SANJIVANI RURAL EDUCATION SOCIETY'S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)

DEPARTMENT OF COMPUTER ENGINEERING

M. Tech. Computer Engineering

Program Curriculum Structure and Syllabus (2019 Pattern)

(M. Tech. First year w. e. f. academic year 2019-2020)

Sanjivani College of Engineering, Kopargaon

(An Autonomous Institute affiliated to SPPU, Pune)

D E C L A R A T I O N

We, the Board of Studies **(Computer Engineering)**, hereby declare that, we have designed the two years of MTech Computer Engineering Program Curriculum Structure and Syllabus of **Pattern 2019** w.e.f. A.Y 2019-2020 as per the guidelines. So, we are pleased to submit and publish this FINAL copy of the curriculum for the information to all the concerned stakeholders.

Submitted by

(Dr. D. B. Kshirsagar)
BoS Chairman

Approved by

Dean Academics

Director

SANJIVANI RURAL EDUCATION SOCIETY"S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON423603

(An Autonomous Institute Affiliated to SPPU Pune)

DEPARTMENT OF COMPUTER ENGINEERING

Profile: For any revolution to make an impact, Computer Engineering holds the key. The Department of Computer Engineering was established in the year 1989-90 and has qualified and experienced staff. The PG Programme in ME [Computer Engineering] is started from academic year 2011-2012. Department is accredited by NBA in Year 2003, 2008, 2015 and 2020 as well Accredited by Institute of Engineers, India in Year 2015. Department is having all the leading edge software's and hardware's in its state-of-the- art laboratories, because we believe that it will be here from where global professionals will be created!!

Total 300 Computers along with a well-equipped project lab have been set up exclusively for final year students for their project work. Department is providing SAP global certification having separate SAP Training lab with necessary software. System Department is looking after the centralized computing facilities having Computer Centre consisting of 120 nodes with dedicated 100 mbps leased line connectivity and separate 25 mbps leased line connectivity exclusively for Wi-Fi campus. Under Train n Hire programme, Department Faculty is providing training on Web Technology and PHP to shortlisted students by Xento Systems, Pune every year. To complement and make the curriculum more interesting, competitive and practical, lot of co-curricular activities are organized and conducted. The Department has formed an Association of Computer Engineering Students (ACES) and established the student chapters of professional bodies like IEEE and CSI. From time to time, these professional bodies, organize various events such as State Level Software Contest, State and National level paper presentation contest, Project Competitions & Workshops on Embedded Systems, leading technologies like AI and Machine Learning, Data Mining and Cloud Technology, Software Testing, Cyber Security, Java Technology, IOT and Data Analytics etc. We are conducting short term courses and seminars on Advanced C, C++, VB and Oracle, VC++, JAVA Technology, Python, PC Troubleshooting and maintenance, design patterns and extreme programming. The department has its own library consisting of around 527 books and manuals based on latest technology.

Institute Vision

- To Develop World Class Professionals through Quality Education.

Institute Mission

- To create Academic Excellence in the field of Engineering and Management through Education, Training and Research to improve quality of life of people.

Department Vision

- To develop world class engineering professionals with good moral characters and make them capable to exhibit leadership through their engineering ability, creative potential and effective soft skills which will improve the quality of life in society.

Department Mission

- To impart quality technical education to the students through innovative and interactive teaching learning process to acquire sound technical knowledge, professional competence and to have aptitude for research and development.
- Develop students as excellent communicators and highly effective team members and leaders with full appreciation of the importance of professional, ethical and social responsibilities.

Program Educational Objectives (PEOs)

PEO1: To prepare the committed and motivated graduates by developing technical competency and research attitude with support of strong academic environment.

PEO2: To train graduates with strong fundamentals, domain knowledge and update with modern technology to design and develop novel products and provide effective solutions for social benefits.

PEO3: To exhibit employability skills, leadership and right attitude to succeed in their professional career.

SRES's Sanjivani College of Engineering, Kopargaon
(An Autonomous Institute)

M. Tech. (Computer Engineering) Program w.e.f. 2019-20

List of Abbreviations	
Abbreviation	**Full Form**
PC	Professional Core
PE	Professional Elective
OE	Open Elective
ISE	In-Semester Evaluation
ESE	End-Semester Evaluation
OR	End-Semester ORAL Examination
TW	Continuous Term work Evaluation

First Year M. Tech (Semester I)

Course			Teaching Scheme				Evaluation Scheme				
Category	**Code**	**Name**	**L**	**T**	**P**	**Credits**		**Component**			**Marks**
							TW	**OR**	**ISE**	**ESE**	
PC	CO601	Advanced Algorithms & Analysis	4	-	-	4	-	-	50	50	**100**
PC	CO602	Advanced Network & Analysis	4	-	-	4	-	-	50	50	**100**
PC	CO603	Research Methodology	4	-	-	4	-	-	50	50	**100**
PE	CO604	Professional Elective 1	4	-	-	4	-	-	50	50	**100**
PE	CO605	Professional Elective 2	4	-	-	4	-	-	50	50	**100**
PC	CO606	Lab practice-I	-	-	2	1	-	50	-	-	**50**
PE	CO607	Lab practice-II	-	-	2	1	-	50	-	-	**50**
Total			20	0	4	22	-	100	250	250	**600**

Professional Elective 1	**Professional Elective 2**
CO604A Machine Intelligence	CO605A Wireless Networks
CO604B Embedded and Real Time Operating Systems	CO605B Parallel Computing
CO604C Soft Computing	CO605C Cloud Technology
CO604D Digital Forensics	CO605D Geographic Information Systems

First Year M. Tech (Semester II)

Course			Teaching Scheme				Evaluation Scheme				
Category	**Code**	**Name**	**L**	**T**	**P**	**Credits**		**Component**			**Marks**
							TW	**OR**	**ISE**	**ESE**	
PC	CO608	Data Analytics & Business Intelligence	4	-	-	4	-	-	50	50	**100**
PC	CO609	Deep Learning	4	-	-	4	-	-	50	50	**100**
PE	CO610	Professional Elective 3	4	-	-	4	-	-	50	50	**100**
PE	CO611	Professional Elective 4	4	-	-	4	-	-	50	50	**100**
OE	CO612	Open Elective	4	-	-	4	-	-	50	50	**100**
PC	CO613	Lab practice-III	-	-	2	1	-	50	-	-	**50**
PE	CO614	Lab practice-IV	-	-	2	1	-	50	-	-	**50**
Total			20	0	4	22	-	100	250	250	**600**

Professional Elective 3	**Professional Elective 4**
CO610A Applied Cloud Technology	CO611A Pattern Recognition
CO610B Image & Video Processing	CO611B Software Design & Architecture
CO610C Blockchain Technology	CO611C User Experience & Usability Engineering

Open Elective
CO612A Startup and Venture Management
CO612B Account and Finance Management
CO612C Project Planning and Operation Research
CO612D Industry Safety Management

Second Year M. Tech (Semester III)

Course			Teaching Scheme				Evaluation Scheme				
Category	**Code**	**Name**	**L**	**T**	**P**	**Credits**	**Component**				**Marks**
							TW	**OR**	**ISE**	**ESE**	
	CO615	**Internship/ Online Course Credit Transfer*/ Certification***	**-**	**-**	**8**	**4**	**50**	-	-	-	**50**
PC	CO616	Technical Seminar 1	-	-	4	2	-	50	-	-	**50**
PC	CO617	Dissertation Phase 1	-	-	16	8	50	50	-	-	**100**
Total			0	0	28	14	100	100	-	-	**200**

Second Year M. Tech (Semester IV)

Course			Teaching Scheme				Evaluation Scheme				
Category	**Code**	**Name**	**L**	**T**	**P**	**Credits**	**Component**				**Marks**
							TW	**OR**	**ISE**	**ESE**	
PC	CO618	Technical Seminar 2	-	-	4	2	-	50	-	-	**50**
PC	CO619	Dissertation Phase 2	-	-	24	12	50	100	-	-	**150**
Total			0	0	28	14	50	150	-	-	**200**

SEMESTER I

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Advanced Algorithms and Analysis (CO601)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Design and Analysis of Algorithms, Data Structures

==========

Course Objectives:

1. To teach problem formulation and problem solving skills.
2. To introduce students to the advanced methods of designing and analyzing algorithms.
3. The student should be able to choose appropriate algorithms and use it for specific problem.
4. To understand different classes of problems concerning their computation difficulties.
5. To learn about problem formulation and problem solving using different algorithmic techniques.
6. To study approximation algorithms and randomized algorithms to address the limitations on the time complexity

Course Outcomes (COs): On completion of the course student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand the basic principles of different paradigms of designing algorithms	2	Understand
2. Apply mathematical principles to solve various problems	3	Apply
3. Analyze the complexities of various algorithms	4	Analyze
4. Evaluate the performance of various algorithms in best case, worst case and average case	5	Evaluate
5. Design efficient algorithms using modern techniques.	6	Create
6. Apply learned algorithm design techniques and data	3	Apply

structures to solve various real life problems.		

Course Contents

Unit-I	**Analysis of Algorithms**	**No. of Hours**	**COs**
	Review of algorithmic strategies, Asymptotic analysis: upper and lower complexity bounds. Identifying differences among best, average and worst Case Behaviors. Big O, little o, omega and theta notations, Standard complexity classes. Empirical measurements of performance. Time and space tradeoffs in algorithms. Analyzing recursive algorithms using recurrence relations.	08	CO1,CO3,CO4
Unit-II	**Graph Algorithms**	**No. of Hours**	**COs**
	Strongly connected components, Bellman-Ford, Floyd-Warshall, Flow networks, max-flow min-cut theorem, Ford-Fulkerson method, Edmonds–Karp algorithm, Maximum bipartite matching, Push-relabel algortihms, Relabel-to-front algorithm	08	CO4, CO5
Unit-III	**Linear Programming**	**No. of Hours**	**COs**
	Standard and Slack forms, formulation of problems as linear programs, simplex algorithm, duality, initial basic feasible solution. Problem formulation for – single source shortest path, maximum flow problem, Vertex cover problem, Knapsack problem.	08	CO4, CO5
Unit-IV	**Geometric Algorithms**	**No. of Hours**	**COs**
	Line segment properties, determining wheher any pair of segments intersects, Finding the convex hull- problem formulation, solving by Graham scan algorithm, Jarvis march algorithm, Finding the closest pair of points – problem formulation,	08	CO4, CO5

	solving by divide & conquer method.		
Unit-V	**Approximation Algorithms**	**No .of Hours**	**COs**
	Vertex-cover problem, Travelling-salesman problem, set-covering problem, Randomization and linear programming, Subset-sum problem	08	CO4,CO5
Unit-VI	**Advanced Algorithmic Analysis**	**No .of Hours**	**COs**
	Amortized analysis, randomized algorithms. Dynamic programming: matrix chain multiplication and longest common subsequence, Greedy algorithms: activity-selection problem and Huffman codes, Combinatorial optimization	08	CO2,CO6

Books:

Text Books:

1. Cormen, Leiserson, Rivest, “Introduction To Algorithms”, PHI
2. Brassard, Bratley “Fundamentals of Algorithmics”, PHI

Reference Books:

1. Horowitz, Sahni, “Fundamentals of Computer Algorithm”, Galgotia
2. S. Baase, S and A. Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition. Addison Wesley,2000
3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms”, Addison Wesley
4. C Papadimitriou and K Steiglitz, “Combinatorial Optimization”, PHI

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Advance Network and Analysis (CO602)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Computer Network

==========

Course Objectives:

1. To develop a comprehensive understanding of computer Networks
2. To learn delay models in data networks
3. To study design issues in networks.
4. To understand various issues hindering the performance of the network.
5. To learn estimation of network requirements.
6. To learn and understand advances in computer networks

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Get aware with general principles, issues and tools of network design	2	Understand
2. Use delay models to evaluate the performance of networks	5	Evaluate
3. Apply the knowledge to design computer networks	6	Create
4. Analyze the performance of networks based on chosen metrics	4	Analyze
5. Choose appropriate and advanced techniques to build the computer network	5	Evaluate
6. Use network simulation tool like NS2/NS3 and network testing tool like Wireshark	3	Apply

Course Contents

Unit-I	Introduction	No. of Hours	COs
	Types of Networks. Network design issues. Network design tools, advanced network architectures. Reliable data delivery, Routing and forwarding, resource allocation, Mobility, Networked applications, Data in support of network design, General Principles of Network Design, network characteristics.	08	CO1
Unit-II	**Delay Models in Data Networks**	**No. of Hours**	**COs**
	Modeling and Performance evaluation. Multiplexing of Traffic on a Communication Link, Queuing Models- Little's Theorem, Probabilistic Form of Little's Theorem, Application of Little's Theorem, Queuing Systems: M/M/1, M/M/2, M/M/m, M/M/∞, M/M/m/m, M/M/m/q, M/M/1/N, D/D/1, M/G/1 System, M/G/1 Queues with Vacations, Reservations and Polling, Priority Queuing	08	CO2
Unit-III	**Network Design**	**No. of Hours**	**COs**
	Modeling Networks as Graphs, Problems & algorithms, Multipoint line topology- CMST, Esau-William's Algorithm, Sharma's Algorithm, Bin Packing algorithms. Terminal Assignment- Greedy algorithm and exchange algorithms, Concentrator location- COM, Add, Drop, Relaxation algorithm. Network of queues, Open, closed and semi-open queues, Network node, Kleinrock's Independent approximation.	08	CO3
Unit-IV	**Network Analysis**	**No. of Hours**	**COs**
	Queuing Networks, Closed Queuing Network	08	CO4

	Example, Nodes in a Packet Switched Network (PSN), Queuing Network Model of Nodes in a PSN, Queuing Network Analysis of a PSN, performance analysis of Data Link Layer, Network layer, QoS,		
Unit-V	**Network Administration**	**No. of Hours**	**COs**
	Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation	08	CO5
Unit-VI	**Advances in Computer Networks**	**No. of Hours**	**COs**
	Wireless and sensor networks, multimedia networking, content distribution networks, Domain-specific networks, Next generation networks, cyber physical systems, computer network simulation NS2/NS3, network testing, testing tool – wireshark	08	CO6

Books:

Text Books:

1. Kershenbaum A., "Telecommunication Network Design Algorithms", Tata McGraw Hill
2. Bertsekas D. and Gallager R., "Data Networks," 2nd Ed., Prentice-Hall, Englewood Cliffs, N.J., 1992.

Reference Books:

1. Keshav S., "An Engineering Approach to Computer Networking," Addison-Wesley,1997.
2. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill
3. Stallings W., "High Speed Networks and Internet : Performance and Quality of Service", Prentice-Hall
4. Zacker, "Networking – The Complete Reference", Tata McGraw Hill
5. Simulation Modeling and analysis, Averill M. Law, W. D. Kelton
6. Computer Networks, Priciples, Technologies and Protocols for network design Natalia Olifer, Victor Olifer, Wiley India

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Research Methodology (CO603)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course:

==========

Course Objectives:

1. To understand the philosophy of research in general
2. To understand basic concepts of research and its methodologies
3. To learn the methodology to conduct the Literature Survey
4. To acquaint with the tools, techniques, and processes of doing research
5. To learn the effective report writing skills and allied documentations
6. To become aware of the ethics in research, academic integrity and plagiarism

Course Outcomes (COs): After completion of the course, students should be able to

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Carry out Literature Survey	2	Understand
2. Identify appropriate topics for research work in computer engineering	2	Understand
3. Select and define appropriate research problem and parameters	3	Apply
4. Design the use of major experimental methods for research	4	Analyze
5. Use appropriate tools, techniques, and processes of doing research in Computer science	3	Apply
6. Demonstrate own contribution to the body of knowledge	6	Create
7. Understand the importance of ethics in research, academic integrity and plagiarism	1	Remember

8. Write a research report and thesis	6	Create

Course Contents

Unit-I	**Research process**	**No .of Hours**	**COs**
	Evolution of research methodology, Meaning, nature, scope, and significance of research, Research paradigm, Objectives of research, Motivation for research, Postulates underlying scientific investigations, Types of research, Research process and workflow, Principles of ethics, ethical considerations in research, Intellectual Property Rights (IPR)	07	CO1,CO2
Unit-II	**Research Planning**	**No. of Hours**	**COs**
	Selecting an area for research, Problem identification, Literature search, Literature review Ascertaining current state of knowledge, Sources of information, Recording literature search findings, Defining the problem, Hypothesis formulation Types of publications- Journal papers, conference papers, books, standards, patents, theses, Measures of research impact, Citations, Impact Factor, h-index, I-index, plagiarism Research Proposals, The elements of research proposals, Various Research grants and funding resources	08	CO1,CO2,CO3
Unit-III	**Research design**	**No. of Hours**	**COs**
	Type of research designs, pitfalls and advantages, Research approaches, Principles of experimental design, Design of experiments, Characteristics of good research design, Universe, population, and sample, Sampling concepts, principles, and techniques, Sample design (random, pseudo random, cluster, stratified, multi-stage), Sampling	08	CO3,CO4

	considerations (size, design, selection, measurements), Measures, Measurements, Metrics and Indicators, Measurement scales and direct measurements		
Unit-IV	**Methods, tools, and techniques**	**No .of Hours**	**COs**
	Data collection techniques (observation, interviewing, questionnaires, web-based, group techniques, experimentation, surveys), Sources of errors, Reliability and validity, Probability theory and theoretical distributions, Parametric statistics, Simple linear models (ANOVA, correlation and Regression, ANACOVA), Multivariate analysis, Step-wise regression, Nonparametric statistics, Sign test, Paired ranking test, Pearson Correlation, Man-Whitney U Test, Chi-square test	09	CO4,CO5
Unit-V	**Data processing and Data analysis**	**No. of Hours**	**COs**
	Primary and secondary data, coding and summarization of data, quantification of qualitative data (content analysis), Computation of indirect metrics, Role of descriptive statistics, Measures of central tendency, dispersion, skewness, kurtosis, plots and correlations, Inferential statistics, hypothesis testing, Type I and Type II errors, Power of tests, Role of computers in research	08	CO5,CO6,CO7
Unit-VI	**Reporting research**	**No.of Hours**	**COs**
	Research presentation**,** Introduction, Standard terms, Standard research methods and experimental techniques, Thesis, Structure and Style for writing thesis, Dissemination of research findings, Reporting and interpretation of results, cautions in interpretations, Type of reports, Typical report outlines, use of diagrams,	08	CO7,CO8

	tables, and charts, Optimization and optimization methods, Introduction to game theory, Queuing theory		

Books:

Text Books:

1. Kothari C.R., " Research Methodology", New Age International, (2004), 2nd Ed. ISBN(13): 978-81-224-1522-3
2. Kumar, Ranjit, " Research Methodology)", Sage Publications, 3rd Ed., 2011, IBSN: 978-1-8492-0301-2

Reference Books:

1. David V Thiel, "Research Methods- for Engineers", Cambridge University Press, ISBN:978-1-107-61019-4
2. Caroline Whitbeck, "Ethics in Engineering Practice and Research", 2nd Ed., Cambridge University Press; ISBN :978-1-107-66847-8

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Machine Intelligence (CO604A)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: discrete structures, probability, statistics and algorithmic analysis

==========

Course Objectives:

1. To introduce the concepts of Artificial Intelligence (AI) with emphasis on its use to solve real world problems.
2. To understand searching strategies to build Intelligent Systems (IS).
3. To study knowledge representation for IS.
4. To understand decision making in uncertainty.
5. To learn learning techniques and its applications
6. To study the challenges inherent in building "intelligent systems

Course Outcomes (COs): After successful completion of the course, the student should be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Interpret concepts of Artificial Intelligence.	2	Understand
2. Apply basic knowledge representation, problem solving	3	Apply
3. Analyze the applicability of algorithms in solving particular engineering problems and building intelligent systems	4	Analyze
4. Develop decision-making processes in uncertainty for IS.	6	Create
5. Apply learning techniques in designing IS applications	6	Create
6. Design and Develop IS for real-world problem solving	5	Evaluate

Course Contents

Unit-I	**Introduction to Intelligent Systems**	**No. of Hours**	**COs**
	Introduction, History, Foundations and Mathematical treatments, Problem solving with AI, AI models, Learning aspects in AI, What is an intelligent Agents, Rational agent, Environments types, types of Agents, Types of Intelligent Systems,	08	CO1
Unit-II	**Search Strategies**	**No. of Hours**	**COs**
	Problem solving by searching, Uninformed and informed search, Heuristic Functions	08	CO2,CO3
Unit-III	**Knowledge Representation and Logic**	**No. of Hours**	**COs**
	Propositional Logic, Inference rules, First Order Logic, Rule based systems, Deductive Retrieval, Backward Chaining, Second order Logic. Semantic nets, Frames,	08	CO2,CO3
Unit-IV	**Uncertain Knowledge and Decision Theory**	**No .of Hours**	**COs**
	Uncertainty and methods, Inference Using Full Joint Distributions, Bayesian probability and belief networks, Relational and First- Order Probability Models, Other techniques in uncertainty and reasoning, Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Decision network, Semi-constraint influence diagram, Decision making and imperfect information, Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility Functions, Multi-attribute Utility Functions, Decision Networks, Decision-Theoretic Expert Systems	08	CO4
Unit-V	**Learning Techniques and Applications**	**No. of**	**COs**

		Hours	
	Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Artificial Neural Networks, Non-parametric Models, Support Vector Machines, Ensemble Learning, empirical learning tasks, Explanation-Based Learning, Inductive Logic Programming, Reinforcement Learning, Active Learning, Learning based on limited information	08	CO5
Unit-VI	**Intelligent System Applications**	**No. of Hours**	**COs**
	Language Models, Text Classification, Information Retrieval, Information Extraction, Phrase Structure Grammars, Syntactic Analysis (Parsing), Augmented Grammars and Semantic Interpretation, Machine Translation, Speech Recognition, Image Formation and object recognition, Early Image-Processing Operations, Object Recognition by Appearance, Reconstructing the 3D World, Object Recognition from Structural Information, Robots	08	CO6

Books:

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall, 2010, 3rd edition
2. Elaine Rich and Kelvin Knight, Nair, "Artificial Intelligence," McGraw Hill Publication, 3rd edition.

Reference Books:

1. Janakiraman et al., "Foundations of Artificial Intelligence and Expert Systems", Macmilan India Ltd.
2. Laxmidhar Behera, Indrani , "Intelligent Systems & Control Principles & Applications", Kar Oxford UNI, 2009

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Embedded & Real Time Operating Systems (CO604B)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Operating Systems, Microprocessor, Linux

==========

Course Objectives:

1. To learn the applications of Embedded Systems & basics of embedded processors
2. To learn the concepts of Embedded Systems & to develop ability to use Embedded Operating utilities in Embedded Linux
3. To learn the concepts of Real Time Operating Systems
4. To understand the working of task scheduler in Embedded & RTOS
5. To learn the internals of real-time kernel
6. To design the Real-Time Databases

Course Outcomes (COs): After successful completion of the course, the student should be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand the concept of Embedded Systems & Embedded processor	2	Understand
2. Use tools & utilities in embedded Linux	3	Apply
3. Understand real-time OS	2	Understand
4. Understand real time tasks and their scheduling	2	Understand
5. Understand the internals of real-time kernel	2	Understand
6. Design a real-time databases	6	Create

Course Contents

Unit-I	Introduction to Embedded Systems	No. of Hours	COs
	Introduction to Embedded Systems, Application Domain and Characteristic of Embedded System, Components of Embedded System & its Classification, Review of Microprocessors and Micro-controllers, Processor basics and System-On-Chip, Multiprocessor systems using General Purpose Processor. CISC and RISC Processor architectures. Introduction to embedded processor, DSP processor, Application Specific System Processor.	08	CO1
Unit-II	**Embedded System Concepts & Tools**	**No. of Hours**	**COs**
	Bootloaders, Device Driver Basics: Character Device, PCI Device Drivers, File Systems, Device Tree, MTD Subsystem, Embedded Development Environment, Development Tools, ssh, Kernel Debugging Techniques, Debugging Embedded Linux Applications, Stepper Motor Controller interfacing using Begal Black Bone Embedded System, Embedded Graphics and Multimedia Tools and Applications. Porting Linux, Linux and Real Time, Embedded Android: Bootloader, Kernel, Init, Zygote, System Server, Activity Manager, Launcher (Home), Embedded Android Applications: Calculator, Twitter Search App, Slide Show App	08	CO2
Unit-III	**Real Time Operating System Concepts**	**No. of Hours**	**COs**
	Operating Systems Concepts, Comparison of traditional and embedded OS, Need for RTOS, Advantages & Disadvantages of RTOS, Software architectures of embedded system and comparison of them. Real-Time Operating Systems, Issues in real time computing, Structure of real time system, Performance measures for real time system: Properties, traditional performance measures, performability, cost functions and hard deadlines, and Estimating program run times, introduction LINUX/ UNIX OS.	08	CO3
Unit-IV	**Task Scheduling in RTOS**	**No. of Hours**	**COs**
	Real-Time Tasks, Types of Real-Time Tasks, Real time systems	10	CO4

	and Real time scheduling, Scheduling algorithms: round robin, round robin with interrupts, function queue scheduling, real time operating system selection, CPU scheduling algorithms: Rate monotonic, EDF, MLF, Priority Scheduling, Priority Ceiling and Priority inheritance Real time operating system: Tasks and task states, shared data and reentrancy		
Unit-V	**Real Time Kernel**	**No. of Hours**	**COs**
	Architecture of Real-time kernel, Real-Time Kernel Concepts: Threads, Context Switch, Kernel, Scheduler, Reentrancy, Thread priority: Static Priorities, Dynamic Priorities, Priority Inversions, Mututal Exclusion: Disabling & Enabling Interrupts, Semaphores, Deadlock, Synchronization, Interthread Communication: Message queues, Message Mailboxes, Interrupts: Interrupt Latency, Interrupt Response, Interrupt Recovery, ISR Processing time, Clock tick, Memory Requirements	10	CO5
Unit-VI	**Real Time Databases**	**No. of Hours**	**COs**
	Real time v/s general purpose databases, main memory databases, transaction priorities, transaction aborts, concurrency control, issues: pessimistic concurrency control andoptimistic concurrency control, Disk scheduling algorithms.	06	CO6

Books:

Text Books:

1. Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN
2. C.M. Krishna and Kang G. Shin, “Real Time Systems”, , TMH Publication ISBN 13: 9780070701151
3. Raj kamal, “Embedded system: Architecture Programming and Design”, TMH Publication ISBN 13: 9780070667648
4. David E. Simon, “ An embedded Software Primer”, Pearson Education Asia Publication ISBN-13: 9780201615692

Reference Books:

1. Christopher Hallinan, “Embedded Linux Primer”, Prentice Hall
2. Frank Vahid, “Embedded sytem design” , PHI
3. Steve Furber “Arm System on chip architecture”, AddisonWesely
4. Alessandro Rubini and Jonathan Corbet, “Linux Device Drivers”, 3rd Edition, O’Reilly

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Soft Computing (CO604C)

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hrs. / Week	**In-Sem Exam: 50 Marks**
Credits: 4	**End Sem Exam: 50 Marks**
	Total: 100 Marks

==========

Prerequisite Course: ----

==========

Course Objectives:

1. To know the Nero-Fuzzy and Soft computing
2. To acquire the knowledge of Fuzzy Logic
3. To understand and explore the regression and optimization.
4. To acquire the knowledge of Neural networks
5. To learn and understand the Advanced Neuro -Fuzzy Modeling

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	**Bloom's Taxonomy**	
	Level	**Descriptor**
1. Understand and explore the Neuro- Fuzzy and soft computing methodologies	2	Understand
2. Understand and apply ANNs methodologies	3	Apply
3. Design and development of certain scientific and commercial application using Fuzzy logic	6	Create
4. Understand and explore the soft computing methodologies such as Genetic algorithms	2	Understand
5. Analyze different hybrid soft computing frameworks	4	Analyze
6. Understand and Develop soft computing applications	6	Create

Course Contents

Unit-I	Introduction to Nero-Fuzzy and Soft Computing	No .of Hours	COs
	Introduction, Soft computing Constituents and Conventional Artificial Intelligence, Neural Networks, Application Scope of Neural Network, Fuzzy Logic, Genetic Algorithm, Hybrid Systems.	09	CO1
Unit-II	**Artificial Neural Network**	**No. of Hours**	**COs**
	Neural Network Architecture, Characteristics of Neural Network, Learning Methods, Taxonomy of Neural Network Architecture, History of Neural Network Research, Early Neural Network Architecture, Some application domains, Back-Propagation Networks, Associative Memory, Adaptive Resonance Theory.	08	CO2
Unit-III	**Fuzzy Logic**	**No. of Hours**	**COs**
	Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Defuzzification, Fuzzy Arithmetic and Fuzzy Measures , Fuzzy Decision Making, Fuzzy Logic Control Systems	09	CO3
Unit-IV	**Genetic Algorithm**	**No. of Hours**	**COs**
	Introduction, Genetic Algorithm and Search Space, Operators in Genetic algorithm- Encoding, Selection, Crossover, Mutation, Classification of Genetic Algorithm, Genetic Programming.	09	CO4
Unit-V	**Hybrid Soft Computing**	**No. of Hours**	**COs**
	Neuro- Fuzzy Hybrid System, Genetic Neuro – Hybrid Systems, Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Syste Laxmidhar Behera, Indrani ms , Simplified Fuzzy ARTMAP, Problem Using MATLAB.	08	CO5

Unit-VI	Application of Soft Computing	No.of Hours	COs
	Introduction, A Fusion Approach of Multi spectral Images with SAR (Synthetic Aperture Radar), Optimization of Traveling Salesman Problem using Genetic Algorithm Approach, Genetic Algorithm-Based Internet Search Technique Soft Computing Based Hybrid Fuzzy Controllers, Soft Computing Based Rocket Engine Control. MATLAB Environment for Soft Computing Technique	08	CO6

Books:

Text Books:

1. S.N. Sivanandam, “Principles of Soft Computing”, Wiley India- ISBN- 9788126527410
2. S. Rajsekaran and G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic
3. J S R Jang, CT Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing” , PHI PVT LTD, ISBN 0-13-261066-*3*.

Reference Books:

1. Andries P. Engelbrecht, “Computational Intelligence: An Introduction”, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0
2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press, ISBN 10: 0195671546
3. Siman Haykin, “Neural Networks”, Prentice Hall of India, ISBN: 0-7923-9475-5
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” , Wiley India, ISBN: 978-0-470-74376-8
5. Eiben and Smith, “Introduction to Evolutionary Computation", Springer, ISBN-10: 3642072852

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Digital Forensics (CO604C)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Operating system, Computer organization, Cyber security

==========

Course Objectives:

1. To emphasize the fundamentals and importance of digital forensics.
2. To learn different techniques and procedures that enables them to perform a digital investigation
3. To conduct a digital investigation in an organized and systematic way
4. To learn open-source forensics tools to perform digital investigation and understand the underlying theory behind these tools.
5. To emphasize theoretical and practical knowledge, as well as current research on Digital Forensics
6. To learn programming for Computer Forensics.

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Students will explain and properly document the process of digital forensics analysis	2	Understand
2. Students will be able to describe the representation and organization of data and metadata within modern computer systems.	2	Understand
3. Students will gain an understanding of the trade-offs and differences between various forensic tools.	2	Understand
4. Students will be able to investigate Networks	6	Create
5. Students will be able to investigate Mobile Networks	6	Create
6. Students will be able to demonstrate forensics of hand held devices.	3	Apply

Course Contents

Unit-I	Introduction to digital Forensics	No. of Hours	COs
	Digital crimes, evidence, extraction, preservation, etc. Overview of hardware and operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.	08	CO1
Unit-II	**Data recovery and Digital evidence controls**	**No. of Hours**	**COs**
	Data recovery: identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files. Digital evidence controls: uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary &cache files.	08	CO2
Unit-III	**Computer Forensics analysis and validation**	**No. of Hours**	**COs**
	Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Computer Forensic tools: Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools.	08	CO3
Unit-IV	**Network Forensic**	**No. of Hours**	**COs**
	Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, e-mail activity, and windows registry changes, intrusion detection, tracking offenders, etc. Mobile Network Forensic: Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.	08	CO4

Unit-V	Software Reverse Engineering	No. of Hours	COs
	Software Reverse Engineering: defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.	08	CO5
Unit-VI	**Computer crime and Legal issues**	**No. of Hours**	**COs**
	Computer crime and Legal issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court of law.	08	CO6

Text Books:

1. Cory Altheide and Harlan Carvey, " Digital Forensics with Open Source Tools", ISBN: 978-1-59749-586-8, Elsevier publication, April 2011.
2. B. Nelson, A. Phillips, F. Enfinger, C. Steuart , "Guide to Computer Forensics and Investigations", 4th edition), ISBN 0-619-21706-5, Thomson, 2009.
3. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction",3rd Edition, 2013.

Reference Books:

1. Sherri Davidoff, Jonathan Ham , "Network Forensics: Tracking Hackers Through Cyberspace", Prentice Hall, 2012
2. EC Council , "Computer Forensics: Hard Disk and Operating Systems", September 17, 2009
3. Computer Forensics Investigation Procedures and response, EC-Council Press, 2010
4. EnCase Computer Forensics., 2014
5. Brian Carrier, " File System Forensic Analysis",. Addison-Wesley Professional, March 27, 2005.
6. NIST Computer Forensic Tool Testing Program (www.cftt.nist.gov/)
7. Computer Forensics: Investigating Data and Image Files (Ec-Council Press Series: Computer Forensics), EC-Council (Paperback - Sep 16, 2009)
8. Eoghan Casey, " Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet" Third Edition , 2011
9. Michael Hale Ligh, Andrew Case, Jamie Levy, AAron Walters, " The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory", ISBN: 978-1-118-82509-9, July 2014

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Wireless Network (CO605A)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

Prerequisite Course: Data Communication, Computer Network.

Course Objectives:

1. To learn and understand Data Communication Concepts and Techniques.
2. To learn and understand different Wireless Communication Algorithm and Techniques.
3. To learn and understand different Concepts of WSN.
4. To learn and understand different protocols for Wireless Network
5. To learn and understand the functionalities of specialized protocols used in Wireless Network.
6. To learn and understand different applications in Wireless Network.

Course Outcomes (COs): After completion of the course, students are able to-

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Implement program using data communication methods and algorithm.	3	Apply
2. Implement program using wireless communication methods and algorithm.	6	Create
3. Analyse capabilities of Wireless Sensor Network in Society.	5	Evaluate
4. Design, Setup, Install and configure Wireless Sensor Network.	6	Create
5. Design and implement different routing algorithm for Wireless Network.	5	Evaluate
6. Develop different applications using Wireless Network.	6	Create

Course Contents

Unit-I	Introduction to Wireless Communication	No. of Hours	COs
	Introduction, Multiplexing techniques: TDM, FDM, and CDMA, TD-SCDMA, LTETDD, LTE-FDD,. LAN standards: Wireless LAN, WiMAX, ZigBee, Bluetooth, Infrastructure based (satellite n/w, Cellular n/w) and Infrastructure less (Adhoc n/w) wireless topologies. VLAN, VPN,	08	CO1
Unit-II	**Overview of Wireless Networks**	**No. of Hours**	**COs**
	Wireless Transmission: Electromagnetic Spectrum, Radio, Micro Waves, Infrared, Lightwave, Spread Spectrum Systems, modem Switching Techniques: Circuit Switching, Packet Switching and Message Switching, Hardware Components: Transceivers, Access Points and wireless routers,	07	CO1 CO2
Unit-III	**Basic Concepts of WSN**	**No. of Hours**	**COs**
	Background of Sensor Network Technology, Basic Overview of the Technology: Basic Sensor Network Architectural Elements, Typical sensing node, Brief Historical Survey of Sensor Networks, Applications of WSN: Building Automation, Sensors and Robots, Health Care and Military Applications. Basic WSN Technology: Sensor Node Technology, Hardware and Software, Sensor Taxonomy, Network Organization and Tracking. RFID based data communication, Architecture.	06	CO3 CO4 CO5 CO6
Unit-IV	**Data link layer protocols**	**No. of Hours**	**COs**
	Link Layer: Error control, Framing, Link management. MAC Layer: Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols, Networking Sensors: ZigBee, Sensor MAC(S-MAC) protocol for WSN, Naming and Addressing: Fundamentals, Address and name management in wireless sensor networks.	07	CO4 CO6
Unit-V	**Routing Protocols**	**No. of Hours**	**COs**

	Routing Strategies (Proactive and Reactive). Geographic and Energy aware routing, Attribute based routing, Routing Techniques: Flooding, SPIN, Mobile Networking: Mobile IP, AODV, DSDV ,DSR	08	CO4 CO5 CO6
Unit-VI	**Applications of Wireless Network**	**No .of Hours**	**COs**
	Wireless Application Protocol (WAP),WML Case Study: MANET, Cellular Network, Wireless Sensor Network, Military and Surveillance Applications.	07	CO4 CO6
Books:			
Text Books:			
1. Kazim Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks: Technology, Protocols and Applications", Wiley ISBN: 978-81-265-2730-4 (Students Edition). 2. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Networks: An information Processing Approach", Elsevier ISBN: 978-81-8147-642-5			
Reference Books:			
1. Holger Karl and Andreas Willig "*Protocols and Architectures for Wireless Sensor Networks",* John Wiley & Sons, Ltd. ISBN: 0-470-09510-5 2. Waltenegus Dargie,Christian Poellabauer, " Fundamentals of wireless sensor networks theory and practice",John Wiley and Sons, Ltd., Publication,ISBN 978-0-470-99765-9			

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Parallel Computing (CO605B)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course:

==========

Course Objectives:

1. To learn and understand the parallel processing and advances in Grid Computing.
2. To learn and understand the advances in cluster computing.
3. To learn and understand the advance parallel algorithms.
4. To learn and understand the advancement in pervasive & quantum computing.

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand how large scale parallel systems are architectured and how massive parallelism are implemented in accelerator architectures	2	Understand
2. Understand and apply the methodologies for cluster setup and administration	6	Create
3. Understand and explore the distributed share memory and resource management	2	Understand
4. Write parallel programs for large scale parallel systems, load sharing and load balancing approach	4	Analyze
5. Design efficient parallel algorithms and applications	6	Create
6. Explore and analyses the ubiquitous computing and quantum computing	2	Understand

Course Contents

Unit-I	Introduction Parallel Computing	No. of Hours	COs
	Introduction: Computational demand in various application areas, advent of parallel processing, terminology pipelining, Data parallelism and control parallelism-Amdahl's law. Basic parallel random access Machine Algorithms-definitions of P, NP and NP-Hard, NP Complete classes of sequential algorithms-NC –class for parallel algorithms. Grid Computing: Data & Computational Grids, Grid Architectures and its relations to various Distributed Technologies. Autonomic Computing, Examples of the Grid Computing Efforts (IBM)	09	CO1
Unit-II	**Cluster Computing 1**	**No. of Hours**	**COs**
	Cluster setup & its Administration, Performance Models & Simulations; Networking, Protocols & I/O, Lightweight Messaging systems, Active Messages	08	CO2
Unit-III	**Cluster Computing 2**	**No. of Hours**	**COs**
	Distributed shared memory, parallel I/O Clusters, Jib and Resource management system, scheduling parallel jobs on clusters	09	CO3
Unit-IV	**Cluster Computing 3**	**No. of Hours**	**COs**
	Load sharing and Fault tolerance manager, parallel programming scheduling techniques, Dynamic load balancing, Example Cluster System – Beowlf, COMPaS and NanOS	09	CO4
Unit-V	**Parallel Algorithms**	**No .of Hours**	**COs**
	Parallel algorithms for Graph searching— All Pairs	08	CO5

	shortest paths and minimum cost spanning tree. Parallelization aspects of combinatorial search algorithms with Focus on Branch and Bound Methods and, Alpha-beta Search methods.		
Unit-VI	**Pervasive Computing & Quantum Computing**	**No. of Hours**	**COs**
	Pervasive Computing: Pervasive Computing concepts & Scenarios, Hardware & Software, Human - machine interface Device connectivity, Java for Pervasive devices, Application examples, Quantum Computing : Introduction to Quantum Computing, QUbits, Quantum Mechanics, Quantum gates, Applications of quantum computing.	08	CO6

Books:

Text Books:

1. Raj Kumar Buyya, "High performance cluster computing," PEA
2. J. Joseph & C. Fellenstein, "Grid Computing," PEA.
3. J.Burkhardt et .al, " Pervasive computing," PEA.
4. Vishal Sahni, "Quantum computing," Tata McGraw Hill.

Reference Books:

1. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998, ISBN:0070317984
2. David Culler Jaswinder Pal Singh, "Parallel Computer Architecture: A Hardware/Software Approach", Morgan Kaufmann,1999, ISBN 978-1-55860-343-1
3. Rod Stephens, " Essential Algorithms", Wiley, ISBN: *ISBN*: 978-1-118-61210-1
4. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Cloud Technology (CO605C)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Computer Network

Course Objectives:

1. To study cloud computing fundamentals.
2. To understand virtualization environment in cloud computing.
3. To study various cloud computing platforms.
4. To study the applications that uses cloud computing.
5. To study cloud monitoring and security aspects.

Course Outcomes (COs): After successful completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Understand the fundamentals and roots of cloud computing	2	Understand
2. Install and create virtualization environments that forms the basics for cloud	6	Create
3. Study and Analyse different cloud file systems. Compare available cloud file systems.	4	Analyse
4. Develop Open source type of cloud	6	Create
5. Understand Service Level Agreements in cloud services offered by cloud service provider to cloud service consumer.	2	Understand
6. Design and Analyse the IoT sensor data by sending data on cloud.	4	Analyse

Course Contents

Unit-I	Introduction cloud computing	No.of Hours	COs
	Roots of Cloud Computing: Distributed computing (Cluster and Grid), Virtualization, Internet Techniques(Web services and SOA) & Autonomic computing. Cloud Fundamentals: cloud definition, hardware and software resources, benefits of cloud computing, limitations of cloud computing.	05	CO1
Unit-II	**Cloud architecture**	**No.of Hours**	
	Cloud computing reference model, Cloud computing service models and deployment models. Web Services, Service Oriented Architecture(SOA), Web service model, Web service components, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and XAMP)	06	CO2
Unit-III	**Virtualization**	**No.of Hours**	
	Virtualization: Definition, types of virtualization, types of hypervisors, virtualization tools and mechanisms- Xen, VMware. Issues with virtualization, advantages of virtualization. Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management. Virtualization for Data-Center Automation.	06	CO3
Unit-IV	**Data Storage in cloud**	**No.of Hours**	
	Storage system architecture, Big data, Block and level storage virtualization, Virtual Provisioning, and automated storage tiering, VLAN, VSAN and benefits, Cloud file systems: GFS and HDFS, BigTable, Hbase and Dynamo. Features and comparisons among GFS, HDFS. Cloud Storage Providers.	07	CO4
Unit-V	**Cloud monitoring and Management**	**No.of Hours**	
	Interoperability and Service Monitoring: Issues with interoperability, Vendor lock-in, Interoperability approaches. SLA Management, Metering Issues, and	06	CO5

	Report generation. Resource Management and Load Balancing: Virtual machine migration, Distributed Management of Virtual Infrastructures, Server consolidation, Dynamic provisioning and resource management.		
Unit-VI	**Cloud and the Internet of Things**	**No.of Hours**	
	Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Cyber-Physical System), Online Social and Professional Networking.	06	CO6

Books:

Text Books:

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.
2. Dr. Kris Jamsa, " Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more" , Wiley Publications, ISBN: 978-0-470-97389-9.
3. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476.

Reference Books:

1. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication, ISBN10: 8126536039.
2. Buyya, "Mastering Cloud Computing", Tata McGraw Hill, ISBN-13: 978-1-25-902995-0.
3. Barrie Sosinsky,"Cloud Computing", Wiley India, ISBN: 978-0-470-90356-8.
4. Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Geographic Information System (CO605D)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Database Management System, Image Processing, Computer Graphics

Course Objectives:

1. To understand the basics components of Geographic Information System.
2. To study the maps, coordinate system and projection of GIS.
3. To learn and understand the data models to represent GIS.
4. To understand and analyse geospatial data.
5. To learn and understand GIS image interpretation, processing and classification.
6. To explore geographical Information system applications and its future

Course Outcomes (COs) : On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Aware with the basic components of GIS	2	Understand
2. Understand the maps, coordinate systems and projections	2	Understand
3. Represent GIS data in data models	3	Apply
4. Understand and analyze GIS geospatial data	2,4	Understand, Analyze
5. Process and classify the GIS images	3	Apply
6. Aware with application and future of GIS	2	Understand

Course Contents

UNIT I	Geographic Information Systems	No. of Hours	COs
	Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration-Data Analysis. Coordinate Systems: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters Commonly used Map Projections - Projected coordinate Systems	08	CO1,CO2
UNIT II	**Vector Data Model**	**No. of Hours**	**COs**
	Representation of simple features- Topology and its importance; data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules	08	CO3
UNIT III	**Raster Data Model**	**No.of Hours**	**COs**
	Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing	08	CO3
UNIT IV	**GIS Data Management and Analysis**	**No.of Hours**	**COs**

	Organizational stratergy of DBMS in GIS, Data input and Editing: data stream, data input model and data input method, data editing. Data Quality issue: Components of data quality, accuracy, precision and resolution, consistency completeness, source of error in GIS, Modeling Errors and error evaluation. Spatial Analysis: Raster Data Analysis– Local, neighborhood, Zonal and Global, Vector Data Analysis – Buffering, Overlays, Distance Measurements, Analyzing Geographic Relationship, pattern analysis, Network Analysis, Basics of Geodatabase Model, Difference between 2D,2.5D, 3D and 4D GIS and conversion	08	CO4
UNIT-V	**Visual Image Interpretation** .	**No. of Hours**	**COs**
	Types of Pictorial data products, image interpretation stratergy, image interpretation process, overview of image interpretation equipment. Digital image processing: Basic chapter of digital images, processing, registration, enhancement, spatial filtering, transformation, classification, image classification, image classification and GIS	08	CO5
UNIT-VI	**Applications**	**No. of Hours**	**COs**
	GIS application areas and user segments, creating custom GIS software applications, user interfaces, case studies. Future data, future hardware, future software, future issue: data ownership, privacy, education. GIS career options and how to pursue them.	08	CO6
Books:			
Text Books:			
1. Kang-tsung Chang, “Introduction to Geographical Information Systems”, Tata McGraw Hill, Fourth Edition, 2008 2.Peter A. Burrough, Rachael A. McDonnell, “ Principles of Geographical Information Systems”, Oxford University Press			

Reference Books:

1. B. Bhatta , “Remote Sensing and GIS,” Oxford Publishers, 2015.
2. M Anji Reddi,“ Remote sensing & Geographical Information Systems” , BS Publication, Second Edition.
3. Terry-Karen Steede, “Integrating GIS and the Global Positioning System,” ESRI Press, 2002.
4. Hofmann W.B & Lichtenegger, H. Collins, “Global Positioning System –Theory and Practice,” Springer-Verlag Wein, New York, 2001
5. Gunter Seeber, “Satellite Geodesy Foundations-Methods and Applications,Gruyter,” Walter de GmbH, 2003

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-1
Advanced Algorithms Lab (CO606)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course: Design and Analysis of Algorithms, Data Structures

==========

Course Objectives:

1. To teach problem formulation and problem solving skills.
2. To understand different classes of problems concerning their computation difficulties.
3. To be capable of understanding basic ability to analyze algorithms
4. To learn about problem formulation and problem solving using different algorithmic techniques.
5. To understand basic features of different algorithm design paradigms like divide and conquer, greedy, dynamic programming etc.
6. To learn algorithm design techniques and data structures to solve various real life problems.

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Understand the basic principles of different paradigms of designing algorithms	2	Understand
2. Apply mathematical principles to solve various problems	3	Apply
3. Analyze the complexities of various algorithms	4	Analyze
4. Evaluate the performance of various algorithms in best case, worst case and average case	5	Evaluate
5. Determine algorithm correctness and time efficiency class.	2	Understand
6. Apply and implement learned algorithm design techniques and data structures to solve various real life problems.	3	Apply

Suggested List of Assignments

In this laboratory Students should run all the programs using C/C++/Java programming language on LINUX platform and then estimate the running time of their programs in best, worst and average case situations for large dataset.

1. Divide and Conquer: Find Maximum and Minimum element from an array of integer using Divide and Conquer approach
2. Divide and Conquer: Implement Quick Sort using Divide and Conquer approach. Check the running time for different positions of pivot elements. Implement the randomized version of quick sort
3. Dynamic Programming: Find the minimum number of scalar multiplication needed for chain of Matrices
4. Implement Single Source shortest Path for a graph (Dijkstra and Bellman Ford Algorithm)
5. Dynamic Programming: Implement all pair Shortest path for a graph (Floyd- Warshall Algorithm)
6. Greedy method: implement fractional Knapsack Problem, MST by Prim's algorithm
7. Greedy method: Implement MST by Kruskal's algorithm by using Union operation on Disjoint data Structures.
8. Graph Traversal Algorithm: Implement Depth First Search (DFS), application of DFS (do topological sorting, identify strongly connected components)
9. Implement KMP algorithm for string matching
10. Implement Ford-Fulkerson algorithm to get maximum flow of a given flow network.

Books:

Text Books:

1. Cormen, Leiserson, Rivest, "Introduction To Algorithms", PHI
2. Brassard, Bratley "Fundamentals of Algorithmics", PHI

Reference Books:

1. Horowitz, Sahni, "Fundamentals of Computer Algorithm", Galgotia
2. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley
3. S. Baase, S and A. Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition. Addison Wesley,2000

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-II
Machine Intelligence Lab (CO607A)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course: AI

Course Objectives:

1. To understand fundamentals of Intelligent Systems
2. To introduce students a set of advanced topics in intelligent systems.
3. To develop comprehensive approach towards building intelligent systems
4. To understand various intelligent system modeling
5. To learn to implement intelligent system
6. To learn real world application scenarios of intelligent systems with its societal and economic impact using case studies

Course Outcomes (COs): After successful completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Gain deep understanding of the basic artificial intelligence techniques.	6	Understand
2. Apply knowledge to design solutions to different real life problems	3	Apply
3. Design an intelligent system for a selected application	2	Understand
4. Develop an intelligent system for a selected application.	4	Analyse
5. Model new intelligent systems	6	Create
6. Evaluate various kinds of intelligent System Applications	5	Evaluate

Instructor Guideline:

Student need to perform the assignments with latest Machine Learning Open Source Tools like Fuzzywuzzy, MongoDB, PyMongo, Python, etc. is highly encouraged. In addition, need to submit complete report including Review Work Carried Out, Applied Implementation Strategy Details as per AI Techniques, System Architecture, results and Evaluation Details of assignment. Also, need to demonstrate working prototype in the form of Video / Live Demonstration.

Assignment No. 1

Add AI Brains to Your Home Camera System

Description:

Many people have home camera systems installed in order to detect when people are around, ranging from doorbell cameras up to multi-camera home surveillance systems. These systems may issue text or audio notifications when motion is detected, but often the motion is not of interest, and may be due to an animal or passing vehicle. These unnecessary alerts are annoying and reduce the effectiveness of alerts since the user begins to get lazy about checking them. Fundamentally, the problem is that the system has no concept of what a person looks like. Therefore, add an AI to a simple camera system allowing the system to know when a person is in an image. By filtering out uninteresting images, the user is only alerted when a person is detected, improving the effectiveness of the alerting system.

Assignment No. 2

Implement a chat bot system

- To make a bot that can respond to human input, learn and return responses that are more organic over time.
- To be able to be trained from large text files such as scripts for movies and transcripts of conversations.
- Have it able to be integrated easily into other projects.

Assignment No. 3

Intelligent Cat Door

Cats love to be outside. Therefore, some people install a cat door to give their pet the freedom to left and enter the house at any time. However, if you do not want to get some unwanted visitors you have to install a system, which can recognize your cat. Current solutions use a special collar or implanted chips. However, cats hate collars and implanting a chip is expensive and stressful for the cat. Design an intelligent solution based on AI, which will provide smart solution for this problem.

Resource Links for this assignment:

https://github.com/MrDio/Smartphone-Sensing-Framework

https://github.com/MrDio/Applied-AI-Technologies

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-II
Embedded and Real Time Operating Systems Laboratory (CO607B)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course: Operating Systems, System Softwares, Programming basics

==========

Course Objectives:

1. To understand the differences between the general computing system and the real time embedded system.
2. To analyse various examples of embedded systems.
3. To learn the interfacing of various embedded devices.
4. To understand the real-time algorithms for task scheduling.
5. To understand the working of real-time operating systems and real-time databases.
6. To work on design and development of protocols related to real-time communication.

Course Outcomes: On completion of the course, student will be able to–

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Distinguish between general computing system and real time embedded systems.	4	Analyze
2. Solve the problems related to the primitive needs using embedded systems.	3	Apply
3. Develop simple embedded system applications.	6	Create
4. Schedule the real time tasks with standard algorithms and customize the algorithms.	3	Apply
5. Use the real time operating systems and real time databases for implementing the real time applications.	3	Apply
6. Implement real-time communication at thread synchronization level.	3	Apply

Suggested List of Laboratory Assignments

1. Write a program to toggle the LEDs with some time delay using ARM7.
2. Write a program to interface LCD with ARM7.
3. Write a program to interface Stepper motor with ARM7.
4. Write a program to implement Rate Monotonic Scheduling Algorithm.
5. Write a program to implement Deadline Monotonic Scheduling Algorithm.
6. Write a program to implement Earliest-Deadline-First Scheduling algorithm.
7. Write a program to implement synchronization of threads using semaphores.
8. Write a program to implement Inter-thread communication.
9. Write an application which uses the real-time database.

Books:

Text Books:

1. Lyla B. Das, "Embedded Systems: An Integrated Approach" Pearson , ISBN
2. "Real Time Systems", C.M. Krishna and Kang G. Shin, TMH Publication ISBN 13: 9780070701151
3. "Embedded system: Architecture Programming and Design", Raj kamal, TMH Publication ISBN 13: 9780070667648
4. An "Embedded Software Primer", David E. Simon Pearson Education Asia Publication ISBN-13: 9780201615692

Reference Books:

1. Christopher Hallinan, "Embedded Linux Primer", Prentice Hall
2. Frank Vahid, "Embedded sytem design" , PHI
3. Steve Furber "Arm System on chip architecture", AddisonWesely
4. Alessandro Rubini and Jonathan Corbet, "Linux Device Drivers", 3rd Edition O'Reilly

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-II
Soft Computing Laboratory (CO607C)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course:

==========

Course Objectives:

1. To learn and understand the fuzzy set and fuzzy operations.
2. To learn and understand the ANN
3. To learn and understand the backpropogation in ANN
4. To learn and understand the Genetic Algorithm
5. To design and implement the application on soft computing.

Course Outcomes (COs): On completion of the course, student will be able to–

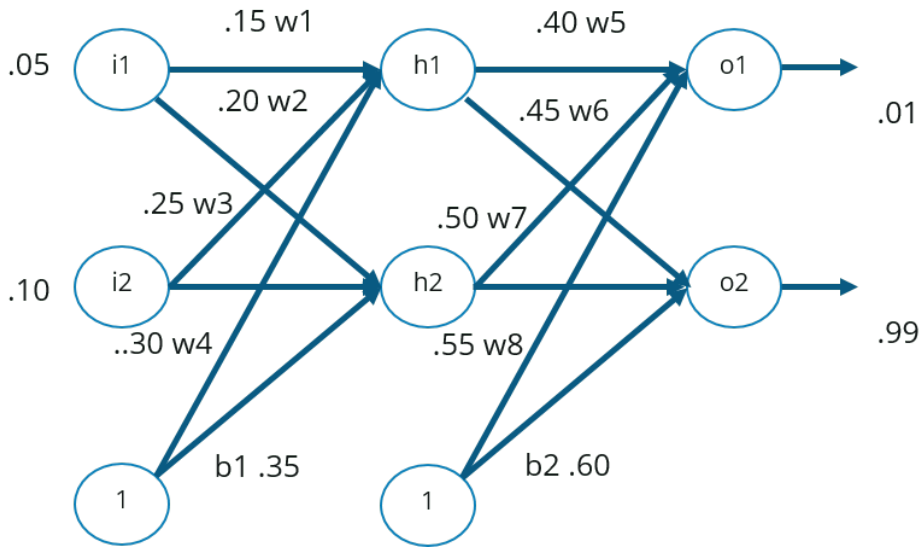
Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. To implement the fuzzy operations on fuzzy sets	2	Understand
2. To implement the simple ANN	3	Apply
3. To apply the backpropogation concept to ANN	6	Create
4. Understand and implement the genetic algorithm	2	Understand
5. To create the single layer and multi-layer percenpton	4	Analyze
6. Create and analyze the applications of soft computing	6	Create

List of Assignments

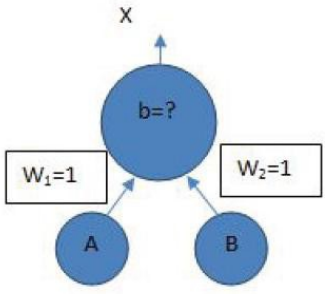
1. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.Implement basic logic gates using Mc-Culoch-Pitts or Hebbnet neural networks

2. Implement basic logic gates using Mc-Culoch-Pitts or Hebbnet neural networks.

3. The figure shows a hidden layer neural network. The weights are initialized to as shown in the diagram and all biases are initialized to 0"s. Assume all the neurons have linear activation functions. The neural network is to be trained with stochastic (online) gradient descent. Design the Back-Propagation algorithm to find the updated value for all weights after backpropagation.



4. Consider the problem of maximizing the function, $f(x) = x^2$
Wherer x is permitted to vary between 0 and 31.
Solve the above problem uisng Genetic Algorithm.



5. Implement the following Single Layer Perception using Pyhton.

6. Design a fuzzy controller to control the temperature of air conditioner using Fuzzy Inferernce System and matlab programming
7. Write a program for implmenting Genetic Algorithm based Travelling Salesman Problem (TSP).

Books:
Text Books:
1. S.N. Sivanandam- “Principles of Soft Computing”, Wiley India- ISBN- 9788126527410 2. S. Rajsekaran and G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic 3. J S R Jang, CT Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing” , PHI PVT LTD, ISBN 0-13-261066-*3*.
Reference Books:
1. Andries P. Engelbrecht, “Computational Intelligence: An Introduction”, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0 2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press, ISBN 10: 0195671546 3. Siman Haykin, “Neural Networks”, Prentice Hall of India, ISBN: 0-7923-9475-5 4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” , Wiley India, ISBN: 978-0-470-74376-8 5. Eiben and Smith, “Introduction to Evolutionary Computation", Springer, ISBN-10: 3642072852

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-II
Digital Forensics Lab (CO607D)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course: Operating system, Computer organization, Cyber Security

==========

Course Objectives:

1. To emphasize the fundamentals and importance of digital forensics.
2. To learn different techniques and procedures that enables them to perform a digital investigation
3. To conduct a digital investigation in an organized and systematic way
4. To learn open-source forensics tools to perform digital investigation and understand the underlying theory behind these tools.
5. To emphasize theoretical and practical knowledge, as well as current research on Digital Forensics
6. To learn programming for Computer Forensics.

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Students will explain and properly document the process of digital forensics analysis	2	Understand
2. Students will be able to describe the representation and organization of data and metadata within modern computer systems.	2	Understand
3. Students will gain an understanding of the tradeoffs and differences between various forensic tools.	2	Understand
4. Students will be able to investigate Networks	6	Create
5. Students will be able to investigate Mobile Networks	6	Create
6. Students will be able to demonstrate forensics of hand held devices.	3	Apply

Suggested list of assignments (Implement any 5)

1. **Write a computer forensic application program in Python for Recovering Deleted Files and Deleted Partitions.**
   Typically, in computer storage, data usually is not erased from the drive, even after emptying the recycle bin and disk formatting. Instead, for each file/data that is deleted or formatted, the storage drive removes the access to that location, and marks it as available for future data storage needs.
2. **Write a program in Python to analyse email header.**
   Every single Internet e-mail message is made up of two parts the header and the message body of the email. Every single email you send or receive on the Internet contains an Internet Header; a full and valid e-mail header provides a detailed log of the network path taken by the message between the mail sender and the mail receiver(s) (email servers).
3. **Write a program in C++ /python for Tracking Emails and Investigating Email Crimes.**
   Investigating email crimes is the process of tracing, collecting, analyzing, and investigating digital evidence and cyber trails. Digital evidence and cyber trails can relate to email spamming, mail bombing/mail storms, email spoofing, identity fraud/chain letters, phishing attacks, and email hijacking.
4. **Install and use Android Mobile Forensics Open Source Tools**.
   In recent years Android operating system, being installed on huge numbers of smartphones, tablets and other devices, had a breakthrough on the market. Following that success, the need to recover and analyse data from Android OS, became important part of mobile forensics. Consequently, many commercial and open-source mobile forensic tools became available for forensics investigators. Like Andriller - is software utility with a collection of forensic tools for smartphones. It performs read-only, forensically sound, non-destructive acquisition from Android devices.
5. **Write a program for identifying the tampering of digital signature using Python.**
   Digital signatures are commonly used for software distribution, financial transactions, and in other cases where it is important to detect forgery or tampering. so digital signatures ("digital thumbprints") are commonly used to identify electronic entities for online transactions. A digital signature uniquely identifies the originator of digitally signed data and also ensures the integrity of the signed data against tampering or corruption.
6. **Write a program to implement a fingerprint recognition using Java Programming.**
   Fingerprint recognition refers to the automated method of identifying or confirming the identity of an individual based on the comparison of two fingerprints**.** Fingerprint recognition is one of the most well-known biometrics, and it is by far the most used biometric solution for authentication on computerized systems.

7. **Perform Disk Imaging and Cloning**.
   Write the steps to perform the disk imaging process in details.
   Write the steps to perform the disk cloning process in details.

Text Books:

4. Cory Altheide and Harlan Carvey, " Digital Forensics with Open Source Tools", ISBN: 978-1-59749-586-8, Elsevier publication, April 2011.
5. B. Nelson, A. Phillips, F. Enfinger, C. Steuart , "Guide to Computer Forensics and Investigations", 4th edition), ISBN 0-619-21706-5, Thomson, 2009.
6. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction",3rd Edition, 2013.

Reference Books:

10. Sherri Davidoff, Jonathan Ham , "Network Forensics: Tracking Hackers Through Cyberspace", Prentice Hall, 2012
11. EC Council , "Computer Forensics: Hard Disk and Operating Systems", September 17, 2009
12. Computer Forensics Investigation Procedures and response, EC-Council Press, 2010
13. EnCase Computer Forensics., 2014
14. Brian Carrier, " File System Forensic Analysis",. Addison-Wesley Professional, March 27, 2005.
15. NIST Computer Forensic Tool Testing Program (www.cftt.nist.gov/)
16. Computer Forensics: Investigating Data and Image Files (Ec-Council Press Series: Computer Forensics), EC-Council (Paperback - Sep 16, 2009)
17. Eoghan Casey, " Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet" Third Edition , 2011
18. Michael Hale Ligh, Andrew Case, Jamie Levy, AAron Walters, " The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory", ISBN: 978-1-118-82509-9, July 2014

SEMESTER II

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Data Analytics and Business Intelligence (CO608)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Data Mining

Course Objectives:

1. To learn & develop problem solving abilities using Mathematics.
2. To understand principles and methods of data analytics.
3. To learn & explore decision support systems.
4. To explore data Analytics life cycle.
5. To learn & manage BI Systems.
6. To learn advanced BI Tools.

Course Outcomes (COs): On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Understand fundamental concepts in Data Analytics & Business Intelligence.	2	Understand
2. Apply Business Intelligence to Make Business Decisions.	3	Apply
3. To demonstrate a survey on applications for Business Analytic and Intelligence.	2	Understand
4. Ability to visualize the data.	5	Evaluate
5. Apply recent BI Tools for various Applications.	3	Apply
6. To write case studies in Data Analytics & Business Intelligence using mathematical models.	6	Create

Course Contents

Unit-I	Data Analytics	No. of Hours	Cos
	Introduction: Data Analytics, Data Analytics life cycle, Discovery, Data preparation, Preprocessing requirements, Results & Findings, Operationalizing, Introduction to OLAP. Real-world Applications, types of outliers, outlier challenges, Outlier detection Methods, Proximity-Based Outlier analysis, Clustering Based Outlier	06	CO1
Unit-II	**Decision Making Concepts**	**No. of Hours**	**Cos**
	Concepts of Decision Making, Techniques of Decision Support System (DSS), Development of Decision Support System (DSS), The DSS Development Method-ology, Change Management, DSS Technology Levels and Tools; DSS Development Platforms;Applications of DSS, Role of Business Intelligence in DSS.	06	CO2
Unit-III	**Introduction to Business Intelligence**	**No. of Hours**	**Cos**
	Introduction to Business Intelligence, Defining BI Cycle, BI Environment and Architecture, Identify BI opportunities, Benefits of BI. Role of Mathematical model in BI, Factors Responsible for successful BI Project, Obstacle to Business Intelligence in an Organization.	08	CO1
Unit-IV	**Advanced Business Intelligence Tools**	**No. of Hours**	**Cos**
	SAP Business Intelligence Tool, Yellowfin BI Tool, Microstrategy BI Tool for powerfull dashboarding & data analytics, Sisense BI Tool, SAS BI Tool, Microsoft Power BI a web-based business analytics tool, Data analytics, business analytics, ERP and Business Intelligence, Looker BI Tool, Tableau Business Intelligence tool for data discovery and data visualisation	06	CO4,CO5
Unit-V	**Designing and managing BI systems**	**No. of Hours**	**Cos**
	Introduction, Business Intelligence Lifecycle, Enterprise Performance Life Cycle (EPLC)Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Strategy, Objectives and Deliverables, Transformation Roadmap, Building a transformation roadmap, BI Development Stages and	06	CO1,CO5,CO6

	Steps, Parallel Development Tracks, BI Framework Determining infrastructure requirements, planning for scalability and availability, managing and maintenance of BI systems, managing BI operations for business continuity		
Unit-VI	**Business Intelligence Implementation & Applications**	**No. of Hours**	**Cos**
	Implementing Business Intelligence: Introduction, Business Intelligence Platform, Business Intelligence Platform Capability Matrix, BI Target Databases, Data Mart, BI Products and Vendor, The Big Four Business Intelligence vendors. **BI Applications in** CRM, Marketing, Logistics and Production, Finance, Banking, Telecommunications, Fraud Detection, Retail Industry.	06	CO4,CO5,CO6

Books:

Text Books:

1. R. Sharda, D. Delen, & E. Turban, Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4;
2. Anil Maheshwari, “Data Analytics” McGraw Hill Publication, ISBN: 9789352604180
3. Business Process Automation, Sanjay Mohapatra, PHI

Reference Books:

1. U. Dinesh Kumar, “Business Analytics”, Willey, ISBN: 9788126568772, 8126568771
2. Introduction to business Intelligence and data warehousing, IBM, PHI.
3. Data mining concepts and techniques, Jawai Han, Michelline Kamber, Jiran Pie, Morgan Kaufmann Publishers 3rd edition
4. Data Mining for Business Intelligence, WILEY
5. Ken W. Collier,Agile Analytics: Avalue driven Approach to Business Intelligence and Data Warehousing, Pearson Education,2012, ISBN-13 978 8131786826

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Deep Learning (CO609)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Data Mining Techniques, Machine Learning

==========

Course Objectives:

1. To explore the Artificial Neural Networks & Deep Learning .
2. To study the concepts of Deep Neural Networks.
3. To introduce dimensionality reduction techniques
4. To enable the students to know regularization .
5. To examine the optimization & generalization in deep learning.
6. To understand the CNN in deep learning & examine the case studies of deep learning.

Course Outcomes (COs):

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Students able to understand basics of Deep learning	2	Understand
2. Students can Implement Various ANN Deep learning model.	6	Create
3. Understand the realign high dimensional data using reduction techniques	2	Understand
4. Understand and Evaluate regularization in deep learning	5	Evaluate
5. Able to Apply the Recurrent Neural Network Language Model.	3	Apply
6. Understand and Analyse the CNN in deep learning & Applications.	4	Analyze

Course Contents

Unit-I	Introduction to Deep Learning	No.of Hours	COs
	History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent,	08	CO1,CO2
Unit-II	**Deep Networks**	**No .of Hours**	**COs**
	Feedforward Neural Networks, Representation Power of Feedforward Neural Networks Backpropagation, batch normalization- VC Dimension,Deep Vs ShallowNetworks,Generative Adversarial Networks (GAN), Semi-supervised Learning	08	CO1,CO2,CO6
Unit-III	**Dimensionality Reduction**	**No. of Hours**	**COs**
	Principal Component Analysis and its interpretations, Singular Value Decomposition Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders	07	CO1,CO3
Unit-IV	**Regularization**	**No. of Hours**	**COs**
	Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout	06	CO4,CO5
Unit-V	**Optimization & Generalization**	**No.of Hours**	**COs**
	Optimization in deep learning– Non-convex	08	CO2,CO5

	optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs		
Unit-VI	**Convolutional Neural Networks**	**No.of Hours**	**COs**
	Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation.	07	CO1,CO2,CO6
Books:			
Text Books:			
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016. 2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.			
Reference Books:			
1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015. 2. Deep learning, Rajiv Chopra,Khanna book Publishing Co. New Delhi			

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Applied Cloud Technology (CO610A)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Cloud Technology, Network Security

Course Objectives:

1. To study virtualization and cloud computing fundamentals.
2. To study cloud security aspects in cloud.
3. To study cloud services offered by cloud service providers.
4. Define trust boundaries between Cloud providers and consumers to ensure that the responsibility for providing security is clear.
5. Learn the legal and compliance issues related to using cloud services.

Course Outcomes (COs): After successful completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand the the cloud computing reference model and its fundamentals	2	Understand
2. Explain major security and privacy problems in the cloud and address them by applying the various security mechanisms.	3	Apply
3. Understand the cloud security architecture and related security aspects that are to be monitored.	2	Understand
4. Design the cloud applications as per the business needs using Google and amazon cloud services.	6	Design
5. Understand and apply privacy tools and best practices of cloud security to real time cloud projects	3	Apply
6. Describe the legal issues and compliance for the cloud services provided across different countries having different security laws	2	Understand

Course Contents

Unit-I	Fundamentals of Cloud Computing	No. of Hours	COs
	Cloud Fundamentals: cloud definition, hardware and software resources, the role of networks in cloud computing, cloud computing reference model, benefits of cloud computing, limitations of cloud computing, essential characteristics of cloud computing, cloud computing service models and deployment models, Multitenancy, Cloud economics and benefits. Virtualization: Definition, virtualization architecture, types of virtualization, types of hypervisors, virtualization tools and mechanisms- Xen, KVM. Issues with virtualization, advantages of virtualization. Virtualization of CPU, Memory, and I/O Devices. Server virtualization, Storage virtualization, Network virtualization, Service virtualization.	08	CO1
Unit-II	**Cloud Security Concepts**	**No. of Hours**	
	Cloud Information Security Objectives, Confidentiality, Integrity, and Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation and Decomposition, Secure Cloud Software Testing, Testing for Security Quality Assurance, Cloud Penetration Testing, Regression Testing, Cloud Computing and Business Continuity Planning/Disaster Recovery.	07	CO2
Unit-III	**Cloud Computing Security Architecture**	**No. of Hours**	
	Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution Environments and Communications, Identity Management and Access Control, Autonomic Security	05	CO3
Unit-IV	**Cloud Applications**	**No.of Hours**	
	Cloud Computing Open Source Technologies: Open Stack, Eucalyptus.	07	CO4

	Amazon Web Services: Services offered by Amazon- EC2(Creating a instance, installing web server and configuring a server), AWS Storage and Content Delivery, Identify key AWS storage options, EBS (Describe Amazon EBS, Creating an Elastic Block Store Volume, Adding an EBS Volume to an Instance, Snap shot- ing an EBS Volume. S3 (Create an Amazon S3 bucket and manage associated objects). AWS Load Balancing Service- Introduction Elastic Load Balancer, Creating and Verifying Elastic Load Balancer. **Google:** Services offered by Google- Google compute engine(Creating a instance, installing web server and configuring a server), Google Storage-S3 (Create an Google bucket and manage associated objects).		
Unit-V	**Docker, Privacy Tools and Best Practices in cloud**	**No. of Hours**	
	Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, The Docker Workflow. Privacy Tools and Best Practices, 2-factor authentication, secure email for cloud storage, Deletion of private data, security as service, distributed cloud storage, what are best practices, cloud data security and check list, Future of cloud data security.	06	CO5
Unit-VI	**Legal and Compliance Issues**	**No. of Hours**	
	Who wants your data? Legal issues, criminals and authorization. Government and friends, legal responsibility, US Federal Law and regulations affecting cloud storage. Cloud storage provider and compliance. Laws and regulations of other countries. Responsibility, ownership of data, right to penetration test, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization.	06	CO6
Books:			
Text Books:			
4. Tim Mather, SubraKumaraswamy, ShahedLatif, “Cloud Security and Privacy:An Enterprise Perspective on Risks and Compliance” O'Reilly Media; 1st edition [ISBN: 0596802765], 2009 .			

5. Ronald L. Krutz, Russell Dean Vines, “Cloud Security” [ISBN: 0470589876],2010.
6. Gautam Shrof, “ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476.
7. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, 2010, The McGraw-Hill.

Reference Books:

8. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication, ISBN10: 8126536039.
9. John Rittinghouse, James Ransome, “Cloud Computing” CRC Press; 1st edition [ISBN: 1439806802], 2009.
10. Buyya, “Mastering Cloud Computing”, Tata McGraw Hill, ISBN-13: 978-1-25-902995-0.
11. J.R. ("Vic") Winkler, “Securing the Cloud” Syngress [ISBN: 1597495921]2011..
12. Cloud Security Alliance, “Security Guidance for Critical Areas of Focus in Cloud Computing” 2009.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Image and Video Processing (CO610B)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Digital signal processing, Engineering Mathematics, Computer Graphics

==========

Course Objectives:

1. To learn fundamentals of Image and Speech Processing.
2. To learn image enhancement and restoration techniques.
3. To learn image compression & segmentation techniques.
4. To explore basics of video representation, motion estimation.
5. To learn video coding and video compression standards.
6. To study motion segmentation

Course Outcomes (COs): After the successful completion of the course, the student should be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand basics of Image Processing.	2	Understand
2. Understand image enhancement and restoration techniques.	2	Understand
3. Describe and use image compression & segmentation techniques.	3	Apply
4. Understand the methods of video representation, motion estimation and manipulation to design and develop algorithms for solving video processing problems related to various applications fields involving video data.	2	Understand
5. Develop mathematical skills to solve video processing problems and apply them to model real life problems in video processing	3	Apply

6. Design Video processing application like video surveillance using Video processing algorithms.	6	Create

Course Contents

Unit-I	Introduction to Image Processing	No. of Hours	COs
	What is Digital Image processing, Fundamental steps in Digital Image processing, Components of an Image Processing System, Image sampling and Quantization: Basic concept in Sampling and Quantization, Representing Digital Images, Spatial and Gray Level resolution. Basic relationships between pixels.	08	CO1
Unit-II	**Image Enhancement and Restoration**	**No. of Hours**	**COs**
	Image Enhancement: Introduction, Intensity transformation and spatial filtering, Smoothing And Image Sharpening in frequency domain **Restoration:** Introduction, Minimum mean square error restoration, Least square error restoration, Restoration by: Singular value decomposition, Maximum a Posterior estimation, Homomorphic Filtering. Blind deconvolution, Super resolution imaging	08	CO2
Unit-III	**Image Compression and Segmentation**	**No. of Hours**	**COs**
	Compression: Introduction, Error criterion, Lossy Compression methods, Lossless compression methods. **Segmentation:** Introduction, Region extraction, Pixel based approach, Multi level thresholding, Local thresholding, Region based approach, GrowCut region growing, Colour image segmentation.	08	CO3
Unit-IV	**Representation of video and motion estimation**	**No. of Hours**	**COs**
	Representation of digital video: Introduction and fundamentals, Time-varying image formation models: Motion models, Geometric image formation. Photometric image formation, Sampling of video signals	09	CO4

	Video Motion estimation: Two dimensional - Optical flow methods, Block based methods, Three dimension – Methods using point correspondences, Optical flow and direct method		
Unit-V	**Video Coding and Video Compression**	**No. of Hours**	**COs**
	Video Coding: Basics of video coding, Content dependent video coding, Two dimensional shape coding, Texture coding for arbitrarily shaped region, Joint shape and texture coding, Region based video coding, Object based video coding, Knowledge based video coding, Semantic Video coding, Layered coding system, Scalable video coding, Basics modes of scalability, Object based scalability, Wavelet transform based coding, Application of motion estimatior in video coding **Video Compression Standards:** MPEG-4 Visual and H.264/AVC, Standard for modern digital video: H.265/HEVC, HEVC coding tools and extensions.	09	CO5, CO6
Unit-VI	**Motion Segmentation**	**No. of Hours**	**COs**
	Stereo and multi view sequence processing: Depth perception Stereo imaging principle Disparity estimation Intermediate view synthesis Stereo sequence coding. Video Segmentation: Motion Segmentation; Tracking; Motion Tracking in Video: 2D and 3D Motion Tracking in Digital Video, Methods using Point Correspondences, Optical Flow and Direct Methods, Applications	09	CO5, CO6
Books:			
Text Books:			
1. Rafel Gonzallez and R. Woods, “Digital Image Processing”, Second edition. 2. Bhabatosh Chanda and Dwijesh Dutta Majumder, “Digital Image Processing And Analysis” 3. A. Murat Tekalp, “Digital Video Processing”, Prentice Hall, 2nd Edition, 2015			
Reference Books:			
1. Gonzalez R C, Woods R E, and Eddins S L, Digital Image Processing using MATLAB, Pearson Education, 2004. 2. Milan Sonka Vaclav Hlavac Roger Boyle, “Image Processing, Analysis, and Machine Vision”, Second Edition, Thomson Publication 3. Alan C. Bovik, “The Essential Guide to Video Processing”, Elsevier Science, 2nd Edition, 2009.			

4. Yao Wang, Jorn Ostermann, Ya-Qin Zhang,“Video Processing and Communications”, Prentice Hall, 2002.
5. Iain E. Richardson, “H.264 and MPEG-4 Video Compression: Video Coding for Next-generation Multimedia”, John Wiley & Sons, 2nd Edition, 2003. 5
6. J.W. Woods, “Multidimensional Signal, Image and Video Processing and Coding,” Academic Press, 2nd edition, 2012.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Blockchain Technology (CO610C)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Digital forensics, Cyber security, Cryptography and Information security

Course Objectives:

1. To understand how Blockchain systems (mainly Bitcoin and Ethereum) work.
2. To provide Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
3. To design, build, and deploy smart contracts and distributed applications.
4. To provide a critical evaluation of existing "smart contract" capabilities and platforms, and examines their future directions, opportunities, risks and challenges.
5. To understand the concept of crypto currency and its applications.
6. To apply Blockchain technology for different real time applications.

Course Outcomes (COs): On completion of the course, student will be able to–

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand how Blockchain systems (mainly Bitcoin and Ethereum) work	2	Understand
2. Understand the Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved	2	Understand
3. Design, build, and deploy smart contracts and distributed applications.	2	Create
4. Evaluation of existing "smart contract" capabilities and platforms, and examines their future directions, opportunities, risks and challenges.	6	analyze

5. Apply Blockchain technology for different real time applications.	3	Apply
6. Understand the concept of crypto currency and its applications.	4	Understand

Course Contents

Unit-I	Introduction to Blockchain	No.of Hours	COs
	Introduction to Blockchain, the technology of Blockchain, network and mechanism, history of blockchain, the benefits of Blockchain, blocks and transactions, Peer to Peer systems, the block structure in blockchain, what is Dynamic shared ledger, digital signatures, how to build a blockchain solution, hashes as addresses, using a key as identity, ways of storing Bitcoin Keys, Trade and transact with Bitcoins, Global Blockchain Ecosystem Core, Layers Of A Blockchain, Data Layer, Network Layer, Consensus Layer.	08	CO1
Unit-II	**Blockchain and Bitcoin**	**No.of Hours**	**COs**
	Identify Bitcoin and its Era Understand Where & How to Get Bitcoins Identify Bitcoin Wallets Identify Jaxx Wallet Define Selling Bitcoins Compare Bitcoin Blockchain, Transaction & Transaction Script Describe Various Transaction Forms in Bitcoin, Define Scripts in Bitcoin, List Nodes in Bitcoin Network.	08	CO2
Unit-III	**Bitcoin Mining**	**No.of Hours**	**COs**
	Understand Economics of Bitcoin Define Bitcoin Mining Describe Fabrication of a Block Header Define Mining Identify Successful Mining List Difficulties in Solo Mining Understand Mining: By pool of Miners, Mining and consensus, autonomous verification of mining, independent verification of mining, checklist for verification of mining, combining transactions into blocks, creation of block header, main chain, orphan block, creation of new block, independent validation of new block.	08	CO3

Unit-IV	Ethereum and working with Smart Contracts	No.of Hours	COs
	Understand Ethereum, Define Smart Contracts, Identify Cryptocurrency used in Ethereum, Describe Transactions in Ethereum, Define Consensus Mechanism in Ethereum, List Development Technologies, Identify Ethereum Clients, Define Platform Functions, Understand Solidity, Describe Solidity Operators and Functions, setting up Metamask, how to interface with ethereum network, first smart contract, Ethereum accounts and how to receive ether, structuring a contract, declaring a function, deploying and redeploying of a contract, comparing Wei & Ether, what is a gas transaction, Remix testing.	08	CO4
Unit-V	**Hyperledger and Hyperledger Composer**	**No.of Hours**	**COs**
	Introduction to Hyperledger, What is Hyperledger?, Distributed Ledger Technology & its Challenges, Setting up the Hyperledger Fabric Developer Environment Tools, Linux/Ubuntu & AWS: Setup of Fabric Development on Local & Cloud VM. Hyperledger Composer: What is hyperledger composer, benefits of hyperledger composer, conceptual components and structure, example business network car auction market, conceptual components and structures, the model, ACL, script file, metadata, the archive, open development toolset, modeling business networks, testing business networks, hyperledger composer playground, developing application using Hyperledger composer.	08	CO5
Unit-VI	**Blockchain Use Cases**	**No.of Hours**	**COs**
	Selected potential Use Cases in Blockchain, Proof of existence, Record keeping, Identity management, UPROOV – Mobile Trust Machine, Log operational maintenance data, Car leasing and Sales – DocuSign, Forecasting – Augur, Online music problem solution, Cloud storage, STORJ – Decentralized cloud storage, Retail – OpenBazaar, Ascribe – Secure your work, Ride sharing, supply chain management, Blockchain and IoT,	08	CO6
Books:			
Text Books:			
1. Mastering Blockchain - Second Edition, by Imran Bashir,Publisher: Packt			

Publishing,Release Date: March 2018, ISBN: 9781788839044.
2. Blockchain : Blueprint for a New Economy Melanie Swan O'Reilly.

Reference Books:

1. Decentralized computing using blockchain technologies and smart contracts by a Adarsh Sasharaf ; ed. ; vol. ; : igs, 2017
2. Mastering bitcoin programming the open blockchain by Andreas M. Antonopoulos ;1st ed. ; vol. ; : o reilly, 2017.
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos.
4. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric.
5. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html.
6. Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer Paperback – June 21, 2018 by Nitin Gaur, Luc Desrosiers, Petr Novotny, Venkatraman Ramakrishna, Anthony O'Dowd, Salman A. Baset.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Pattern Recognition (CO611A)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Image Processing, Machine Learning

Course Objectives:

1. To study the fundamentals of pattern recognition and its relevance to classical and modern problems.
2. To familiar with general approaches such as Bayes Classification, Nearest Neighbor Rule.
3. To study of Maximum-likelihood parameter estimation in relatively complex probabilistic models.
4. To study various Nonparametric Techniques like Fuzzy Classification- Reduced Coulomb Energy Networks.
5. To study of Linear Discriminants functions and Decision Surfaces
6. To study of Stochastic Search-Boltzmann Learning-Boltzmann Network and Graphical Models.

Course Outcomes (COs): On completion of the course, student will be able to–

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, hidden Markov models (HMM),	3	Apply
2. Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models	3	Apply
3. Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models,	5	Evaluate

4. Apply pattern recognition techniques to real-world problems such as document analysis and recognition using Nonparametric Techniques	4	Analyze
5. Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.	2	Understand
6. Understand the principles of Stochastic Methods estimation and apply them to relatively simple probabilistic models.	5	Evaluate

Course Contents

Unit-I	Introduction to Pattern Recognitions	No.of Hours	COs
	Pattern recognition System-Design Cycles- Sensing-Segmentation-feature extraction- classification-post processing-Design Cycle-Learning and Adaption- Supervised Learning, Unsupervised Learning, Reinforcement Learning.	09	CO1
Unit-II	**Bayesian Decision Theory**	**No.of Hours**	**COs**
	Introduction- Bayesian Decision Theory- Minimum Error Rate Classification-Classifiers-Discriminant Functions and Decision Surfaces-The normal Density, Error Bounds for Normal Densities-Missing and Noisy Features –Bayesian Belief Networks.	08	CO1, CO3
Unit-III	**Maximum Likelihood and Bayesian Parameters Estimations**	**No.of Hours**	**COs**
	Introduction-maximum likelihood Estimation-Bayesian Estimation- Bayesian parameter Estimation-Sufficient Statistics-Component Analysis and Discriminants-Hidden Markov Models- Hidden Markov Models.	09	CO2
Unit-IV	**Nonparametric Techniques**	**No.of Hours**	**COs**
	Introduction- Density Estimation-Parzen windows-K Nearest Neighbor Estimation- The Nearest neighbour Rules-Metrics and Nearest Neighbor Classification-Fuzzy Classification-	08 .	CO1, 4

	Reduced Coulomb Energy Networks.		
Unit-V	**Liner Discriminate Functions**	**No.of Hours**	**COs**
	Introduction-Linear Discriminant functions and Decision Surfaces- Generalized Linear Discriminant Functions-The Two Category Linearly Separable Case-Minimizing the perception Criterion function- Relaxation Procedures-Nonseparable Behavior-Minimum Squared Error Procedures-Linear Programming Algorithms-Support Vector Machines	09	CO6
Unit-VI	**Stochastic Methods**	**No.of Hours**	**COs**
	Introduction- Stochastic Search-Boltzmann Learning-Boltzmann Network and Graphical Models- Evolutionary Methods- Genetic Programming-NonMetric Methods-Decision Tree-CART.	09	CO5

Books:

Text Books:

1. R.O.Duda, P.E.Hart and D.G.Stork, " Pattern Classification," John Wiley, 2001
2. S.Theodoridis and K.Koutroumbas, " Pattern Recognition", 4th Ed., Academic Press,2009
3. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006

Reference Books:

1. Richard. E.G., Johnsonbaugh and Jost.S. "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.
2. Duda R.O. and Hart P.E., "Pattern Classification and Scene Analysis", Wiley, New York, 1973.
3. Morton Nadler and Eric Smith P.,"Pattern Recognition Engineering", John Willey and Sons, New York, 1993. 4. Tou and Gonzalez R.," Pattern Recognition Principles", Addision Wesley, 1974.
4. Rober J. Schalkoff, "Pattern Recognition – Statistical, Structural and Neural Approaches", John Wiley & Sons Inc, New York, 1992.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Software Design & Architecture (CO611B)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Software Modeling & Design, Software Engineering

Course Objectives:

1. To understand the concept software architecture.
2. To learn design issues in software system.
3. To learn different software architectures views and styles.
4. To study different approaches of software design.
5. To learn different analysis & design languages.
6. To know how to analyse and review software architecture.

Course Outcomes (COs): After completion of the course, students should be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Describe the essential elements of software architecture.	2	Understand
2. Discuss the issues related to designing a large-scale software system.	2	Understand
3. Describe and understand different software architectures views and styles.	4	Analyse
4. Describe, understand, and be able to use the Siemens four-view approach for developing and documenting software architectures.	2	Understand
5. Describe, understand, and be able to use the AADL (Architecture Analysis & Design Language).	6	Create
6. Work as part of a team, develop, analyze and review architecture of a software system.	5	Evaluate

Course Contents

Unit-I	Software Design Process	No.of Hours	COs
	Role of Software Design**:** Software design process, nature of design process, software design process, design qualities; Transferring Design Knowledge: describe design solution, design notations, design strategies, design patterns-design by template and design reuse.	09	CO1,CO2
Unit-II	**Introduction to Software Architecture**	**No.of Hours**	**COs**
	Software Architecture, Relationships to Other Disciplines, Multi-Disciplinary Overview, Foundations of Software Architecture, Software architecture in the context of the overall Software life cycle, Architectural Styles, CASE study of Architectures.	09	CO2
Unit-III	**Design Patterns**	**No.of Hours**	**COs**
	Design Patterns-Introduction, creational, Structural and behavioralpatterns,singleton,proxy,adapter,factory, iterator,observer pattern with application.	08	CO2
Unit-IV	**Software Architecture Design**	**No.of Hours**	**COs**
	Conceptual Architecture View, Module Architecture View, Styles of the Module Viewtype, Execution Architecture View, Code Architecture View. Component-and-Connector Viewtype, Styles of Component-and-Connector Viewtype, Allocation Viewtype and Styles.	09	CO3,CO4
Unit-V	**Software Architecture Documentation**	**No.of Hours**	**COs**
	Advanced Concepts, Documenting Software Interfaces, Documenting Behavior, Choosing the Views, Building the Documentation Package.	08	CO3,CO4, CO5

Unit-VI	Archetype Patterns	No.of Hours	COs
	Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. , Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype pattern.	09	CO5 ,CO6

Books:

Text Books:

1. David Budgen, "Software Design", 2nd edition, Pearson Education (LPE)
2. Christine Hofmeister, Robert Nord, Deli Soni"Applied Software Architecture",Addison-Wesley Professional; first edition (November 4, 1999), ISBN-13: 978-0201325713.

Reference Books:

1. Ian Gorton, "Essential Software Architecture", Springer, first edition (2006) ISBN-10:3540287132 ISBN-13: 978-3540287131
2. Jan Bosch, "Design and Use of Software Architectures", Addison-WesleyProfessional; first edition (May 19, 2000) ISBN-10: 0201674947 ISBN-13: 978-0201674941
3. Paul Clements,Felix Bachmann,Len Bass,"Documenting Software Architectures: Views and Beyond", Stafford Publisher:Addison-Wesley Professional 2003 ISBN-10: 0201703726 ISBN-13:9780201703726
4. Jim Arlow, Ila Neustadt, "Enterprise Patterns and MDA: Building Better Software with Archetype Patternsand UML", Addison-Wesley Professional, 2004, ISBN-10:032111230X ISBN-13: 9780321112309.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: User Experience and Usability Engineering (CO611C)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: --

Course Objectives :

1. To learn and understand basics of user experience and its importance
2. To learn and understand design process and examples of real world design
3. To understand available methods for measuring the user experience
4. To know the methods and processes used by user experience in industry
5. To understand the s pros and cons of various Ux design tools.
6. To know career path and identifying research opportunities in Ux.

Course Outcomes (COs) : On completion of the course, student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Define user experience and its importance, and compare its alternative definitions.	2	Understand
2. Describe the prevailing theories of high-level perception, attention, engagement, emotion, communication, learning, persuasion and behavior	2	Understand
3. List the generative and evaluative techniques used in design for creating products and systems.	4	Analyse
4. Enumerate existing tools and methods for measuring the effects on users of products, devices and systems.	5	Evaluate
5. Apply foundational theories, design techniques to build and evaluate a device or system.	5	Evaluate
6. Identify the career path and outstanding problems in user experience practice, and corresponding research opportunities.	2	Understand

Course Contents

UNIT 1	UX Fundamentals	No. Hours	COs
	Introduction and history. What is "User eXperience"? ,What Makes a Great User eXperience? , Why is the User eXperience Important? The growth of user experience as a field. Defining user experience. Definitions of user experience, including both early and current theoretical definitions as well as the concrete definitions of what practitioners actually do.	08	CO1
UNIT 2	**Designing Alternatives**		
	Recreating an Existing Interface, Conceptualization of Design Principles, User Experience Design, Design Workflow, Mobile App Design for iPhone and Android,Approaches to products and systems with great user experience. Design thinking, design process, and examples of real world design processes. Gathering information, brainstorming, prototyping and evaluation as part of the generative process.	08	CO2,3
UNIT 3	**Methods and tools of measurement.**		
	The wide range of available methods for measuring the user experience, and their relationships. Qualitative methods including interviews, focus groups, field studies, diaries and experience sampling. Quantitative methods such as online unique visits and click through, surveys, ratings, standard scales, speed and accuracy. Formative vs. summative assessments. Biometric methods like galvantic skin response, heart rate, eye tracking and fMRI.	08	CO4
UNIT 4	**Real world application & Research frontiers**		
	Comparing and contrasting the methods and processes used by user experience teams in industry, at companies such as IBM and All scripts.Research frontiers: New measurement methods made possible by the widespread adoption of mobile devices and the continuing		CO4,5, 6

	improvement of the web platform, including real time location and social network analyses, Amazon's mechanical Turk and Survey Monkey. Emerging sensing technologies, such as lightweight eye trackers and alternatives to fMRI. New measurement techniques, from implicit association to subjective duration assessment. Emerging research sub fields like visual experience and behavioral economics.		
UNIT 5	**UX design tools**		
	Below is a list of some of the most popular UX design tools. A UX design course should discuss these tools in detail and provide pros and cons so that you can understand which one might be the best for you:\ InVision - Great for creating interactive prototypes that can be shared with others. Sketch App - Industry standard interface design tool. Adobe Experience Design - A tool by Adobe that's specifically for UX designers. It's still in beta, but this one will likely grow very popular once it's officially released. Omnigraffle - Industry standard tool for creating detailed flow charts and wireframes. UserTesting - This site allows you to test your prototypes on real live users. UXPin - A well-rounded UX design platform complete with wireframing and prototyping tools as well as built in collaboration. Optimizely - Easily conduct A/B tests on web based apps and landing pages. Balsamiq - Industry standard tool for creating quick, interactive wireframes	08	CO5
UNIT 6	**UX Specialization**		
	Present Your Work: Present your design process and solution to stakeholders in a clear, engaging and convincing manner, substantiating the decisions you've made every step of the way. Choose a Specialization: UI for UX Designers, Voice User Interface Design, Front end Development for Designers A Career In UX Design: Draft a personal design profile to map out a path for continuing design education and decide whether you would like to pursue a creative, rewarding career in UX.	08	CO6

References:

1. Robier, J. (2016). UX Redefined: Winning and Keeping Customers with Enhanced Usability and User Experience, Springer.
2. Turner, P. (2017). A psychology of user experience involvement, affect and aesthetics, Springer.
3. Tullis, T., & Albert, W. (2013). Measuring the user experience: collecting, analyzing, and presenting usability metrics, 2nd ed. Morgan Kaufmann.
4. Kuniavsky, M. (2012). Observing the user experience: a practitioner's guide to user research, 2nd ed. Morgan Kaufmann
5. Sauro, J., & Lewis, J. R. (2016). Quantifying the user experience: Practical statistics for user research. Morgan Kaufmann.
6. Emrah Yayici. UX Design and Usability Mentor Book : With Best Practice Business Analysis and User Interface Design Tips and Techniques
7. Beasley, M. (2013). Practical Web Analytics for User Experience: How Analytics Can Help You Understand Your Users. (Focused very specifically on web analytics for user experience)

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Startup and Venture Management (CO612A)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: ---

Course Objectives

1. To provide the basics conceptual framework on entrepreneurship development and management of business enterprise.
2. To understanding the contribution of Small Scale Industries in the growth and development of individual and the nation.
3. To acquaint students with the emerging challenges and concepts in the field of entrepreneurship
4. To instill a spirit of entrepreneurship among the student participants.
5. To provide an overview of the competences needed to become an entrepreneur.
6. To develop Learners with a Risk taking ability and go getter attitude.

Course Outcomes (CO's): At the end of the Course, the Student will be able to:

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Remember the importance and functionalities of enterprise and entrepreneurship and to learn basic entrepreneurial skills and knowledge to run a business efficiently and effectively.	1	Remember
2. Understand different aspects and stages of entrepreneurial process.	2	Understand
3. Apply the knowledge of Entrepreneurship Development in scanning the different environments to initiate a business.	3	Apply
4. Analyze the feasibility of various type of enterprises.	4	Analyze
5. Evaluate the extent of entrepreneurial cultural and industrial	5	Evaluate

growth so as to prepare student to set up and manage own business.		
6. Create the pool of students who are willing to take risk in their Career Choices with a view to proceed towards Entrepreneurship.	6	Create

Course Contents

Unit No.	Details	Hrs	Cos
1	**Introduction:** Meaning, Definition and its importance, Evolution of the concept: Functions entrepreneur, types of entrepreneur, Concept of Entrepreneurship- evolution of entrepreneurship: Development of Entrepreneurship; the entrepreneurial cultures, Stages of Entrepreneurial process, Entrepreneurship in India and Intrepreneur, Women Entrepreneur and SHG's.	09	CO1, CO2
2	**Business Plan, Creativity and innovation** Idea generation–sources and methods, Identification and classification of ideas. Environmental Scanning and SWOT analysis, Business Opportunities in various sectors, Preparation of project plan, Components of an ideal business plan – market plan, financial plan, operational plan, and HR plan. Project formulation –project report significance and contents, Project appraisal –Aspects and methods: Economic oriented appraisal, financial appraisal, Market oriented appraisal-Technological feasibility, Managerial competency, Business Set up, concept of Creativity and Innovation.	09	CO3, CO6
3	**MSME's**: Meaning and definition (evolution), Role and importance, Policies governing MSMEs, Organizational structure, Steps in setting up a MSME unit. Small industry financing developing countries, a brief overview of financial institutions in India	09	CO5
4	**Institutions supporting entrepreneurs:** Financial institutions in India- Central and State level Institutions, SIDBI, NABARD, IDBI, SIDCO, KVIC Indian institute of entrepreneurship, DIC, single window and industrial policy of government of India.	09	CO5,
5	**Venture Capital:** Meaning of Venture capital and informal risk capital market, nature and overview of venture capital, venture cap-	06	CO2, CO3

	ital process, Angel Investors.		
6	**International Entrepreneurship opportunities**: The nature and importance of international business of the firm, international versus domestic entrepreneurship, entrepreneurship entry levels into international business.	06	CO1, CO6

Text Books:

1. Entrepreneurship Development-Small Business Enterprise-Poornima Charantimath Pearson Education, 2007
2. Entrepreneurship- Robber D Hisrich, Michael P Peters, Dean A Shepherd 6/e, the McGraw-Hill co, 2007
3. Entrepreneurship Development- Khanka, S chand Publication
4. Entrepreneurship Development-B Janakiram
5. Hisrich Peters Shephard, ―Entrepreneurship, Tata McGraw Hill

Reference Books:

1. Dr. Vasant Desai, ―Small scale industries and entrepreneurship, Himalayan Publishing House
2. Dr. Vasant Desai, ―Management of small scale industries , Himalayan Publishing House
3. J.C. Saboo,Megha Biyani, ―Management of small scale industries, Himalayan Publishing House
4. Dr. Vasant Desai, ―Dynamics of entrepreneurial development and Management

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Account and Finance Management (CO612B)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course:

Course Objectives:

1. To understand concepts related to financial management
2. To study in detail, various tools and techniques in the areas of finance
3. To develop the analytical skills this would facilitate the decision making in Business situations
4. To understand the importance cost management in business
5. To understand the tools and techniques used for cost control
6. To study the finance for project management

Course Outcomes (COs):

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Define the basic concepts of accounting and cost accounting. And enlist the importance of cost accounting..	1	Remember
2. Explain the objectives of financial management and summarize the approaches to financial management	2	Understand
3. Analyze financial statements using standard financial ratios of liquidity, activity, debt, Profitability to evaluate firm performance	4	Analyze
4. Compute working capital requirement using cash cost approach and total cost approach and analyze the use of working capital management	4	Analyze
5. Create an optimum capital structure plan to minimize the cost of capital	6	Create

6. Evaluate projects using capital budgeting techniques	5	Evaluate

Course Contents

Unit-I	Unit Title Basic Concepts of accounting and costing	No.of Hours	COs
	Forms of Business Organization. Meaning and Importance of Accounting in Business Organization, Basic concepts and terms used in accounting, Capital & Revenue Expenditure, Capital & Revenue Receipts, Users of Accounting Information. Accounting Concepts and Conventions, Fundamental Accounting Equation, Journal, Ledger and Trial Balance Basic Concepts of Cost Accounting, Objectives, Importance and Advantages of Cost Accounting, Cost Centre, Cost Unit, Elements of Cost, Classification and Analysis of Costs, Preparation of Cost Sheet. Numerical - Preparation of Cost Sheet	08	CO1
Unit-II	**Unit Title Business Finance**	**No.of Hours**	**COs**
	Introduction to Business Finance, Meaning and Definition of Financial Management, Objectives of Financial Management- (Profit Maximization and Wealth Maximization) Modern Approach to Financial Management- (Investment Decision, Financing Decision, Dividend Policy Decision), Finance and its relation with other disciplines, Functions of Finance Manager	08	CO2
Unit-III	**Unit Title Techniques of Financial Statement Analysis**	**No.of Hours**	**COs**
	Introduction &Objectives of financial statement analysis, Common Size Statements Analysis, Comparative Statements Analysis, Trend Analysis, Ratio Analysis, Funds Flow Statement & Cash Flow Statement Analysis	10	CO3
Unit-IV	**Unit Title Working Capital Management**	**No.of Hours**	**COs**
	Meaning of Working Capital, its components& types,	08	CO4

	Operating Cycle, Factors affecting working capital, Estimation of working capital requirement. (Total Cost Method & Cash Cost Method)		
Unit-V	**Unit Title Capital Structure**	**No.of Hours**	**COs**
	Meaning and Factors Affecting Capital Structure. Different sources of finance. Concept and measurement of Cost of Capital (a measurement of Specific Cost and WACC). Trading on Equity. Concept of Leverages and its types.	08	CO5
Unit-VI	**Unit Title Capital Budgeting**	**No.of Hours**	**COs**
	Meaning, Definition of Capital Budgeting, Time value of money. Tools of evaluation of the project based on traditional techniques and modern techniques - ARR, Payback Period, Discounted Payback Period, NPV, PI &IRR	08	CO6

Books:

Text Books:

1. Financial Management, Shashi K. Gupta and R.K. Sharma (Kalyani Publication)
2. Basics of Financial Management, V.K. Saxena and C.D.Vashist (Sultan Chand & Sons)
3. Financial Management, A Contemporary Approach, Rajesh Kothari (SAGE)
4. Financial Management, Dr. Mahesh Abale&Dr.ShriprakashSoni (Himalaya Publishing House Pvt. Ltd.)
5. Financial Management, I M Pandey (Vikas Publishing House Pvt. Ltd)
6. Fundamentals of Financial Management, A.P.Rao (Everest Publishing House)
7. Advanced Financial management, N.M. Vechalekar
8. Management Accounting, Khan and Jain, Tata McGraw Hill
9. Financial Cost and Management Accounting, P.Periasamy

Reference Books:

1. Financial Management, Rajiv Srivastava and Anil Misra (OXFORD University Press)
2. Financial Management, Ravi Kishore (Taxmann)
3. Financial management, V.K. Bhalla (S. Chand)
4. Financial Management, Jonathan Berk, Peter DeMarzo and Ashok Thampy (Pearson Publication)

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Project Planning and Operation Research (CO612C)

Teaching Scheme
Lectures: 4 Hrs. / Week
Credits: 4

Examination Scheme
In-Sem Exam: 50 Marks
End Sem Exam: 50 Marks
Total: 100 Marks

==========

Prerequisite Course: Mathematics I, II and III

==========

Course Objectives:

1. To explain and apply the Precedence Diagramming Method formulas (PDM) and Path Method (CPM) analysis to determine the project schedule baseline
2. To familiarize the learners with various tools of project control.
3. To make aware learners the techniques of process time minimization
4. To familiarize the learners transportation and assignment techniques
5. To teach the learner methods of Sensitivity and duality
6. To familiarize the learners with multistage decision-making techniques

Course Outcomes (COs): After learning this subject, the students will be able to,

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. Implement the project management techniques	3	Apply
2. Control projects effectively	2	Understand
3. Decide optimal strategies in conflicting situations.	4	Analyze
4. Apply the concept of transportation models to optimize available resources.	3	Apply
5. Find effect of any parameters on overall output of process	5	Evaluate

6. Optimize multi stage decision making problems	5	Evaluate

Course Contents

Unit-I	**Introduction to Project Management**	**No. of Hours**	**COs**
	Project Phases and project life cycle, Project stake holders ,Organizational influences, Project Processes, Project Groups, process interactions, customizing process interactions, Project cost management, Project Procurement management	05	CO1
Unit-II	**Project Control Methods.**	**No. of Hours**	**COs**
	Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource Constraints: Resource Leveling and Resource Allocation. Time Cost Tradeoff: Crashing Heuristic. Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management; Post Project Analysis.	06	CO2
Unit-III	**Theory of Games and Linear Programming**	**No. of Hours**	**COs**
	Theory of Games: Introduction, Minimax and Maximin Principle, Solution of Game with Saddle Point, Solution by Dominance, Solution by Graphical Method. m x n size Game Problem, Iterative method, Introduction to formulation of games using Linear Programming. Replacement Analysis: Replacement of Items that Deteriorate, Replacement of Items that Fail Suddenly.	06	CO3
Unit-IV	**Transportation & Assignment Model**	**No.of Hours**	**COs**
	Iintroduction, Formulation, Basic Method of Solving Transportation Problem. Optimization Methods like UV and Stepping Stone Method. Assignment Problem- Hungarian Method to solve Assignment Problem..	06	CO4
Unit-V	**Duality and sensitivity analysis.**	**No. of Hours**	**COs**

	The Essence of Duality Theory, Economic Interpretation of Duality , Primal-Dual Relationships , Adapting to Other Primal Forms ,The Role of Duality Theory in Sensitivity Analysis ,The Essence of Sensitivity Analysis , Applying Sensitivity Analysis	05	CO5
Unit-VI	**Integer and Dynamic Programming**	**No. of Hours**	**COs**
	Integer Programming Introduction to Integer Programming, Cutting plane method and Branch and Bound Method. Dynamic Programming: Introduction, DP Model, Applications of DP Model to shortest route problems. Solution of LPP by Dynamic Programming	05	CO6

Books:

Text Books:

1. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002.
2. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, PH Inc.
3. S. Choudhury, Project Scheduling and Monitoring in Practice.
4. Prem Kumar Gupta, D. S. Hira, Problems in Operations Research: Principles and Solutions, S. Chand, 1991
5. J. K. Sharma, Operations Research: Theory and Application, Laxmi pub. India.
6. Operations Research, S. D. Sharma, Kedar Nath Ram Nath-Meerut.
7. Manohar Mahajan, Operation Research, Dhanpatrai Publication.

Reference Books:

1. Wysocki, R. K. (2014). Effective project management: Traditional, agile, extreme (7th ed.). Indianapolis, IN: John Wiley & Sons, Inc. ISBN13: 978-1-118-72916-8 softcover
2. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002
3. Hillier F.S., and Lieberman G.J., Operations Research, Eight Edition, Mc. Tata McGraw Hill, India.
4. Ravindran, ―Engineering optimization Methods and Applications‖, 2nd edition, Wiley, India.
5. Ravindran, Phillips and Solberg, Operations Research Principles and Practice, Second Edition, Mc. WSE Willey,
6. Operations Research - An introduction, Hamdy A Taha, Pearson Education.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Industry Safety Management (CO612D)

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hrs. / Week	**In-Sem Exam: 50 Marks**
Credits: 4	**End Sem Exam: 50 Marks**
	Total: 100 Marks

==========

Unit - I

Safety and Health Management :

Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. Musculoskeletal Disorders and Cumulative Trauma Disorders. Importance of Industrial safety, role of safety department, Safety committee and Function.

INTRODUCTION TO SAFETY STANDARDS

Safety – Safety and Productivity – Role of Government – National Safety Council – Standards – ILO Model code of safety regulation / legislation – Factory Act – Boiler Act – Electricity Act – Workman's compensation act, Safety policies – Elements of safety policy – Implementation

Unit - II

Occupational Health and Ergonomics

Ergonomics – Human-body – Health – Posture – Workplace or office ergonomics – Ergonomics for women at work – physical work and environment – Anthropometry – Work related stress – Causes of stress – Signs of stress – Measurement of stress – Stress management systems – Prevention – Stress health and productivity – Occupational safety and health Act – Health program – First Aid

Unit - III

Accident and Incident Investigation

Reporting and Analysis – Accident and Incident Investigation – Identifying the key factors and the immediate and basic causes. Corrective Action – Agencies investigating accident. Accident reporting: Report forms, writing reports, essential elements. Accident and Incident Analysis Standard classification of factors associated with accident – Record keeping.

Personal Protective Equipment

Need for personal protection equipment – selection, applicable standards, supply, use, care & maintenance respiratory and non-respiratory personal protective equipment. – Classification and selection.

Unit-IV

Radiation and Industrial Hazards :

Types and effects of radiation on human body, Measurement and detection of radiation intensity. Effects of radiation on human body, Measurement – disposal of radioactive waste, Control of radiation Industrial noise -Sources, and its control, Effects of noise on the auditory system and health, Measurement of noise , Different air pollutants in industries, Effect of different gases and particulate matter ,acid fumes ,smoke, fog on human health, Vibration - effects, measurement and control measures Industrial Hygiene.

Unit -V

Electrical Hazards

Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection , Protection against voltage fluctuations, Effects of shock on human body Hazards from Borrowed nutrals, Electrical equipment in hazardous atmosphere, Criteria in their selection, installation, maintenance and use, Control of hazards due to static electricity.

Unit – VI

Fire and other Hazards :

General causes and classification of fire, Detection of fire, extinguishing methods, firefighting installations with and without water. Machine guards and its types, automation. High pressure hazards, safety, emptying, inspecting, repairing, hydraulic and nondestructive testing, hazards and control in mines. Safety Precautions for transporting hazardous, toxic, flammable, explosive, radioactive substances by all modes.

Reference Books:

1. Anupama Prashar & Bansal, “Industrial Safety and Environment”, S.K. Kataria & sons, New Delhi, 2005.
2. Agrawal S. K. “Industrial Environment Assessment and Strategy”, APH Publishing Corporation, New Delhi, 1996.
3. Safety- Health and working conditions: Training Manual, National Safety Council, Mumbai, 2000.
4. Suresh K. Dhameja, “Environmental Engineering and Management”, S. K. Kataria & Sons, New Delhi. 2004.
5. R.K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)
6. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, NewYork .

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-III
Deep Learning Lab (CO613)

Teaching Scheme
Practical: 2 Hrs./Week
Credits: 1

Examination Scheme
Oral Exam: 50 Marks
Total: 50 Marks

==========

Prerequisite Course: Data Mining Techniques, Machine Learning

==========

Course Objectives:

1. To explore the Artificial Neural Networks & Deep Learning .
2. To study the concepts of Deep Neural Networks.
3. To introduce dimensionality reduction techniques
4. To enable the students to know regularization .
5. To examine the optimization & generalization in deep learning.
6. To understand the CNN in deep learning & examine the case studies of deep learning.

Course Outcomes(COs):

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Students able to understand basics of Deep learning	**2**	**Understand**
2. Students can Implement Various ANN Deep learning model.	**6**	**Create**
3. Understand the realign high dimensional data using reduction techniques	**2**	**Understand**
4. Understand and Evaluate regularization in deep learning	**5**	**Evaluate**
5. Able to Apply the Recurrent Neural Network Language Model.	**3**	**Apply**
6. Understand and Analyse the CNN in deep learning & Applications.	**4**	**Analyse**

Operating System recommended :- 64-bit Open source Linux or its derivative
Programming Languages: JAVA/PYTHON/R

Programming tools recommended: Front End: Java/Python,
Backend : Tensorflow framework with keras

Suggested List of Deep Learning Lab Assignments

Title of Assignments
1. Build a ANN(Artificial Neural Network) model on any dataset,for ex: Predict which Customer are leaving from a bank (Download Churn_Modelling dataset for this Assignment.
2. Build a Convolution neural network using suitableDataset (For Ex: **MNIST** database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits.)
3. Building a Recurrent neural network using suitableDataset (For Ex: **MNIST** database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits.)
4. Building a 2 layers auto encoder using suitableDataset (For Ex: **MNIST** database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits.)
5. Study the Deep Neural Network for Image Classification: Application: Use **Cat vs non-Cat** dataset & build a deep neural network to distinguish cat images from non-cat images. Student hast study A 2-layer neural network model in this assignment.

Books:
Text Books:
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016. 2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
Reference Books:
1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015. 2. Deep learning, Rajiv Chopra,Khanna book Publishing Co. New Delhi

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-IV
Applied Cloud Technology Lab (CO614A)

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs./Week	**Oral Exam: 50 Marks**
Credits: 1	**Total: 50 Marks**

==========

Prerequisite Course: Cloud Technology, Operating System

Course Objectives:

1. To study virtualization and cloud computing fundamentals.
2. To study cloud secuirty aspects in cloud.
3. To study cloud services offered by existing cloud service provider.
4. To study the privacy tools of cloud security.
5. To study cloud security architecture in cloud computing.

Course Outcomes (COs): After successful completion of the course, student will be able to

Course Outcomes	**Bloom's Taxonomy**	
	Level	**Descriptor**
1. Understand the the cloud computing reference model and its fundamentals	2	Understand
2. Design cloud services using google and amazon cloud services.	6	Design
3. Study about AWS Identity Management and Security in the Cloud.	2	Understand
4. Understand the cloud security architecture and related security aspects that are to be monitored.	2	Understand
5. Design and implement Authentication mechanism in Cloud Environments.	2	Understand
6. Select the appropriate privacy tools of cloud security to real time cloud projects	5	Select

List of the Assignment
1. Install and configure VirtualBox or VMWare to create virtual machines in order to understand basic concepts of virtualization.
2. Demonstrate an application using Google App Engine as a Platform-as-a-Service.
3. Study and demonstrate AWS Identity and Access Management (IAM) in the Cloud.
4. Demonstrate the use of Amazon web services to create a cloud service.
5. Install and configure Cloudsim Toolkit and demonstrate cloudlet example.
6. Design and implement Authentication mechanism in Cloud Environments.
7. Study and demonstrate any one of Cloud security tool.
Books:
Text Books:
1. Tim Mather, Subra Kumaraswamy, ShahedLatif, "Cloud Security and Privacy:An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1st edition [ISBN: 0596802765], 2009 . 2. Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876],2010. 3. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476.
Reference Books:
1. John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1st edition [ISBN: 1439806802], 2009. 2. J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921]2011.. 3. Cloud Security Alliance, "Security Guidance for Critical Areas of Focus in Cloud Computing" 2009.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Lab Practice-IV
Imag and Video Processing Lab (CO614B)

Teaching Scheme | **Examination Scheme**
Practical: 2 Hrs./Week | **Oral Exam: 50 Marks**
Credits: 1 | **Total: 50 Marks**

==========

Prerequisite Course: Digital signal processing, Engineering Mathematics, Computer Graphics

==========

Course Objectives:

1. To learn fundamentals of Image and video Processing.
2. To learn image enhancement techniques.
3. To learn image compression & segmentation techniques.
4. To explore basics of video representation.
5. To study motion estimation.

Course Outcomes (COs): After successful completion of this course student will be able to

Course Outcomes	Bloom's Taxonomy	
	Level	**Descriptor**
1. Understand basics of image and video processing.	**2**	**Understand**
2. Develop image enhancement module in various image processing applications.	**6**	**Create**
3. Design image processing application involving image segmentation.	**6**	**Create**
4. Use image compression algorithms.	**3**	**Apply**
5. Demonstrate the methods of video representation, motion estimation and manipulation to design and develop algorithms for solving video processing problems related to various applications fields involving video data	**3**	**Apply**
6. Design Video processing application like video surveillance using Video processing algorithms.	**6**	**Create**

Guideline for Laboratory Conduction

- Students should perform at least 6 assignments- Any 4 assignments from group A and any 2 assignments from group B.

Suggested List of Laboratory Assignments

Group A (Use C, C++, JAVA or any suitable programming language)

1. Develop a program to compute the histogram of given gray scale image. Implement the algorithm for Histogram Equalization and Comment on the results.
2. For a gray scale image apply following Image Enhancement Techniques :
   Contrast Stretching
   Digital Negative
   Bit level slicing
3. Implement following Image Filtering operations w.r.t. a given gray scale image: LPF, HPF and Sobel / Prewitt Masks. Comment on the result of filtering operations performed on the image.
4. Perform Image Smoothing with following special filters: Median, Weiner and Homomorphic filters. Comment and compare results
5. Perform Image segmentation using watershed /fuzzy/clustering segmentation technique.
6. Perform image sharpening on gray scale image using following frequency domain filters
   Ideal High pass filtering
   Butterworth High Pass Filtering
   Gaussian High Pass Filter
7. To perform DCT based image compression and recover the original image file. Compare the original image file with compressed image file.

Group B (Use MATLAB or any suitable programming language)

8. Implement following basic Operation on gray scale/colour video
   a) Extracting frames from video
   b) Playing video in reverse
   c) Applying background subtraction
9. Perform following Digital Video Manipulation In MATLAB
   a) Gather video file information using the aviinfo function.
   b) Read video data into a variable using the aviread function.
   c) Explore the montage function for viewing multiple frames simultaneously.
   d) Play a video using the movie function and the implay movie player.
   e) Convert from frame to image and vice versa using the frame2im and im2frame functions.
   f) Explore techniques for assembling images into video, including the immovie function.
   g) Write video data to a file using the movie2avi function.
   h) Read and play video files in different formats using the mmreader function
10. Write a MATLAB script to
    a) Read an RGB color image and convert it to YcrCb.
    b) Subsample this image into the 4:2:0 format.

c) Up sample the Cr and Cb components to full size (4:4:4 format) and convert the result back to RGB.
d) Compute the difference between the original and processed RGB images.

11. Implement motion estimation algorithms in MATLAB.
    a. Explore EBMA using both integer-pixel and half-pixel accuracy.
    b. Explore HBMA using both integer-pixel and half-pixel accuracy.
    c. Explore the phase correlation method.

Text Books

1. Rafael.C,Gonzalez, Richard E Woods, "Digital Image Processing",3rdEdition, Pearson India, 2013.
2. Jain A.K, "Fundamentals of Digital Image Processing", 4th Edition, Prentice hall of India, 2004.
3. S Sridhar, "Digital Image Processing", Oxford University Press

Reference Books

1. B.Chanda, D. DuttaMajumder, "Digital Image Processing and Analysis", 2ndEdition, Phi learning, 2011.
2. William K Pratt, "Digital Image Processing", 4th Edition, Wiley, 2012.
3. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, "Digital Image Processing Using MATLAB", Second Edition, - Tata McGraw Hill Publication

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT:Lab Practice-IV
Blockchain Technology Lab (CO614C)

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs./Week	**Oral Exam: 50 Marks**
Credits: 1	**Total: 50 Marks**

==========

Prerequisite Course: Digital forensics, Cyber security, Cryptography and Information security

Course Objectives:

1. To provide conceptual understanding of the function of Blockchains.
2. To provide Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
3. To understand the technological underpinnings of blockchain operations as distributed data structures and decision making systems, their functionality and different architecture types.
4. To provide a critical evaluation of existing "smart contract" capabilities and platforms, and examines their future directions, opportunities, risks and challenges.
5. To understand the concept of crypto currency and its applications.
6. To apply blockchain technology for different real time applications.

Course Outcomes (COs): On completion of the course, student will be able to–

Course Outcome	**Bloom's Taxonomy**	
	Level	**Descriptor**
1. Understand the function of Blockchains	2	Understand
2. Understand the Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved	2	Understand
3. understand the technological underpinnings of blockchain operations as distributed data structures and decision making systems	2	Understand
4. evaluation of existing "smart contract" capabilities and platforms, and examines their future directions, opportunities, risks and challenges.	6	Analyse

5. apply blockchain technology for different real time applications.	3	Apply
6. understand the concept of crypto currency and its applications.	4	Understand

List of Block chain mini projects (Complete Any One)

Project 1: Setting up the Hyperledger Composer

Industry: General

Problem Statement : How to setup the Hyperledger Composer

Topics : In this project you will understand how to setup the Hyperledger Composer. This includes learning what is a business network, defining your assets, who are the participants, what are the transactions that will go through the Hyperledger, testing the network by creating the participants and the assets, submitting the transactions to change the ownership of the asset.

Highlights

1. Hyperledger Composer execution runtime
2. Command line interface
3. Playground web user interface

Project 2 : Creating a 'to-do' list with blockchain

Industry : General

Problem Statement : How to successfully manage a project with blockchain based assigning of tasks to various team members

Topics : In this blockchain project you will work on creating a 'to-do' list. You will define the structure of each list, create the mapping of the notes, create function to add new to-do to the sender, add a function to mark a task as completed all using blockchain technology. Each note will have a date of creation and owner information stamped on it.

Highlights :

1. Deploying Ethereum smart contract
2. Implementing Solidity code
3. Creating a web3.js app to interact with contract.

Project 3 : Creating an online auction system with DApp

Industry – Internet related

Problem Statement – How to build a model auction website with the least human intervention using DApp.

Topics : In this project you will build an auction contract with a simple interface that allows users to place bids and, after the auction is complete, they should be able to withdraw their funds. The owner of the auction needs to be able to cancel the auction in any exceptional cases and the winner must be allowed to withdraw the winning bid as well as this is for demo purpose.

Highlights :

1. Build an algorithm to meet various conditions
2. Designing the smart contract using Solidity
3. Deploying a blockchain-based DAPP

Project 4 : Supply Chain Management with Hyperledger Composer

Industry : Logistics

Problem Statement : How to build an SCM application to keep track of the product flow
Topics: Build a Supply Chain Management application using the Hyperledger Composer Online, the type of application that you will develop should be coded, deployed and tested on your Online Hyperledger Composer Playground and then should be deployed locally in your computer and build an Angular front-end platform to interact with it.

Highlights:

1. Deploy a Business Network
2. Hyperledger Composer Playground
3. Build an angular front-end platform

Project 5 : Sample car auction with Hyperledger Composer

Industry : Internet related

Problem Statement : How to deploy a Business Network using the Online Hyperledger Composer Playground

Topics : The car auction Business Network has a set of known participants (buyers and sellers), assets (cars and car listings) and transactions (placing bids and closing auctions). We will model

these using Hyperledger Composer and test the business logic that makes the online auction work.

Highlights :

1. Hyperledger Composer Playground
2. Developing the Business Network
3. Modelling assets, participants & transactions

Project 6 : Voting with Ethereum blockchain

Industry : Government

Problem Statement : To ensure there is no vote rigging in a democratic election and there is complete transparency.

Topics : This project includes deploying the Ethereum blockchain for building a secure voting system to elect a democratic government. You will learn how the Ethereum blockchain ensures confidentiality. Some of the aspects of this project include learning how to secure and validate the voting process, understanding how blockchain overcomes vote rigging, guarantees immutability and more.

Highlights :

1. Building a decentralized blockchain network
2. Issuing digital tokens to all eligible voters
3. Recording the votes with Ethereum blockchain
4. Announcing the winner in a swift manner

SEMESTER III

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Technical Seminar 1 (CO616)

Teaching Scheme	**Examination Scheme**
Practical: 4 Hrs. / Week	**Oral: 50 Marks**
Credits: 2	**Total: 50 Marks**

Course Objectives:

To explore the basic principles of communication (verbal and non-verbal) and active, empathetic listening, speaking and writing techniques.

To Identify, understand and discuss current, real-world issues, new technologies, research, products, algorithms and services.

Course Outcomes:

On completion of the course, student will be able–

5. To use multiple thinking strategies to examine real-world issues and explore creative avenues of expression,.
6. To acquire, articulate, create and convey intended meaning using verbal and non-verbal method of communication.
7. To learn and integrate, through independent learning in sciences and technologies, with disciplinary specialization and the ability to integrate information across

The student shall have to deliver the seminar I in semester III on a topic approved by guide and authorities. It is recommended to allot guide to the student since the commencement of semester III. The guide allotment preferably needs to be carried out in synchronization with mutual domains of interest. It is recommended that seminar shall be on the topic relevant to latest trends in the field of concerned branch, preferably on the topic of specialization based on the electives selected or domain of interest.

It is appreciated and strongly recommended that the student will select the domain of his/her dissertation and identify the literature confined to the domain. Thorough literature study based on the broad identified topic has to be carried out. This practice will eventually lead to convergence of the efforts for the dissertation in Semester III and IV.

The relevant literature then be explored as state-of-the-art, exotic, recent technological advancement, future trend, application and research & innovation. Multidisciplinary topics are encouraged. The student shall submit the duly approved and certified seminar report in standard format, for satisfactory completion of the work by the concerned Guide and head of the department/institute. The student will be assessed based on his/her presentation and preparations by the panel of examiners out of them one has to be an external examiner.

The students are expected to validate their study undertaken by publishing it at standard platforms.

The student has to exhibit the continuous progress through regular reporting and presentations

and proper documentation the frequency of the activities in the sole discretion of the PG coordination.

The continuous assessment of the progress need to be documented unambiguously. For standardization and documentation, follow the guidelines circulated / as in seminar logbook approved by Board of Studies

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Dissertation Phase 1 (CO617)

Teaching Scheme	**Examination Scheme**
Practical: 16 Hrs. / Week	**TW: 50 Marks**
Credits: 8	**Oral: 50 Marks**
	Total: 100 Marks

Course Objectives:

7. To identify the domain of research
8. To learn to communicate in a scientific language through collaboration with guide.
9. To understand the various means of technical publications and terminologies associated with publications
10. To categorize the research material confined to the domain of choice
11. To formulate research problem with the help of the guide/mentor elaborating the research.
12. To Acquire information independently and assessing its relevance for answering the research questions.

Course Outcomes:

On completion of the course the student should be able to-

8. Conduct thorough literature survey confined to the domain of choice
9. Develop presentation skills to deliver the technical contents
10. Furnish the report of the technical research domain
11. Analyze the findings and work of various authors confined to the chosen domain

Dissertation Phase – I is an integral part of the Dissertation work. In this, the student shall complete the partial work of the Dissertation which will consist of problem statement, literature review, design, scheme of implementation (Mathematical Model/SRS/UML/ERD/block diagram/ PERT chart, etc.) and Layout & Design of the Set-up.

The student is expected to complete the dissertation at least up to the design phase. As a part of the progress report of Dissertation work Phase-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected dissertation topic. The student shall submit the duly approved and certified progress report of Dissertation Phase-I in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

The examiner will be assessed by a panel of examiners of which one is necessarily an external examiner. The assessment will be broadly based on literature study, work undergone, content delivery, presentation skills, documentation and report.

The students are expected to validate their study undertaken by publishing it at standard platforms.

The investigations and findings need to be validated appropriately at standard platforms – conference and/or peer reviewed journal.

The student has to exhibit the continuous progress through regular reporting and presentations and proper documentation the frequency of the activities in the sole discretion of the PG

coordination.
The continuous assessment of the progress need to be documented unambiguously. For standardization and documentation, it is recommended to follow the formats and guidelines circulated / as in dissertation workbook approved by Board of Studies. Follow guidelines and formats as mentioned in Dissertation Workbook.

SEMESTER IV

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Technical Seminar 2 (CO618)

Teaching Scheme	**Examination Scheme**
Practical: 4 Hrs. / Week	**Oral: 50 Marks**
Credits: 2	**Total: 50 Marks**

Course Objectives:

5. To explore the basic principles of communication (verbal and non-verbal) and active, empathetic listening, speaking and writing techniques.
6. To Identify, understand and discuss current, real-world issues, new technologies, research, products, algorithms, services.

Course Outcomes:

On completion of the course, student will be able –

7. To use multiple thinking strategies to examine real-world issues and explore creative avenues of expression,.
8. To acquire, articulate, create and convey intended meaning using verbal and non-verbal method of communication.
9. To learn and integrate, through independent learning in sciences and technologies, with disciplinary specialization and the ability to integrate information across

The student shall have to deliver the seminar II in semester IV on a topic approved by guide and authorities.

It is appreciated if student has already selected the domain of his/her dissertation work and identified the literature confined to the domain and thorough literature study based on identified topic has been carried out. This practice will eventually lead to convergence of the efforts for the dissertation work. The meticulous analyses of the literature can be part of seminar.

The relevant literature then be explored as state-of-the-art, exotic, recent technological advancements, future trends, applications and research & innovations. The student shall submit the duly approved and certified seminar report in standard format, for satisfactory completion of the work by the concerned Guide and head of the department/institute. The student will be assessed based on his/her presentation and preparations by the panel of examiners out of them one has to be an external examiner.

The students are expected to validate their study undertaken by publishing it at standard platforms.

The student has to exhibit the continuous progress through regular reporting and presentations and proper documentation the frequency of the activities in the sole discretion of the PG coordination. The continuous assessment of the progress need to be documented unambiguously. For standardization and documentation, follow the guidelines circulated / as in seminar logbook approved by Board of Studies.

SANJIVANI RURAL EDUCATION SOCIETY'S
SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON

SUBJECT: Dissertation Phase 2 (CO619)

Teaching Scheme	**Examination Scheme**
Practical: 24 Hrs. / Week	**TW: 50 Marks**
Credits: 12	**Oral: 100 Marks**
	Total: 150 Marks

Course Objectives:

19. To follow SDLC meticulously and meet the objectives of proposed work
20. To test rigorously before deployment of system
21. To validate the work undertaken
22. To consolidate the work as furnished report

Course Outcomes:

On completion of the course the student shall be able to-

4. Show evidence of independent investigation
5. Critically analyze the results and their interpretation ; infer findings
6. Report and present the original results in an orderly way and placing the open questions in the right perspective.
7. Link techniques and results from literature as well as actual research and future research lines with the research.
8. Appreciate practical implications and constraints of the specialist subject

Guidelines:

In Dissertation Work Phase–II, the student shall consolidate and complete the remaining part of the dissertation which will consist of Selection of Technology, Installations, UML implementations, testing, Results, measuring performance, discussions using data tables per parameter considered for the improvement with existing/known algorithms/systems, comparative analysis, validation of results and conclusions. The student shall prepare the duly certified final report of Dissertation in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

The students are expected to validate their study undertaken by publishing it at standard platforms.

The investigations and findings need to be validated appropriately at standard platforms – conference and/or peer reviewed journal.

The student has to exhibit the continuous progress through regular reporting and presentations and proper documentation the frequency of the activities in the sole discretion of the PG coordination.

The continuous assessment of the progress need to be documented unambiguously.