network without back propagation.
3. Implementation of operations on Fuzzy Sets.
3. Implement Travelling Sales man problem with genetic algorithm..
4. Implement Crisp partitions for real life iris dataset.
5. Write a program to implement Logic gates.
6. Implement SVM classification of Fuzzy Concepts.
7. Implement ABC (Artificial Bee Colony) optimization Technique.
8. Implement DE (Differential Evolution) algorithm.

PE-CS-D409L	Neural Networks and Deep Learning Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	Demonstrate knowledge and apply engineering and management principles to manage projects and in multi-disciplinary environment and use research-based knowledge and research methods including design of experiments, analysis and interpretation of data for valid conclusions.						
Course Outcomes (CO)							
CO1	Apply learning algorithms on perceptron and apply back propagation learning on Neural Network.						
CO2	Apply Feedback NN and plot a Boltzmann machine and associative memory on various application.						
CO3	Apply different types of auto encoders with dimensionality reduction and regularization.						
CO4	Design Convolutional Neural Network and classification using Convolutional Neural Network.						

List of Practicals

1. To Write a program to implement Perceptron.
2. To write a program to implement AND OR gates using Perceptron.
3. To implement Crab Classification using pattern net Objective.
4. To write a program to implement Wine Classification using Back propagation.
5. Write a MatLab Script containing four functions Addition, Subtraction, Multiply and Divide functions.
6. Write a program to implement classification of linearly separable Data with a perceptron.
7. To study ImageNet, GoogleNet, ResNet convolutional Neural Networks.
8. To study Convolutional Neural Network and Recurrent Neural Network.

PE-CS-D411L	Object Oriented Software Engineering Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	Object-Oriented Software Development is an approach/paradigm of developing software by identifying and implementing a set of objects and their interactions to meet the desired objectives. The first step towards this kind of software development is to learn and master the various concepts, tools and techniques that are to be used design and implementation of such systems.						
Course Outcomes (CO)							
CO1	To learn and understand various O-O concepts along with their applicability contexts.						
CO2	To learn various modeling techniques to model different perspectives of object-oriented software design (UML)						
CO3	To learn software development life cycle for Object-Oriented solutions for Real-World Problems.						
CO4	Learn how to test and document software.						

List of Practicals

1. Choose any one project and Write the complete problem statement.
2. Write the software requirement specification document
3. Draw the entity relationship diagram
4. Draw the data flow diagrams at level 0 and level 1
5. Draw use case diagram
6. Draw activity diagram of all use cases.
7. Draw state chart diagram of all use cases
8. Draw sequence diagram of all use cases
9. Draw collaboration diagram of all use cases
10. Assign objects in sequence diagram to classes and make class diagram.

PE-CS-D413L	Expert System Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	In this course the student will learn different techniques of AI and Expert system that can be used to solve real-time problems.						
Course Outcomes(CO)							
CO1	Examining the fundamentals and terminologies of expert system.						
CO2	Study of various trends and issues related to AI and expert system.						
CO3	Implement general problems using AI and expert system techniques.						
CO4	Student will capable to handle real time problems related to AI and expert system.						

List of Practicals

1. Study of Prolog.
2. Write simple fact for the statements using PROLOG.
3. Write predicates One converts centigrade temperatures to
4. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
5. Write a program to solve the Monkey Banana problem.
6. WAP to implement factorial, Fibonacci of a given number.
7. Write a program to solve 4-Queen problem.
8. Write a program to solve traveling salesman problem.
9. Write a program to solve water jug problem using LISP
10. Solve any problem using depth first search and best first search.

Bachelor of Technology (Computer Science & Engineering)										
Credit-Based Scheme of Studies/Examination										
Semester VIII (w.e.f. session 2021-2022)										
S. No.	**Course Code**	**Subject**	**L:T:P**	**Hours/ Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of Exam (Hrs)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	PE	Elective-VI	3:0:0	3	3	75	25	0	100	3
2	OE	Open Elective-III	2:0:0	2	2	75	25	0	100	3
3	OE	Open Elective-IV	2:0:0	2	2	75	25	0	100	3
4	PROJ-CS-402	Project-III	0:0:12	12	6	0	40	60	100	3
5	PE-L	Elective-VI Lab	0:0:4	4	2	0	40	60	100	3
		Total		**23**	**15**	**225**	**155**	**120**	**500**	

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE Elective-VI
Cloud Computing: PE-CS-A402
Computer Graphics: PE-CS-A404
Software Reliability: PE-CS-A406
Mobile Apps Development: PE-CS-A408

OE Elective-III	**OE Elective-IV**
Cyber Security: OE-CS-402	Web and Internet Technology: OE-CS-410
Satellite Communication: OE-CS-404	Automation in Manufacturing: OE-CS-412
Social Networks Analysis & Mining: OE-CS-406	IPR, Bioethics and Biosafety: OE-CS-414
Agile Software Engineering: OE-CS-408	Signal & Systems: OE-CS-416

PE-CS-A402	Cloud computing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3 hrs
Purpose	**To introduce the concepts of Cloud Computing**						
Course Outcomes (CO)							
Co1	Introduction & Overview of Computing Paradigm						
Co2	To Cloud Computing Architecture						
Co3	To study the concepts of Service Management in Cloud Computing						
Co-4	To study the concepts of Cloud Security						

Unit-I

Overview of Computing Paradigm: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, evolution of cloud computing, Business driver for adopting cloud computing

Introduction to Cloud Computing: Cloud Computing (NIST Model), introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards

Unit-II

Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services,

Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud.Data Security, Network Security

Unit-III

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data- Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing.

Cloud Applications: Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

Case study: Eucalyptus, Microsoft Azure, Amazon EC2.

Unit-IV

Cloud Security: Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage, Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

Suggested books:

1. *Cloud Computing Bible,* Barrie Sosinsky, *Wiley-India,* 2010
2. *Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Wile,* 2011
3. *Cloud Computing: Principles, Systems and Applications, Editors:* Nikos Antonopoulos, Lee Gillam, *Springer,* 2012
4. *Cloud Security: A Comprehensive Guide to Secure Cloud Computing,* Ronald L. Krutz, Russell Dean Vines, *Wiley-India,* 2010

PE-CS-A404	Computer Graphics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	**Introduces Computer Graphics that help in designing different kinds of static and movable objects.**						
Course Outcomes(CO)							
CO1	Explore the background and standard line and circle drawing algorithms.						
CO2	Exposure of various transformation approaches and its comparative analysis.						
CO3	Illustrate Projection and clipping with different techniques.						
CO4	Apply design principles to create different curves and explore hidden lines and surface techniques.						

UNIT – I: Introduction

Computer Graphics applications, Classification, Components, Display Devices, Scan conversion-Point & Line, Line drawing algorithms: DDA, Bresenham's, Circle drawing algorithms: Bresenham's, Mid point Algorithm .

UNIT – II: Advanced Design Techniques

Window to view port transformation, Window to view port mapping, Two Dimensional transformation: translation, scaling, rotation, reflection and Shear, Homogeneous Coordinate system.

3-D transformation: Rotation, Shear, translation, Numerical Problems of transformation viewing pipeline.

UNIT – III: Graph Algorithms

Clipping: Point & Line clipping algorithm, 4-bit code algorithm, Cohen-Sutherland Line clipping algorithms, Polygon clipping: Sutherland-Hodgeman Polygon clipping algorithm. Curve clipping, Text clipping.

Projection: Parallel, Perspective, Vanishing Points.

UNIT – IV: String Matching Algorithms

Representation of 3-D Curves and Surfaces: interpolation and approximation alpines, parametric conditions, Geometric continuity conditions, Bezier curves and surfaces: properties of bezier curves, bezier surfaces.

Hidden Surfaces removal: Hidden surface elimination, depth buffer algorithm, scan line coherence and area coherence algorithm, Painter's algorithm.

Text Books:

1. Donald Hearn & M.Pauline Baker, Computer Graphics, 2nd Edition, Pearson Education.
2. William M. Newmann & Robert F. Sproull, Principles of Interactive Computer Graphics, Tata McGraw-Hill Second Edition, New Delhi, India.
3. Zhigang Xiang & Roy A Plastock , Computer Graphics, Second Edition, Schaum's Outline, Tata McGraw Hill Education Private Limited, New Delhi, India.

PE-CS-A406	Software Reliability						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	In this course the student will understand the working of software reliability models and reliability prediction models, and able to design and develop reliability models.						
Course Outcomes(CO)							
CO1	Develop reliable software systems.						
CO2	Understand the fault handling and failure forecasting techniques in software systems.						
CO3	To learn different time dependent and time independent software reliability models and design reliability models for software systems.						
CO4	Design reliability models for software systems.						

UNIT I

Basic Ideas of Software Reliability, Hardware reliability vs. Software reliability, Reliability metrics, Failure and Faults – Prevention, Removal, Tolerance, Forecast, Dependability Concept – Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk.

UNIT II

Computation of software reliability, Functional and Operational Profile, Operational Profiles – Difficulties, Customer Type, User Type, System Mode, Test Selection - Selecting Operations, Regression Test.

UNIT III

Classes of software reliability Models, Time Dependent Software Reliability Models: Time between failure reliability Models, Fault Counting Reliability Models. Time Independent Software Reliability Models: Fault injection model of Software Reliability, Input Domain Reliability Model, Orthogonal defect classification, Software availability Models. Software Reliability Modeling: A general procedure for reliability modeling.

UNIT IV

Short and Long Term Prediction, Model Accuracy, Analysing Predictive Accuracy – Outcomes, PLR, U and Y Plot, Errors and Inaccuracy, Recalibration – Detecting Bias, Different Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements.

Suggested Books

1. J.D. Musa, *Software Reliability Engineering*, McGraw Hill, New York , 2004
2. H. Pham, *Software Reliability*, Springer Verlag, New York , 2000
3. Patric D. T.O Connor, *Practical Reliability Engineering, 4th Edition*, John Wesley & Sons , 2003
4. D. Reled, *Software Reliability Methods*, Springer Verlag, New York , 2001

PE-CS-A408	Mobile Apps Development						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	3	75	25	100	3
Purpose	**To introduce the concepts of developing the mobile applications.**						
	Course Outcomes (CO)						
CO1	Be exposed to technology and Mobile apps development aspects.						
CO2	Be competent with the characterization and architecture of mobile applications.						
CO3	Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.						
CO4	Perform testing, signing, packaging and distribution of mobile apps.						

Unit 1: Introduction to Mobility

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, challenges of Android app development, versions of Android, why develop apps for android, Setting up the Mobile App Development environment along with an Emulator.

Mobile Platforms: URIs for mobile apps, Compare and contrast native mobile platforms such as tightly controlled (IPhone), open (Android), and licensed (Windows Mobile), web as a mobile application platform.

Unit II: Building blocks of Mobile

Activities, Activity life cycle and interaction between activities, App User Interface Designing – User Interaction, user input controls, Mobile UI resources (Layout, UI elements, Drawable, Menu)screen navigation, Recycle view. App functionality beyond user interface - Threads, Async task, Services – States and Life Cycle, Notifications, Broadcast receivers, Content provider.

Unit III: Sprucing up Mobile Apps

Triggering, scheduling and optimizing background tasks: Notifications, Scheduling Alarms, transferring data efficiently. Graphics and animation – Custom views, Canvas, Animation APIs, Multimedia – Audio/Video playback and record, Location awareness.

Native data handling –file I/O, Shared preferences, shared data through content provider, Mobile databases such as SQLite, and Enterprise data access (via Internet/Intranet).

Unit IV: Testing and Launching Mobile Apps

Debugging mobile apps, White box testing, Black box testing, and test automation of Mobile apps, JUnit for Android. Loading data using loaders, Permissions, Performance and Security, Firebase and AdMob and publish.

Suggested Books:

1. Barry Burd, *Android Application Development All in one for Dummies*, Wiley publications, 2nd Edition 2015.
2. Android Developer Fundamentals Course– Concepts (Learn to develop Android applications) Concepts Reference *Developed by Google Developer Training Team, 2016.*
3. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.
4. Rick Boyer, Kyle Mew,Android Application Development Cookbook - Second Edition,2016.
5. Carmen Delessio, Lauren Darcey, Teach Yourself Android Application Development In 24 Hours , SAMS, 2013.
6. Brian Fling, Mobile Design and Development, O'Reilly Media, 2009.
7. Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, 2010.

OE-CS-402	Cyber Security						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**-**	**-**	**2**	**75**	**25**	**100**	**3 Hrs.**
Purpose	To gain a broad understanding in order to get predictive ways out related to cyber security.						
Course Outcomes							
CO1	To facilitate the basic knowledge of cyber security.						
CO2	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.						
CO3	To get enable to fix the various cyber-attacks.						
CO4	To deal with the digital forensics and related scenarios of cybercrimes.						

Unit I

Introduction: Fundamentals of Cyber Crime, Types of Cyber Crime: crime against individual, Crime against property, Cyber extortion, Drug trafficking, cyber terrorism. Cybercrime issues. Cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiestal structure - data encryption standard (DES) - strength of DES - differential and linear crypt analysis of DES - block cipher modes of operations - triple DES – AES.

Unit 2

Integrity checks and Authentication algorithms MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.

Unit 3

Introduction to cyber-attacks: passive attacks, active attacks.

Cyber-crime prevention methods, Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology Firewall and VPNs, Intrusion Detection, Access Control ,OS Security.

Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.

Unit 4

Digital Forensics: Introduction to Digital Forensics, historical background of digital forensics, Forensic Software and Hardware, need for computer forensics science, special tools and techniques digital forensic life cycle, challenges in digital forensic.

Law Perspective: Introduction to the Legal Perspectives of Cybercrimes and Cyber security, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Cybercrime Scenario in India, Cybercrime and Punishment.

IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.

Suggested Books:

1. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI.
3. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
4. SunitBelapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt. Ltd.

OE-CS-404	Satellite Communication:						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	0	0	2	75	25	100	3
Purpose	**To familiarize the students with the concepts of Satellite communication and various terms, laws and multiple access schemes used in its working.**						
Course Outcomes							
CO1	To understand the concept of basics of satellite communication and various basic laws and terms of satellite communication.						
CO2	To understand the concept and processes of various communication satellites used in satellite communication.						
CO3	To familiarize with the concept and design issues of satellite link design and satellite access.						
CO4	To familiarize with the concepts of Multiple access schemes used in satellite communication.						

Unit -I

SATELLITE ORBITS: Orbital Mechanics- Kepler's laws ,locating the satellite in the Orbit, locating the satellite with respect to the earth, Orbital elements, look angle determination, Sub satellite point, Azimuth and elevation angle calculation, Orbital perturbations, Longitudinal and Inclination changes; Launches and launch vehicles-ELV's, Placing the satellite into geostationary orbit, Doppler shift, range variations, solar eclipse, sun transit outage.

Unit -II

COMMUNICATION SATELLITES: Satellite Subsystems, Attitude and Orbit Control system(AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems-description, Transponders, satellite antennas-basic antenna types, basic antennas in practice.

Unit -III

Satellite link design and Satellite access: Basic transmission theory**,** system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit –IV

Multiple access schemes: FDMA, TDMA, CDMA, DAMA; VSAT systems-basic techniques, VSAT earth station engineering, system design; DBS systems-C-band and Ku band home TV, digital DBS; satellite mobile systems; GPS

Suggested Books:

1. Timothy Pratt, Satellite Communications, Wiley India edition
2. Anil K Maini, Satellite Communication, Wiley India edition

OE-CS-406	Social Networks Analysis & Mining						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3 Hrs.**
Program Objective (PO)	This emerging and innovative field will provide the insight into latest communication techniques used in the online social networks for identifying and representing the relationships and link prediction via the effective combination of graph theory, matrix, clustering, and equivalence between users.						
Course Outcomes (CO)							
CO1	To understand the essentials of social networks by learning link prediction, clustering, community detection and structural relationships among the nodes to determine their relative importance.						
CO2	To explore the detailed explanation of homophily, selection, closure, segregation, relationships and graph creation in an efficient distribution.						
CO3	To analyze the social networks using betweenness, centrality, equivalence relation, centralization, clustering coefficient and structural cohesion, page rank and random graph models to generate visualizations and to perform empirical investigations of network data.						
CO4	To interpret and synthesize the results with respect to modeling epidemics, experimental and generative models and the basic of collated datasets by using equivalence concepts for interpreting complex data to execute better recommendation.						

Unit-I

Introduction to Social Networks, Google Page Rank, Link Prediction, Importance of Acquaintances, Web Graph, Introduction: Emergence of Connectedness, Granovetter's Strength of weak ties, Triads, clustering coefficient and neighborhood overlap, Structure of weak ties, bridges, and local bridges, Emeddedness, Betweenness Measures and Graph Partitioning, Finding Communities in a graph (Brute Force Method), Community Detection Using Girvan Newman Algorithm, Strong and Weak Relationship

Unit-II

Introduction to Homophily, Selection and Social Influence, Foci Closure and Membership Closure, Introduction to Fatman Evolutionary model, Triadic Closure, Spatial Segregation: An Introduction, Schelling Model Implementation, Positive and Negative Relationships – Introduction, Structural Balance, Creating graph, displaying it and counting unstable triangles, Equal Coin Distribution, Random Walk Coin Distribution.

Unit-III

Metrics in social network analysis (Betweenness, Centrality, Equivalence relation, Centralization, Clustering coefficient and Structural cohesion), Diffusion in Networks, Impact of Communities on Diffusion, Cascade and Clusters, Introduction to Hubs and Authorities, Hubs and Authorities, PageRank as a Matrix Operation, Introduction to Power Law, Rich Get Richer Phenomenon, Implementing a Random Graph (Erdos-Renyi Model)

Unit-IV

Rich Get Richer - The Long Tail, Epidemics- An Introduction, Simple Branching Process for Modeling Epidemics, Basic reproductive number, SIR and SIS spreading models, Percolation model, Milgram's Experiment, The Generative Model, Decentralized Search, Basic of Equivalence concepts in Social Networks.

Suggested Books:

1. David Easley and Jon Kleinberg, "Networks, Crowds and Markets", Cambridge University Press.
2. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press.
3. Matthew A. Russell, “Mining the Social Web”, O'Reilly and SPD, Second edition New Delhi.

4. Hanneman, R. A., & Riddle, M., “Introduction to social network methods, Riverside, California: University of California, Riverside. Retrieved from http://faculty.ucr.edu/~hanneman/nettext/.
5. “Social network analysis: Theory and applications”. A free, Wiki Book available at: http://train.ed.psu.edu/WFED-543/SocNet_TheoryApp.pdf.
6. John Scott, Peter J. Carrington, “Social Network Analysis”, SAGE Publishing Ltd.

OE-CS-408	Agile Software Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	0	0	2	75	25	100	3
Purpose	**Introduces the business value of adopting Agile approaches and provide complete understanding of the Agile development practices**						
Course Outcomes (CO)							
CO1	Understand the background and driving forces for taking an Agile approach to software development						
CO2	Understand the business value of adopting Agile approaches						
CO3	Drive development with unit tests using Test Driven Development						
CO4	Apply design principles and refactoring to achieve Agility						

Unit I: Fundamentals of Agile

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

Unit II: Agile Scrum Framework

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

Unit III: Agile Testing

Agile Testing Planning and Managing Testing Cycle, Agile Lifecycle and its impact on testing, Principles of Agile Testing, Agile Testing Techniques, Test-Driven Development, User Acceptance Tests, Test Automation.

Agile Project Management Scheduling in an agile project, scheduling challenges, estimating costs, monitoring project progress, burning down the product backlog, reporting, controlling the project

Unit IV: Agile Software Design and Development

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

Suggested Books:

- Ken Schawber, Mike Beedle, *Agile Software Development with Scrum*, Pearson publications
- Robert C. Martin, *Agile Software Development, Principles, Patterns and Practices*, Prentice Hall
- Lisa Crispin, Janet Gregory, *Agile Testing: A Practical Guide for Testers and Agile Teams*, Addison Wesley
- Alistair Cockburn, *Agile Software Development: The Cooperative Game*, Addison Wesley

- Mike Cohn, *User Stories Applied: For Agile Software*, Addison Wesley
- Enterprise-Scale Agile Software Development James Schiel Latest edition, CRC Press
- Succeeding with Agile: Software Development Using Scrum Mike Cohn Latest edition, Addison-Wesley

OE-CS-410	Web and Internet Technology						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hour
Purpose	To learn the architecture and programming of Internet and study of scripting language :Python						
Course Outcomes							
CO 1	To Learn the basic concepts of internet and its connectivity						
CO 2	To Learn about the services of internet , designing and its architecture						
CO 3	To Learn the basic concepts of Python and its applications in information industry						
CO 4	To Acquaint the knowledge of latest programming language for the implementation of object based and procedure based applications using Python.						

Unit-I: **Introduction to Internet**

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet, The role of Information Architect, Collaboration and communication, Organizing information, Organizing web sites and Intranets, Creating cohesive organization systems, designing navigation systems, types of navigation systems, Integrated navigation elements, Searching systems, Searching your web site, designing the search interface.

Unit-II: **Internet Services and Web Publishing**

Setting up a connection: Hardware requirement, Selection of a Modem, Software Requirement, Modem Configuration, Common terminologies: Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Service options – E-mail, News Firewall, etc.
Introduction to XHTML and HTML5: Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms in HTML, Syntactic Differences between HTML5 and XHTML, Cascading Style Sheets: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, Alignment of Text, Box Model, Background Images.

Unit –III: Introduction of Scripting Language: Python

Introduction to Python: Applications of Python in information industry, Introduction to Python, Data Types, Branching Programs, Control Structures, Array and Input, Iteration. Functions and Scoping: Functions and scoping, Recursion and Global variables. Creation, insertion and deletion of items: Strings, Tuples, Lists and Dictionaries.

Unit –IV: Advanced Python

Classes and Object-Oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding. File Handling, Exceptions Handling, Data base (MySQLdb) operation: file check, table creation, insertion and deletion of data, Regular Expressions – REs in Python and Plotting.

Suggested Books

1. "Information Architecture on the World Wide Web", By Peter Morville, Louis Rosenfeld, O'Reilly Media, 2006.
2. "Programming The World Wide Web", By Robert W. Sebesta, 8th Edition, Pearson India, 2015.

3. “The Fundamentals of Python: First Programs”, By Kenneth A. Lambert, 2011, Cengage Learning.
4. “Python: The Complete Reference”, By Martin C. Brown, Paperback March 2018
5. “Core Python Programming”, by R. Nageswara Rao, Dreamtech Publication, 2018

OE-CS-412	Automation in Manufacturing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	0	0	2	75	25	100	3
Purpose	The purpose of this course is to impart knowledge of production automation, robotics, flexible manufacturing, CNC programming, material handling and automated storage systems.						
Course Outcomes							
CO1	Students will be able to explain the role automation in manufacturing and robotics in industry.						
CO2	Students will be able to describe the group technology and flexible manufacturing techniques in the automated production line and manufacturing system.						
CO3	Students will be able to explain computer aided process planning and shop floor manufacturing activities.						
CO4	Students will be able to develop CNC programs and understand the concept automated guided vehicle and automated storage system in material handling.						

UNIT I

Introduction: Production system, automation in production system, manual labour in production system, automation principle and strategies, manufacturing industries and products, manufacturing operations, product facilities, product/ production relationship, basic elements of an automation system, advance automation function, level of automation.

Industrial robotics: Robot anatomy and related attributes, joint and links, common robot configuration, joint drive system, sensors in robotics, robot control system, end effectors, grippers and tools, applications of industrial robots, material handling, processing operation, assembly and inspection, robot programming.

UNIT II

Group technology and cellular manufacturing: Part families, parts classifications and coding, production flow analysis, cellular Manufacturing- composite part concept, machine cell design, applications of group technology, grouping parts and machines by rank order clustering technique, arranging machines in a G.T. cell.

Flexible manufacturing: Introduction, FMS components, flexibility in manufacturing – machine, product, routing, operation, types of FMS, FMS layouts, FMS planning and control issues, deadlock in FMS, FMS benefits and applications.

UNIT III

Process planning: Introduction, manual process planning, computer aided process planning – variant, generative, decision logic decision tables, decision trees, Introduction to artificial intelligence.

Shop floor control: Introduction, shop floor control features, major displays, major reports, phases of SFC, order release, order scheduling, order progress, manufacturing control, methodology, applications,shop floor data collections, Types of data collection system, data input techniques, automatic data, collection system.

UNIT IV

CNC basics and part programming: Introduction, historical, background, basic components of an NC, steps in NC, verifications of numerical control machine tool programs, classification of NC Machine tool, basics of motion control and feedback for NC M/C, NC part programming, part programming methods, modern machining system, automatically programmed tools, DNC, adaptive control.

Automated Guided Vehicle and Storage System: Functions of AGV, types of AGV, safety consideration for AGV, design of AGV; Introduction to storage system, storage system

performance, storage location strategies, conventional storage method and equipment, automated storage system, fixed aisle automated storage/ retrieval system, carousel storage systems, analysis of storage system, fixed aisle automated storage/ retrieval systems, carousel storage systems.

Reference Books:

1. Automation, production system and computer integrated manufacturing- Mikell P. Groover, Pearson fourth edition.
2. CAD/CAM: Computer Aided Design and ManufacturingGroover-M.P. and Zimmers E. W.,Prentice Hall International, New Delhi, 1992.
3. CAD/CAM/CIM-P. Radhakrishnan, S. Subramanayan and V.Raju, New Age International (P) Ltd., New Delhi.
4. Computer Integrated Manufacturing- Alavudeen and Venkateshwaran, Prentice- Hall of India Pvt. Ltd., New Delhi.

OE-CS-414	IPR, Bioethics, and Biosafety						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3hrs**
Program Objective (PO)	Students will able to acquire knowledge of regulatory bodies ,acts and organization indulge in creating a balancing force between advent in technology with monitoring their impacts on human and ecology alongwith biosafety measures with ethical conduct to society.						
Course Outcomes							
CO1	Students will be able to describe the basic terms and procedure for IPR, patent filing and implications on society of commercialized products.						
CO2	Students will be able to learn and describe various act, policies, different organizations and guidelines for biosafety.						
CO3	Students will develop knowledge of outbreak and risk assessment and management at laboratory level along with health impacts.						
CO4	Students will develop awareness of ecological impact of release of genetically modified organisms and monitoring methods.						

UNIT -1

Introduction- Intellectual Property Rights, Copyrights, Trademarks, Trade secrets, Geographical indications, Patents, Patent Filing, Indian Patent act and amendments, Implications of intellectual property rights on the commercialization of Biotechnology products, Patented products in Market and Success story.

UNIT- II

Policies, Agreements and Organization -National biosafety policies and law, The Cartagena protocol on biosafety, Convention on biological diversity, Cross border movement of germplasm and agreements, World Trade Organization and agreements, Updated Regulatory frameworks.

UNIT-III

Biological Containment- Risk assessment, Risk management, General principal for biological containment at laboratory level, Health impact of containment issues-Allergenicity, Antibiotic resistance and Toxicology. Case studies.

UNIT –IV

Ecological Impacts-Genetically Modified organism and impact on biodiversity, gene flow, gene escape and creation of superweeds/ superviruses, Monitoring strategies and method of detecting transgenics(Radioactive /Non radioactive methods).Case studies.

Suggested Books:

1. Padma Nambisan, An introduction to ethical safety and intellectual property rights issues in biotechnology, Academic Press,ISBN-978-0-12-809231-6, 2017.
2. Deepa Goel and Shomini Parashar, IPR, Biosafety and Bioethics, Pearson Education,India,ISBN-978933251429,2013.
3. V. Sree Krishna, Bioethics and Biosafety in Biotechnology, New age international private ltd., 2007.
4. Gerald A. Urban, BioMEMS, Springer, 2010.

OE-CS-416	Signals and Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**-**	**-**	**2**	**75**	**25**	**100**	**3 Hrs.**
Course Outcomes (CO) At the end of this course, students will demonstrate the ability to							
CO1	Analyze different types of signals.						
CO2	Represent continuous and discrete systems in time and frequency domain using different transforms.						
CO3	Understand sampling theorem and its implications.						
CO4	Apply transform techniques to analyze continuous-time and discrete-time signal and systems						

UNIT-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signal, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions.

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

UNIT-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions.

Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations, Concept of impulse response.

UNIT-III

Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof, effect of undersampling, reconstruction of a signal from sampled signal.

Fourier Series: Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS**,** Fourier series and LTI system.

UNIT-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations, Discrete time fourier transform (DTFT), Properties of DTFT.

Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties of laplace transform, Analysis and characterization of LTI systems using laplace transform,

Suggested Books:

- Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009
- Simon Haykins – "Signal & Systems", Wiley Eastern
- Tarun Kumar Rawat , Signals and Systems , Oxford University Press.
- H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
- M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
- B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

PE-CS-A402L	Cloud Computing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**4**	**2**	**40**	**60**	**100**	**3hrs**
Purpose	Design and Implement various mobile applications using emulators and learn how to Deploy applications to hand-held devices.						
Course Outcomes(CO)							
CO1	Know the components and structure of mobile application development frameworks for Android based mobiles.						
CO2	Understand how to work with various mobile application development frameworks.						
CO3	Learn the basic and important design concepts and issues of development of mobile applications.						
CO4	Understand the capabilities of mobile devices.						

List of Practicals

1. Write a program to use the API's of Hadoop to interact with it.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Show the virtual machine migration based on the certain condition from one node to the other.
6. Write a word count program to demonstrate the use of Map and Reduce tasks.
7. Find procedure to set up the one node Hadoop cluster and run simple applications like word count.

PE-CS-A404L	Computer Graphics Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**4**	**2**	**40**	**60**	**100**	**3hrs**
Purpose	To Design and implement various Line and Circle Drawing Algorithms.						
Course Outcomes(CO)							
CO1	To Implement basic algorithms related to Line & Circle Drawing.						
CO2	Implement various Line & Circle Drawing Algorithms.						
CO3	Hands on experiments on 2-D transformations.						
CO4	Conceptual implementation of Clipping and other drawing algorithms.						

List of Practicals

1. Write a program to implement DDA line drawing algorithm.
2. Write a program to implement Bresenham's line drawing algorithm.
3. Implement the Bresenham's circle drawing algorithm.
4. Write a program to draw a decagon whose all vertices are connected with every other vertex using lines.
5. Write a program to move an object using the concepts of 2-D transformations.
6. Write a program to implement the midpoint circle drawing algorithm any Object Oriented Programming Language like Python, C++, Java.
7. Implement the line clipping algorithm using any Object Oriented Programming Language like Python, C++, Java.
8. Implement boundary fill algorithm using any Object Oriented Programming Language like Python, C++, Java.
9. Implement the depth buffer algorithm using any Object oriented language like Python, C++, Java.
10. Perform the Polygon Clipping Algorithm using any Object oriented language like Python, C++, Java.
11. Draw a Rectangle using Bresenham's and DDA Algorithm using any Object oriented language like Python, C++, Java.

PE-CS-A406L	Software Reliability Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**4**	**2**	**40**	**60**	**100**	**3hrs**
Purpose	In this course the student will understand the working of software reliability models and reliability prediction models, and able to design reliability models.						
Course Outcomes(CO)							
CO1	To study the computation method for evaluation of software reliability						
CO2	Understand the mechanisms for Evaluation Testing methods in Software Reliability						
CO3	Understand the working of Software Reliability Models						
CO4	To Study and understand procedure of software Reliability Prediction						

List of Practicals

1. To study the Computation of software reliability
2. To implement software Reliability Evaluation Testing methods
3. To understand the working of Functional and Operational Profiles
4. To understand the concept of Time Dependent Software Reliability Models
5. To understand the concept of Time Independent Software Reliability Models.
6. To study Software Reliability Modeling
7. To identify the role of various phases included in software Reliability Prediction
8. To study software Reliability Analyzing Predictive
9. To study software Reliability Recalibration

PE—CS-A408L	Mobile Apps Development Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**4**	**2**	**40**	**60**	**100**	**3hrs**
Purpose	To understand the components and structure of mobile application development frameworks for Android based mobiles						
Course Outcomes(CO)							
CO1	To understand the components and structure of mobile application Development frameworks for Android based mobiles.						
CO2	To understand how to work with various mobile application development frameworks.						
CO3	To learn the basic and important design concepts and issues of development of mobile applications.						
CO4	To understand the capabilities and limitations of mobile devices.						

List of Practicals

1. Develop an application that uses GUI components, Font and Colors
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Implement an application that implements Multi threading
6. Develop a native application that uses GPS location information.
7. Implement an application that writes data to the SD card.
8. Implement an application that creates an alert upon receiving a message.
9. Write a mobile application that creates alarm clock.
10. Develop a sign-in page with appropriate validation.
11. Develop a real life application that makes use of database.