CURRICULUM

FOR THE ACADEMIC YEAR 2024-2025

(22 Series)

DEPARTMENTOF COMPUTER SCIENCE AND ENGINEERING

B.E IN COMPUTER SCIENCE & DESIGN

B.E.V AND VI SEMESTER

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI

About the institution: The Hyderabad Karnataka Education (HKE) society founded by Late Shri Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg, Industrial & Production Engg, Mechanical Engg, Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs. 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmers are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.
At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state levelstudents projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 240 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 18 students) and PG(Computer Network and Engineering with an intake of 09 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state- of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical, and professional activities.

Vision of the Department

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer Scienceand Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

Program Outcomes:

01. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

02. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

03. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

04. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

05. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

06. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

07. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

08. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

09. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one,,s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1:	Acquire competency in hardware and software working principles to design, analyze and solve computing problems.
PSO2:	Develop solution for scientific and business applications using software engineering practices.
PSO3:	Create innovative solutions from idea to product by applying cutting edge technologies using modern tools to find novel solution ethically.

Department of Computer Science & Design
SCHEME OF TEACHING FOR V SEMESTER–22 SERIES

Sl. No	Course	Course Code	Course Title	Teaching Hours/Week				Examination				Credits
				Theory Lecture(L)	Tutorial (T)	Practical	Self Study(S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	22CG51	Software Engineering and Project Management	4	0	0	0	3	50	50	100	4
2	IPCC	22CG52	Computer Networks	3	0	2	0	3	50	50	100	4
3	PCC	22CG53	Artificial Intelligence and Machine Learning	4	0	0	0	3	50	50	100	4
4	PCCL	22CGL54	Artificial Intelligence and Machine Learning Lab	0	0	2	0	3	50	50	100	1
5	PEC	22CG55x	Professional Elective-I	3	0	0	0	3	50	50	100	3
6	PROJ	22CGMP56	Mini Project	0	0	4	0	0	50	0	50	2
7	AEC	22RMI57	Research Methodology and IPR	3	0	0	0	3	50	50	100	3
8	BSC	22ES58	Environmental Studies	2	0	0	0	3	50	50	100	2
9	NCMC	22NS59	National Service Scheme(NSS)	0	0	2	0	0	50	0	50	0
10		22PE59	Physical Education(PE)Sports &Athletics									
11		22YO59	Yoga									
			Total	19	0	10	0	21	450	350	800	23

Professional Elective-I

Sl.No	Course Code	Course Name
1.	22CG551	System Software and Compiler Design
2.	22CG552	Design of IoT System
3.	22CG553	Virtual and Augumented Reality

SCHEME OF TEACHING FOR VI SEMESTER–22 SERIES

Sl. No	Course	Course Code	Course Title	Teaching Hours/Week				Teaching Hours/Week				
				Theory Lecture(L)	Tutorial (T)	Practical	Self Study(S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1	HSMS	22HU61	Entrepreneurship, Management and Finance	3	0	0	0	3	50	50	100	3
2	PCC	22CG62	Digital Image Processing	4	0	0	0	3	50	50	100	4
3	PEC	22CG63x	Professional Elective-II	3	0	0	0	3	50	50	100	3
4	OEC	22CGOE64	Open Elective –I	3	0	0	0	3	50	50	100	3
5	PROJ	22CG65	Major Project Phase -I	0	0	4	0	3	50	0	50	2
6	PCCL	22CGL66	Digital Image Processing lab	0	0	2	0	3	50	50	100	1
7	AEC/SDC	22IKSAE67	Indian Knowledge Systems	1	0	0	0	2	50	50	100	1
8	NCMC	22NS68	National Service Scheme(NSS)	0	0	2	0	0	50	0	50	0
9		22PE68	Physical Education(PE)Sports &Athletics									
10		22YO68	Yoga									
			Total	14	0	8	0	20	400	300	700	17

Professional Elective-II

Sl.No	Course Code	Course Name
1.	22CG631	Visual Design and Communication
2.	22CG632	Human Computer Interaction
3.	22CG633	Object Oriented Modelling and Design

Open Elective- I

Sl.No	Course Code	Course Name
1.	22CGOE641	Digital Forensics

Course Title: SOFTWARE ENGINEERING AND PROJECT MANAGEMENT		
Subject Code : **22CG51**	Credit : 03	CIE: 50
Number of Lecture Hours/Week (L:T:P)	**3:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisites: Software Engineering

Course Objectives:

- Understand the fundamental principles of project management
- Be familiar with different methods and techniques used for Project management.
- Exposure to issues and challenges faced while doing s/w project management.
- Able to perform Project Scheduling ,tracking, Risk Analysis, Quality management and Project cost estimation

MODULES	**Teaching Hours**
Module I **SOFTWARE MANAGEMENT & ECONOMICS SDLC** :waterfall model Conventional Software Management Performance Evolution of Software Economics – Software economics Pragmatic software cost estimation Reducing software product size Improving software processes Improving team effectiveness Improving automation through software environment.	**09 Hrs**
Module II **THE OLD AND THE NEW WAY OF PROJECT MANAGEMENT** :The principles of conventional software engineering Principles of modern software management, Transitioning to an iterative process Basics of Software estimation – Effort and Cost estimation techniques COSMIC Full function points COCOMO-I COCOMO II A Parametric Productivity Model - Staffing Pattern.	**08 Hrs**
Module III **SOFTWARE MANAGEMENT PROCESS FRAMEWORK**: Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, pragmatic artifacts. **Model based software architectures:** A Management perspective. Model, Technical perspective, Software process workflows Iteration workflows Checkpoints of the process: Major milestones, Minor Milestones, Periodic status assessment	**09 Hrs**
Module IV **PROJECT ORGANIZATION AND PLANNING**: Work breakdown structures Planning guidelines. The cost and schedule estimating process The iteration planning process Pragmatic planning**. Project Organization and Responsibility:** Line-of-Business organizations Project organizations, Evolution of organizations **Process automation** - Automation building Blocks The project environment.	**08 Hrs**
Module V **PROJECT CONTROL AND PROCESS INSTRUMENTATION:** The Seven-Core metrics: Management indicators The Seven-Core metrics:	

Quality indicators Life-Cycle expectations, Pragmatic software metrics **Tailoring the process**: Process discriminates, scale, stakeholder cohesion and content, process flexibility or Rigor, process maturity, Architectural risk, domain experience, small scale project versus Large scale project. **Modern project profiles**: Continuous iteration, early risk evolution, Evolution requirements, Team work among stakeholders, Top 10 Software management principals, Software management best Practices. **Next generation software economics**: Next Generation cost models, Modern process transitions.	**08 Hrs**

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books/References Books

1. Walker Royce, "Software Project Management", 1st Edition, Pearson Education, 2006.

References Books

1. Bob huges, Mike cotterell, Rajib Mall "Software Project Management", 6 th Edition, Tata McGraw Hill, 2017.
2. SA Kelkar, Software Project Management: A Concise Study, 3 rd Edition, PHI, 2013.
3. Joel Henry, Software Project Management: A Real-World Guide to Success, Pearson Education, 2009.
4. Pankaj Jalote, Software Project Management in Practice, Pearson Education, 2015.
5. https://ocw.mit.edu/courses/engineering-systems-division/esd-36-system-projectmanagement-fall-2012/
6. https://uit.stanford.edu/pmo/pm-life-cycle

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CG51	CO1	Identify the different project contexts and suggest an appropriate management strategy.
	CO2	Practice the role of professional ethics in successful software development.
	CO3	Identify and describe the key phases of project management.
	CO4	Determine an appropriate project management in organizing and planning .
	CO5	Analyze the concepts of Project control and Process instrumentation

Course Title: COMPUTER NETWORKS		
Subject Code : **22CG52**	Credit : 4	CIE: 50
Number of Lecture Hours/Week(L:T:P)	**3:0:2 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisites: Nil

Course Objectives:

- Develop an understanding about architectural principles of computer networks , network devices and their functions.
- Gain knowledge about functions and services of OSI layers and TCP/IP protocol.
- Learn how internet works, understand working of routing protocols and study implementation issues in internetworking.
- Understand transport and application layer protocols.

MODULES	**Teaching Hours**
Module I **Introductory concepts& Physical Layer:** Network Hardware, Network Software, Reference Models, ARPANET, The Theoretical Basis for Data Communication, Guided Transmission Media ,Wireless Transmission. 1. Experimental study of various network components and devices. a. Study different network cables and Prepare, test straight over and cross overcabling using crimping tool. b. Install and configure wired and wireless NIC. Demonstrate file transfer inwired and wireless LAN. c. Install and configure network devices hub. 2. Use CISCO packet tracer to a. Build a Local Area Network of 4 to 6 nodes using hub /repeater. b. Build a peer to peer network	**08 Hrs**
Module II **Data Link Layer & Medium Access Control Sub-layer:** Data link layer design issues, Error detection & correction, Elementary data link protocols, Sliding window protocols, Example data link protocols**,** Th**e** channel allocation problem, Multiple access protocols. 1. Implement sliding window protocol. 2. Implement go back N protocol.	**08 Hrs**

Module III **Medium Access Control Sub-layer:** Ethernet, Wireless LANS, Broadband Wireless, Bluetooth, Data link layer switching. 1. Install and configure network devices Switch. 2. Use CISCO packet tracer to a. Build a Local Area Network of 4 to 6 nodes using switch. b. Build a Local Area Network of 4 to 6 nodes using hub and a switch andstudy the differences between repeater, hub and switch. c. identify broadcast and collision domain. 3. Use wireshark to a. Examine Ethernet packets and ARP packets. 4. To study performance of CSMA/ CD protocol.	**08 Hrs**
Module IV **The Network Layer:** Network layer design issues**,** Routing Algorithms, Congestion control algorithms, Internetworking, The network layer in the internet. 1. Install and configure network devices Routers. 2. Use CISCO packet tracer to a. Design and apply IP addressing scheme for a given topology b. Connect two or three LAN's via a router. Trace how routing happens viasimulation, and study the working of router. c. Design multiple subnets with suitable number of hosts d. Demonstrate static routing and dynamic routing for given topology e. Configure DHCP server f. Create subnets , Configure Host IP, Subnet Mask and Default Gateway in aLAN g. Configure RIP/OSPF. 3. Use wireshark to a. Analyze IP Datagram and IP fragmentation received during the execution oftrace route command. b. Run ping command and examine ICMP packets using wireshark.	**08 Hrs**
Module V **The Transport Layer and Application Layer protocols:** The transport services. Elements of transport protocols, The internet transport protocols: UDP The internet transport protocols: TCP, Electronic mail, The world wide web. 1. Use wireshark to a. Examine UDP and TCP ports and handshake segments b. Use packet tracer to configure DHCP server, SMTP server	**10 Hrs**

2. Implement Client Server Program in C/ Java.	

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXT BOOKS:

1. Andrew S. Tanenbaum: Computer Networks, 5th Edition, Pearson,2010.
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2010.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol suite , Sixth Edition, McGraw Hill,2022.
2. Kurose and Ross, Computer Networking: A Top- Down Approach, Pearson, Sixth Edition,2021
3. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education,2007.
4. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw-Hill,2004.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG52	CO1	Understand basic concepts, study OSI, TCP/IP model with functions of each layer and understand wired and wireless transmissionfundamentals.
	CO2	Describe error detection, correction methods, data link layer functions and evaluate channel access mechanisms.
	CO3	Study and compare medium access protocols for wired and wireless LAN's
	CO4	Demonstrate routing layer functions, issues and routing protocols in Internet.
	CO5	Explore transport layer functions, issues and application layer protocols.

Course Title: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING		
Subject Code : **22CG53**	Credit :04	CIE: 50
Number of Lecture Hours/Week	**4:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
Prerequisites: Discrete Mathematics, Statistics.		

Course Objectives:

- To Apply a given AI technique to a given concrete problem
- To Implement non-trivial AI techniques in a relatively large system
- To understand uncertainty and Problem solving techniques.
- To understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
- Acquiring the fundamentals of machine learning
- Usage of various learning methods to develop an intelligent machine.

MODULES	**Teaching Hours**
Module I **Artificial Intelligence:** The AI Problems, The Underlying assumption, Introduction to AI Technique, The Level of the model, Criteria for success. **Problems, problem spaces, and search:** Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs. **Heuristic search techniques:** Generate-and-test, Hill climbing, Best-first search, Problem reduction.	**09 Hrs**
Module II **Knowledge representation issues:** Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, the frame problem. **Using predicate logic:** Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction **Representing Knowledge Using Rules:** Procedural versus Declarative knowledge, Logic programming, forward versus backward reasoning, matching, control knowledge.	**08 Hrs**
Module III **Machine Learning:** Need , Machine Learning Explained , Machine Learning in Relation to Other Fields , Machine Learning and Artificial Intelligence, Machine Learning Data Science Data Mining and Data Analytics , Machine Learning and Statistics , Types of Machine Learning , Challenges, Process, Applications. **Understanding Data** : Types of Data , Data Storage and Representation, Big Data Analytics and Types of Analytics , Big Data	**08 Hrs**

Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization, Bivariate Data and Multivariate Data Multivariate Statistics , Essential Mathematics for Multivariate Data, Overview of Hypothesis, Feature Engineering and Dimensionality Reduction Techniques.	
Module – IV **Learning Theory**: Introduction to Learning and its Types, Introduction to Computation Learning Theory, Design of a Learning System , Introduction to Concept Learning, Induction Biases, Modeling in Machine Learning, Learning Frameworks. **Similarity-based Learning**: Introduction to Similarity or Instance-based Learning , Nearest-Neighbor Learning , Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier , Locally Weighted Regression (LWR) **Regression Analysis**: Introduction to Regression , Introduction to Linearity, Correlation, and Causation, Introduction to Linear Regression, Validation of Regression Methods, Multiple Linear Regression , Polynomial Regression , Logistic Regression, Ridge, Lasso, and Elastic Net Regression.	**09 Hrs**
Module –V **Decision Tree Learning:** Introduction to Decision Tree Learning Model**,** Decision Tree Induction Algorithms, Validating and Pruning of Decision Trees, **Bayesian Learning:** Introduction to Probability-based Learning, Fundamentals of Bayes Theorem ,Classification Using Bayes Model, Naïve Bayes Algorithm for Continuous Attributes, Other Popular Types of Naive Bayes Classifier, Bayesian Belief Network, **Support Vector Machines:** Introduction to Support Vector Machines , Optimal Hyperplane Functional and Geometric Margin, Hard Margin SVM as an Optimization Problem, Soft Margin Support Vector Machines, Introduction to Kernels and Non-Linear SVM, Kernel-based Non-Linear Classifier, Support Vector Regression. **Ensemble Learning:** Techniques, parallel Ensemble Models, incremental and Sequential ensemble models	**08 Hrs**
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module**.**	
TEXT BOOKS: 1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, 3rd Edition 2008 2. S. Sridhar and VijayLaxmi, "Machine Learning" Oxford Unversity Press first edition published 2021	

REFERENCES:

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.
2. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education/ PHI.
3. Trevor ***"The Elements of Statistical Learning"***, 2nd edition, 2017, Springer series in statistics. Hastie, Robert Tibshirani, Jerome Friedman
4. Tom M. Mitchell, "***Machine Learning",*** Indian Edition Paperback 2017, McGraw Hill Education.
5. Ethem Alpaydın, "***Introduction to machine learning"***, Third Edition, PHI Learning Pvt. Ltd. 2015

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CG53	CO1	Discuss artificial intelligence techniques, problem and heuristic search algorithm
	CO2	Apply knowledge representation techniques and predicate Logic rules to solve reasoning programs.
	CO3	Describe fundamentals of machine learning ,understand and analyse data
	CO4	Apply supervised/ unsupervised learning for the given problem
	CO5	Applying Classification algorithms for solving Machine Learning Problems.

Course Title: ARTIFICIAL INTELLIGENCEAND MACHINE LEARNING LAB		
Subject Code : **22CGL54**	Credit :01	CIE: 50
Number of Lecture Hours/Week	**0:0:2 Hrs**	SEE: 50
		SEE Hours: 03
Prerequisites: Discrete Mathematics ,Statistics, Java/Python Programming		

Course Objectives:

- Learn implementation and applications of Artificial Intelligence Algorithms.
- Learn implementation and applications of Machine Learning Algorithms.
- Understand the usage of various datasets for implementing ML Algorithms.

PROGRAMS

1. Write a Program to Implement Tic-Tac-Toe game using Python.
2. Write a Program to Implement Water-Jug problem using Python.
3. Write a Program to implement 8-Puzzle problem using Python.
4. Write a Program to Implement AO* Algorithm using Python.
5. Predict the price of the Uber ride from a given pickup point to the agreed drop-off location. Perform following tasks: 1. Pre-process the dataset. 2. Identify outliers. 3. Check the correlation. 4. Implement linear regression and random forest regression models. 5. Evaluate the models and compare their respective scores like R2, RMSE, etc.
   Dataset link: https://www.kaggle.com/datasets/yasserh/uber-fares-dataset.
6. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file**.**
7. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
8. Write a program to demonstrate the working of the decision tree basedID3 algorithm.
9. Classify the email using the binary classification method. Email Spam detection has two states: a) Normal State – Not Spam, b) Abnormal State – Spam. Use K-Nearest Neighbors and Support Vector Machine for classification. Analyze their performance. Dataset link: The emails.csv dataset on the Kaggle https://www.kaggle.com/datasets/balaka18/email-spam-classification-dataset-csv
10. Given a bank customer, build a neural network-based classifier that can determine whether they will leave or not in the next 6 months. Dataset Description: The case study is from an open-source dataset from Kaggle. The dataset contains 10,000 sample points with 14 distinct features such as Customer Id, Credit Score, Geography, Gender, Age, Tenure, Balance, etc. Link to the Kaggle project: https://www.kaggle.com/barelydedicated/bank-customer-churn-modeling Perform following steps: 1. Read the dataset. 2. Distinguish the feature and target set and divide the data set into training and test sets. 3. Normalize the train and test data. 4. Initialize and build the model. Identify the points of improvement and implement the same. 5. Print

the accuracy score and confusion matrix (5 points) 11. Implement Gradient Descent Algorithm to find the local minima of a function. For example, find the local minima of the function $y=(x+3)^2$ starting from the point x=2. 12. Implement K-Nearest Neighbors algorithm on diabetes.csv dataset. Compute confusion matrix, accuracy, error rate, precision and recall on the given dataset. Dataset link: https://www.kaggle.com/datasets/abdallamahgoub/diabetes. 13. Implement K-Means clustering/ hierarchical clustering on sales_data_sample.csv dataset. Determine the number of clusters using the elbow method. Dataset link : https://www.kaggle.com/datasets/kyanyoga/sample-sales-data.	

Question paper pattern: For SEE , two programs from the Exercise programs list will be asked.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CGL54	CO1	Apply and implement Artificial Intelligence based Problem solving Techniques.
	CO2	Implement Learning algorithms.
	CO3	Apply appropriate data sets to the Machine Learning algorithms.
	CO4	Perform Classification and clustering of Data using ML algorithms.
	CO5	Apply Machine Learning algorithms to solve real world problems.

COURSE TITLE: SYSTEM SOFTWARE AND COMPILER DESIGN		
Subject Code:22CG551	Credits:3	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisite: Finite Automata and Formal Languages.		

Course Objectives:

- Understand the Process involved in constructing compilers.
- Understand various types of parsers, intermediate code generation, Target code generation, Optimization of target code.

Modules	Teaching Hours
Module I **Assemblers:** Basic Assembler Functions, Machine-Dependent Assembler Features, Machine-Independent Assembler Features, Assembler Design Options. **Loaders and Linkers:** Basic Loader Functions, machine- Dependent Loaders Features, Machine-Independent Loader Features, Loader Design Option.	**09 Hrs**
Module II **Introduction**: Language Processors, The Structure of a Compiler, The Science of Building a Compiler, Applications of Compiler Technology. **Simple Syntax directed Translator:** Syntax Definition, Syntax Directed Translation, A translator for simple Expressions, Symbol Tables, Intermediate code generation. **Lexical Analysis**: the Role of Lexical Analyzer, Input buffering, specification of tokens, reorganization of tokens, the lexical analyzer generator Lex.	**08 Hrs**
Module III **Syntax Analysis:** Introduction to Recursive-Descent, Top-Down parsing, Bottom-Up parsing, LL(1),Shift/Reduce , Operator Precedence, LR(0), SLR(1), LR(1), SLAR(1) and LALR(1) parsers, Parser generators-Yacc.	**08 Hrs**
Module IV **Syntax Directed Translation:** Syntax directed definitions, Evaluation orders for SDDs, Applications of syntax directed translation, Syntax directed Translations schemes. **Intermediate code generation:** Variants of syntax trees, three address code, pipes and declarations, translations of expression, Type checking, Control flow, Back patching, Switch statements, Intermediate code for processors.	**09 Hrs**
Module V **Code Generation :** Issues in the design of code generator, The target language, Address in the target code, Basic blocks and flow graphs, Optimization of basic blocks, A simple code generator, Peephole optimization, register allocation and assignment, Instructions selection by tree rewriting, Optimal code generation for expressions.	**08 Hrs**

The question paper will have ten questions.
There will be Two questions from each module, covering all the topics from a module.
The students will have to answer Five full questions , selecting one full question from each module**.**

Text book:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers - Principles, Techniques and Tools, 2nd Edition, Pearson, 2007.
2. Leland L. Beck, D.Manjula : System Software "An Introduction to System Programming", 3rd Edition 2008

Reference Books:

1. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997
3. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson, 1991.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG551	CO1	Describe the Science of Building a Compiler, Specification and recognition of Tokens using Lexical Analyzer tool – Lex.
	CO2	Design and analyze of Top-Down, Bottom-up, LR, LALR parsers and usage of Yacc tool to build parsers.
	CO3	Design SDD, SDT schemes and describe techniques for intermediate code generation.
	CO4	Demonstrate techniques for simple and optimal machine code generators.
	CO5	Illustrate the basic functions of assemblers, Loaders and Linkers.

Course Title: **DESIGN OF IOT SYSTEM**		
Subject Code:22CG552	Credits:03	CIE:50
Number of Lecture Hours/Week (L:T:P)	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42 Hrs	SEE Hours:03

Prerequisites: Microprocessors and Microcontrollers

Course Objectives:

- Understand basics of embedded systems and their design concepts
- Introduce IoT technology and its communication mechanisms
- Understand programming IoT development boards like Arduino and Raspberry pi
- Acquire the data with sensors and perform data analysis

MODULES	Teaching Hours
Module I Introduction to Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System ,Examples of Embedded Systems ,Embedded System-on-chip (So) and Use of VLSI Circuit Design Technology, Complex Systems Design and Processors, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills required for an Embedded system designer.	**09 Hrs**
Module II IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind new Network Architectures, Comparing IoT Architectures ,A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	**08 Hrs**
Module III **Smart Objects**: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies: IEEE802.15.4, IEE802.15.4g,IEE802.15.4eIP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP from6Low PANto7Lo.ApplicationLayerProtocols:GenericWeb Based protocols, COAP,MQTT protocol.	**09 Hrs**
Module IV Data and Analytic s for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytic Tools and Technology, Edge Streaming Analytic, Network Analytics. Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming.	**08 Hrs**
Module V **Raspberry Pi:** Introduction to Raspberry Pi, About the Raspberry Pi Board: Hardware Layout, Operating Systems on Raspberry Pi, Configuring Raspberry Pi, Programming Raspberry Pi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor.	**08 Hrs**

The question paper will have ten questions.
There will be Two questions from each module, covering all the topics from a module.
The students will have to answer Five full questions, selecting one full question from each module.

Text Books:

Rajkamal, "Embedded System Architecture, Programming and Design", second edition
Tata McGraw- Hill publishing company limited.2018 Reprint.
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things",1st Edition, Pearson 2017.
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.javapoint.com

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
2. Raj Kamal, "Internet of Things: Architecture and DesignPrinciples",1stEdition,McGrawHill Education,2017.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG552	CO1	Describe embedded system and its classification.
	CO2	Illustrate the impact and challenges posed by IoT networks leading to new architectural models.
	CO3	Deployment of smart objects and the technologies to connect them to network and its protocols for efficient network communication.
	CO4	Describe the need for Data analytics and Security in IoT. Understand Arduino Board and programming and developing simple projects using Arduino UNO board.
	CO5	Explore Raspberry pi board and programming and develop simple projects using Raspberry pi and sensors.

COURSE TITLE: VIRTUAL AND AUGMENTED REALITY		
Subject Code:**22CG553**	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0Hrs**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisites:		

Course Objectives:

- Describe the working of VR systems and list the applications of VR.
- Design and implementation of the hardware that enables VR systems to be built
- Understand the system of human vision and its implication on perception and rendering.
- Explain the concepts of motion and tracking in VR systems.
- Describe the applications of MR, AR and VR

MODULES	**Teaching Hours**
Module-I **Mixed Reality:** Introduction, A history of MR technologies, Origin of MR concept Virtual Reality: Definitions, Terms for understanding VR, Virtuality, Virtual object/image, Virtual world/environment, Presence, Telepresence, Types of VR: Immersive VR, Non-Immersive VR.	**08 Hrs**
Module-II **Current VR Technologies:** Hardware, HMDs (Head-Mounted Displays) as an Output, HMDs, Tethered HMDs, Mobile phone integrated HMDs, Stand-alone HMDs, 2 Inputs, Software, Game Engines, 3D modelling tools, Video editing, Benefits. Disadvantages, Examples of VR applications.	**09 Hrs**
Module–III **Augmented Reality:** Definitions, Terminology associated with AR, Types of AR, Marker-based AR, Markerless-based AR, Current AR Technologies, Hardware, Tracking systems for AR, AR Displays, Head attached displays (HADs), Handheld displays, Spatial Displays	**09 Hrs**
Module–IV **Augmented Reality Software**: Interaction in AR interfaces, Tangible AR interfaces, Collaborative AR interfaces, Hybrid AR interfaces, Multimodal AR interfaces AR development tools: Vuforia, Easy AR, Wikitude, Kudan, 5 AR Tool Kit, AR Core, AR Kit, Benefits of AR, Disadvantages, Examples of AR Applications	**08 Hrs**
Module–V Augmented Reality in Education: AR applications for primary school , AR applications for science training, AR applications for social science training, AR applications for high school and university, AR applications for in-service & professional training, ID in MR , What is ID Characteristics of the ID process, MR ID models , Should I use MR technologies for my teaching process, How do I design my MRLE, 3D environment design, Hints for deciding on your ID.	**08 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be Two questions from each module, covering all the topics from a module.

The students will have to answer Five full questions , selecting one full question from each module**.**

Text Books:

1. Virtual and Augmented Reality: An Educational Handbook by Zeynep Tacgin, Cambridge Scholars Publishing, 2020.

Reference Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2018

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG553	CO1	Describe Mixed and Virtual Reality
	CO2	Analyze and Describe the working of Virtual Reality
	CO3	Explain Augmented Reality
	CO4	Understand the use of Augmented Reality Software and uses
	CO5	Describe the applications Augmented and Virtual Reality

Course Title: **MINI-PROJECT**		
Subject Code:**22CGMP56**	Credit:2	CIE:50
Number of Practical Hours/Week(L:T:P)	0:0:4 Hrs	
Pre-requisite: Programming languages, Operating Systems		

Course Objectives:

- Acquire the ability to integrate different areas of knowledge and evaluate and formulate problem
- Acquire skills to communicate effectively and present their ideas and collaborate to work as a team.
- Understand the procedure of documentation and presentation of Mini-project

Guidelines for Mini project:

- Student is required to do an innovation with application of knowledge earned while undergoing various courses and laboratories in the course of study.
- Mini project is to be carried out individually or by a team of two to three students
- Student has to carry out literature survey to identify and formulate the problem.
- Student has to design and develop hardware or software model in any domain of Computer Science.
- Project Review & CIE evaluation will be done timely by a committee constituted by the department. The committee shall consist of respective guide and two faculty members.

At the end of the semester students has to prepare and submit a project report

Course outcomes:
On completion of the course, the student will have the ability to::

Course Code	CO#	Course Outcome(CO)
22CGMP56	CO1	Demonstrate skills to identify open ended problems.
	CO2	Identify the methods and software design strategy for the project work.
	CO3	Formulate and implement innovative ideas for social and environment with minimum resource utilization.
	CO4	Analyse the results with current state of art technology
	CO5	Develop technical report and prepare presentations.

Course Title **: RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS**			
Course Code	22RMI57	Credits	3
Course Type	Theory	CIE Marks	50
Lecture Hours(L:T:P)	2:2:0	SEE Marks	50
Total Hours	28	SEE Hours	3

Course Objectives: The objectives of the course is to enable students:

- To understand the knowledge on basics of research and its types.
- To learn the concept of defining research problem and Literature Review, Technical Reading.
- To learn the concept of attributions and citation and research design.
- Concepts, classification, need for protection, International regime of IPRs -WIPO,TRIPS, Patent - Meaning, Types, surrender, revocation, restoration, Infringement, Procedure for obtaining Patent and Patent Agents.
- Meaning, essential requirements, procedure for registration and Infringement of Industrial Designs, Copyright.

Modules	**Teaching Hours**
Module-I **Introduction:** Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship	**6 Hrs**
Module-II Defining the research problem - Selecting the problem. Necessity of defining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	**6 Hrs**
Module-III Research design and methods - Research design - Basic principles. Need of research design Features of good design- Important concepts relating to research design – Observation and Facts Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	**6 Hrs**

Module-IV Basic Concepts of Intellectual Property (IP), Classification of IP, Need for Protection of IP, International regime of IPRs - WIPO , TRIPS. Patents: Meaning of a Patent – Characteristics/ Features. Patentable and Non-Patentable Invention. Procedure for obtaining Patent. Surrender of Patent, revocation &restoration of Patents, Infringement of Patents and related remedies (penalties). Different prescribed forms used in Patent Act. Patent agents qualifications and disqualifications Case studies on patents - Case study of Neem patent, Curcuma(Turmeric)patent and Basmati rice patent, Apple inc. v Samsung electronics co.Ltd	**5 Hrs**
Module-V Industrial Design: Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, who is entitled to seek Registration, Procedure for Registration of Designs Copy Right Meaning of Copy Right. Characteristics of Copyright. Who is Author, various rights of owner of Copyright. Procedure for registration. Term of copyright, Infringement of Copyright and Its remedies. Software Copyright. Case Study on paper of Mini Project write up.	**5 Hrs**

Question paper pattern:

- The question paper shall have five Module for100 marks;
- Each full question carries 20 marks.
- Two questions to be set in each module (total ten questions).
- The candidate will have to answer one full question from each module.

Note: There can be a maximum of 4 sub sections in each Question.

Text Books:

1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4th Edition,2018
2. Dipankar Deb Rajeeb Dey,Valentina E.Balas "Engineering Research Methodology",ISSN1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0.3
3. Dr. M.K. Bhandari "Law relating to Intellectual property" January 2017 (Publisher By Central Law Publications). Dr. R Radha Krishna and Dr. S Balasubramanain "Text book of Intellectual Property Right". First edition, New Delhi 2008. Excel books.
4. P Narayan"TextbookofIntellectualPropertyRight".2017,Publisher: Eastern Law House

Reference Books:

1. David V.Thiel "Research Methods for Engineers"CambridgeUniversityPress,978-1-107-03488-4-
2. Nishith Desai Associates-Intellectual property law in India– Legal, Regulatory &Tax

Ebooks and online course materials:

- NPTEL: INTELLECTUAL PROPERTY by PROF.FEROZALI, Department of Humanities and Social Sciences IIT Madras https://nptel.ac.in/content/syllabus_pdf/109106137.pdf
- www.wipo.int
- www.ipindia.nic.in

Course Code	CO#	Course Outcome(CO)
22RMI57	CO1	To know the meaning of engineering research.
	CO2	To know the defining of research problem and procedure of Literature Review.
	CO3	To know the Attributions and Citations and research design.
	CO4	Highlights the basic Concepts and types of IPRs and Patents
	CO5	Analyze and verify the procedure for Registration of Industrial Designs & Copyrights

Course Title: ENVIRONMENTAL STUDIES		
Subject Code **: 22ES58**	Credit :02	CIE: 50
Number of Lecture Hours/Week	**2:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	28	SEE Hours: 03

Prerequisites: NIL.

Course Objectives:

To creative environmental awareness among the students'

To gain knowledge on different types of pollution in the Environment.

Teaching- Learning process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- Apart from conventional lecture methods various types of innovative teaching techniques through videos and animation films may be adopted so that the delivered lesson can progress the students in theoretical applied and practical skills.
- Environmental awareness program on off campus
- Encourage Collaborative (Group learning) learning in the class seminars, surf prize test and quizzes may be arranged for students in respective subjects to develop skills

MODULES	**Teaching Hours**
Module I **Environment-**Definition, components, Ecosystem-Balanced Ecosystem, Structural and functional unit of Ecosystem, Human activities – Economic and Social Security	**05 Hrs**
Module II Human activities Effects on Environment-Industries, Housing, Agriculture, mining, Transportation, Natural Resources-Water Resources, forest, mineral resources, fluoride problems in Drinking water, water Induced diseases. Deforestation, sustainable mining.	**06 Hrs**
Module III Material cycles – Nitrogen, Sulphur, carbon cycle Environmental pollution – ground water pollution, noise pollution, soil pollution, Industrial and Municipal sludge. Air pollution, B.O medical waste E-wastes, Automobile pollution.	**06 Hrs**
Module – IV Global Environmental Concerns-Climate change and global warming effects, urbanization, ozone layer depletion, acid rain, current Environmental issues and important, population growth, Environmental toxicology, Biogas energy, solar energy.	**06 Hrs**

Module -V	**05 Hrs**
Objects of Environmental studies, Importance of women's Education, non-government organization (NGO), Green building or water treatment plant, G.I.S and Remote sensing, EIA (Environmental Impact Assessment), Role of Government for protection of Environmental	

REFERENCES:

1. Environmental Studies- Benny Joseph –Tata Megrawhill 2005
2. Environmental Studies-D L Manjunath, P M Dotrad, B.S.Raman
3. Environmental Studies-Geeta Naagbhushan

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22ES58	**CO1**	Understand the Environmental components balance eco systems
	CO2	Develop critical thinking and apply them to the analysis of a problems or question related to Environment
	CO3	Demonstrate Ecology knowledge of a complex relationship between biotic and a biotic components
	CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers phase when dealing with complex issue
	CO5	Understand latest developments in environmental pollution, Mitigation, Tools Concept and applications of G.I.S and Remote sensing.

Course Title : NATIONAL SERVICE SCHEME (NSS)		
Subject Code : 22NS59	**Credits :00**	**CIE: 50**
Number of Lecture Hours/Week(L:T:P)	**0:0:2 Hrs**	**SEE: 00**
Total Number of Lecture Hours	**28**	**SEE Hours: 00**

Prerequisites:

1. Students should have a service oriented mind set and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.

Students should be ready to sacrifice some of the time and wishes to achieve service oriented targets on time

Course Objectives:

1. Understand the community in which they work
2. Identify the needs and problems of the community and involve them in problem-solving
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony

Modules

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management– Public, Private and Govt organization, 5 R's.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4. Water conservation techniques – Role of different stakeholders– Implementation.
5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
6. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.
7. Developing Sustainable Water management system for rural areas and implementation approaches.
8. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath,Make in India, Mudra scheme, Skill development programs etc.
9. Spreading public awareness under rural outreach programs.(minimum5 programs).
10. Social connect and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure

ONE NSS – CAMP @ College /University /State or Central Govt Level / NGO's / General Social Camps:

Students have to take up anyone activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for Implementation of the same. Compulsorily students have to attend one camp.

CIE will be evaluated based on their presentation, approach and implementation strategies.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	SEE
Presentation 1-Selectionoftopic-(phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2(phase2)	**10**	*****
Case Study-based Teaching-Learning	**10**	• Implementation strategies of the project with report duly signed by the Dept's Coordinator, HoD & Principal. • At last It should be evaluated by the NSS Coordinator. • Finally consolidated report should be sent to the University.
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKSFORTHE COURSE	**50 MARKS**	**50 MARKS**
Suggested Learning Resource: 1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.		

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22NS59	**CO1**	Understand the importance of his / her responsibilities towards society.
	CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
	CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
	CO4	Implement government or self-driven projects effectively in the field.

Course Title : YOGA AND MEDITATION

Subject Code : 22YO59	**Credits :00**	**CIE: 50**
Number of Lecture Hours/Week(L:T:P)	**0:0:2 Hrs**	**SEE: 00**
Total Number of Lecture Hours	**28**	**SEE Hours: 00**

SEMESTER	CONTENTS
V	1) Patanjali's Ashtanga Yoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c.Prone line d.Supine line 4) Kapalbhati 5) Pranayama
VI	1) Patanjali's Ashtanga Yoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c.Prone line d.Supine line 4) Kapalbhati 5) Pranayama

Notes:

· One Hour of Lecture is equal to 1 Credit
· One Hour of Tutorial is equal to 1 Credit (Except Languages)
· Two Hours of Practical is equal to 1 Credit
· SEE : Semester End Examination
· CIE : Continuous Internal Examination
· L+T+P : Lecture + Tutorial + Practical

5th Semester	Ashtanga Yoga 3. Asana 4. Pranayama	Patanjali's Ashtanga Yoga its need and importance.	Total 32 hrs 2 hrs / week
	Suryanamaskara	Suryanamaskar 12 count 6 rounds	
	Different types of Asanas a. Sitting 1. Ardha Ushtrasana 2. Vakrasana b. Standing 1. Urdhva Hastothanasana 2. Hastapadasana c. Prone line 1. Padangushtha Dhanurasana d. Supine line 1. Sarvangasana 2. Chakraasana	Asana, Need, importance of Asana. Different types. Asana its meaning by name, technique, precautionary measures and benefits of each asana	
	Kapalabhati	Revision of practice 50 strokes/min 3 rounds	
	Pranayama – 1. Surya Bhedana 2. Ujjayi	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama	
6th Semester	Ashtanga Yoga 5. Pratyahara 6. Dharana	Patanjali's Ashtanga Yoga its need and importance.	Total 32 hrs 2 hrs / week
	Suryanamaskara	Revision of practice 12 count 8 rounds	
	Different types of Asanas a. Sitting 1. Aakarna Dhanurasana 2. Yogamudra in Padmasana b. Standing 1. Parivritta Trikonasana 2. Utkatasana c. Prone line 1. Poorna Bhujangasana / Rajakapotasana d. Supine line 1. Navasana/Noukasana 2. Pavanamuktasana	Asana, Need, importance of Asana. Different types, Asana by name, technique, precautionary measures and benefits of each asana	
	Kapalabhati	Revision of practice 60 strokes/min 3 rounds	
	Pranayama – 1. Sheetali 2. Sheektari	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama	
7th Semester	Ashtanga Yoga 1. Dhyana (Meditation) 2. Samadhi	Patanjali's Ashtanga Yoga its need and importance.	Total 32 hrs 2 hrs / week
	Suryanamaskara	Revision of practice 12 count 10 rounds	
	Different types of Asanas a. Sitting 1. Vibhakta Paschimottanasana 2. Yogamudra in Vajrasana b. Standing 1. Parshvakonasana 2. Ekapadbaddhapadmottanasana c. Prone line balancing 1. Mayurasana d. Supine line 1. Sarvangasana 2. Setubandhasana 3. Shavasanaa (Relaxation poisture)	Asana, Need, importance of Asana. Different types, Asana by name, technique, precautionary measures and benefits of each asana	
	Kapalabhati	Revision of practice 80 strokes/min 3 rounds	

Syllabus for B.E VI Semester

Course Title: ENTREPRENEURSHIP, MANAGEMENT AND FINANCE		
Subject Code :**22HU61**	Credits:3	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Nil		

Course Objectives:

- The Meaning, Functions, Characteristics, Types, Role and Barriers of Entrepreneurship,
- Government Support for Entrepreneurship
- Management–Meaning, nature, characteristics, scope, functions, role etc and Engineers social responsibility and ethics
- Preparation of Project and Source of Finance
- Fundamentals of Financial Accounting
- Personnel and Material Management, Inventory Control

MODULES	**Teaching Hours**
Module– I **Entrepreneur:** Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur, Types of Entrepreneur; Intrapreneurs – an emerging class ; Role of Entrepreneurs in economic development; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India-Startup-India, Make-in- India, PMMY, AIM, STEP, BIRAC, Stand-up India, TREAD	**08 Hrs**
Module-II **Management:** Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management, Levels of Management, HenryFayol-14 Principles to Management, McKinsey‟s 7-SModel,Managementbyobjective(MBO)– Meaning, process of MBO, benefits and drawbacks of MBO	**09 Hrs**
Module-III **Preparation of Project and Source of Finance:** **Preparation of Project:** Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; **Source of Finance:** Long Term Sources (Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc) and Short Term Source (Loan from commercial banks, Trade Credit, Customer Advances etc)	**08 Hrs**
Module– IV **Fundamentals of Financial Accounting**: Definition, Scope and Functions of Accounting, Accounting Concepts and Conventions: Golden rules of Accounting ,Final Accounts-Trading And Profit and Loss Account, Balance sheet	**09 Hrs**

Module– V	
Personnel Management, Material Management and inventory Control: Personnel Management: Functions of Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives. **Material Management and Inventory Control:** Meaning, Scope and Objects of Material Management. Inventory Control-Meaning and Functions of Inventory control; Economic Order Quantity(EOQ)andvariousstocklevel(Re-orderlevel,Minimumlevel,Maximumlevel,Averageleveland Danger level)	**08 Hrs**

Question Paper Pattern

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text book:

1. Financial Accounting-BSRAMAN-United Publishers Manglore, Maheswar SN & Maheswari S K-Vikas Publishing House. January 2018
2. Management & Entrepreneurship- K R Phaneesh- Sudha Publications January 2018 ,Prof Manjunatha & Amit kumar G–laxmi Publication,January2011.Veerbhadrappa Havina - Published by New Age International (P) Ltd., 2009.
3. PrinciplesofManagementFirstEdition(English,G.Murugesan),LaxmiPublications – New Delhi
4. Management by Objectives (Mbo) in Enterprises:21December2018 by Dr Wazir Ali Khan

Reference Books:

1. IndustrialOrganization&EngineeringEconomics-TRBanga&SCSharma-Khanna Publishers, Dehli.
2. NPTEL: ENTREPRENEURSHIP: PROF.CBHAKTAVATSALA RAO Department of Management Studies IITMadrashttps://nptel.ac.in/courses/110/106/110106141/
3. https://www.businessmanagementideas.com/notes/management-notes/notes-on-management- in-an-organization/4669
4. https://vskub.ac.in/wp-content/uploads/2020/04/Unit-5-ppmb.pdf

Course outcomes:
On completion of the course, the student will have the ability to:

Course code	CO #	Course Outcome (CO)
22HU61	CO1	Develop Entrepreneurship skills
	CO2	Apply the concepts of management and Management By Objective(MBO)
	CO3	Prepare project report & choose different Source of Finance.
	CO4	Apply Fundamentals of Financial Accounting and interpret the final accounts
	CO5	Apply personnel management skills, Material and inventory control techniques

COURSE TITLE: DIGITAL IMAGE PROCESSING		
Subject Code:22CG62	Credits:04	CIE:50
Number of Lecture Hours/Week(L:T:P)	**4:0:0Hrs**	SEE:50
Total Number of Lecture Hours	52	SEEHours:03

Prerequisites: Mathematics

Course Objectives:

- To understand the Image fundamental and mathematical representations necessary for image processing.
- Understand the image enhancement techniques.
- To understand image enhancement techniques and filtering techniques.
- To adopt restoration and color image processing.
- Analyze segmentation techniques and image description approaches.

MODULES	**Teaching Hours**
Module-I **Digital Image Fundamentals:** Introduction to Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Image Sensing and Acquisition: image acquisition using a single sensing element, image acquisition using sensor strips, image acquisition using sensor arrays ,a simple image formation model, Image Sampling and Quantization: basic concepts in sampling and quantization, representing digital images, Some Basic Relationships between Pixels.	**11Hrs**
Module-II **Image Enhancement in the Spatial Domain:** Basics of intensity transformations and spatial filtering, Some Basic Intensity Transformation Functions, Histogram Processing: Histogram equalization, and Matching, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.	**11 Hrs**
Module–III **Restoration:** A model of the image degradation/restoration process, Noise models, Restoration in the Presence of Noise Only using Spatial Filtering.	**10 Hrs**
Module–IV **Image Segmentation**: Fundamentals, point, line, edge detection: background, detection of isolated points, line detection, edge models: the image gradient and its properties, Thresholding: the basics of intensity thresholding, Applications of segmentation techniques to sample images.	**10Hrs**
Module–V **Color Image Processing and Image Representation:** Color Fundamentals, color Models, Pseudo color Image Processing, Basics of Full-color Image Processing, Boundary Descriptors, Regional Descriptors.	**10Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

Text Books:

1. ***Gonzalez*** and. Richard E. Woods' ***Digital Image Processing***, Fourth Edition, Global Edition 2018.

Reference Books:

1. Digital Image Processing- S.Jayaraman, S. Esakkirajan, T. Veerakumar, TataMc Graw Hill 2014.
2. Digital Image Processing (with Matlab and Lab view),Vipul Singh, Elsiver. Filiplearning

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG62	CO1	Describe the fundamentals concepts of digital image processing
	CO2	Demonstrate the techniques for Image enhancement in Spatial and frequency domain.
	CO3	Analyze Images restoration for noise removal.
	CO4	Implement segmentation techniques and apply on real life problems
	CO5	Adopt color image processing and apply representation approaches on given images.

COURSE TITLE: VISUAL DESIGN AND COMMUNICATIONS		
Subject Code:**22CG631**	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0Hrs**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03

Prerequisites:

Course Objectives:

- Apply appropriate communication skills across settings, purposes, and audiences.
- Demonstrate knowledge of communication theory and application

MODULES	**Teaching Hours**
Module-I Designing for Experience: Making sense of experience, Experience and Time, Experience and Media, Denotation and Connotation. The Vocabulary of Visual Images: Elements, Composition, Code, Style	**09 Hrs**
Module-II Getting Attention: Perceptual and cultural experience, Contrast, Figure - Ground, Color, Size Constancy, Scale, Proportion, Proximity, Focus, Layering, Symmetry/ Asymmetry, Closure, Continuity, Series and sequences, Pattern, Rhythm and Pacing, Motion.	**08 Hrs**
Module–III Orienting for use and Interpretation: Principles for orienting readers to the interpretation of information, Affordances, Channel, Medium/Format, Feedback, Wayfinding, Mapping, Hierarchy, Reading pattern, Grouping, Edge Relationships, Direction, point of view.	**08 Hrs**
Module–IV Interacting, Interpreting and Experiencing: The Nature of signs, The nature of Interaction and Interpretation, Legibility/ Readability, Denotation and Connotation, Framing, Abstraction, Icon, Index and symbol, Materiality, Substitution, Metaphor, Appropriation, Ambiguity, Cognitive dissonance	**09 Hrs**
Module–V Retaining and Extending meaning: Memory and categorization, extending the impact of form, Stereotypes, Archetypes, Narrative, Mnemonics, Checking, Redundancy, Graphic Identity, Branding.	**08 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Meredith Davis (Author), Jamer Hunt, Visual Communication Design: An Introduction to Design Concepts in Everyday Experience

Reference Books:

1. Communication between cultures - Larry A. Samovar, Richard E. Porter, Edwin R. McDaniel & Carolyn Sexton Roy, Monica Eckman, USA, 2012.
2. Introduction to Communication studies - John Fiske & Henry Jenkins 3rd edition, Routledge, Oxon 2011.
3. An Introduction to communication studies - Sheila Steinberg, Juta & Co., Cape Town, 2007.
4. One World Many Voices: Our Cultures - Marilyn Marquis & Sarah Nielsen, Wingspan Press, California, 2010.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG631	CO1	Demonstrate Designing for Experience.
	CO2	Understand perceptual and cultural experience in Visual Design and Communications.
	CO3	Analyze principles for orienting readers to the interpretation of information.
	CO4	Illustrate the nature of Interaction and Interpretation, Legibility/ Readability, Denotation and Connotation.
	CO5	Understand Retaining and Extending forms and their types.

Course Title: HUMAN COMPUTER INTERACTION		
Subject Code :**22CG632**	Credit : 3	CIE: 50
Number of Lecture Hours/Week	**3 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisite: Programming Skill, Data Structures, Mathematics.		

Course Objectives:

- To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design
- Able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks
- Recognize the limits of human performance as they apply to computer operation
- Understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems.

MODULES	**Teaching Hours**
Module –I **Introduction:** Importance of user Interface –definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –Interface popularity, characteristics-Principles of user interface	**09 Hrs**
Module-II Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis –presentation information simply and meaningfully– information retrieval on web– statistical graphics– Technological consideration in interface design.	**08Hrs**
Module-III Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	**08Hrs**
Module- IV HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert 12 - analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.	**08 hrs**

Module- V	
Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.	**09 Hrs**

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3 2.
2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

REFERENCE BOOKS:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia,2005.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech, 4th Edition, 2015
3. User Interface Design, Soren Lauesen , Pearson Education, 2nd Edition, 2005.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning, 2nd Edition, 2010
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.2009

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CG632	**CO1**	Understand the primitives and methods in learning process by computation
	CO2	Analyse the nature of problems solved with machine learning
	CO3	Apply the real-world problems in the context of human interaction
	CO4	Create familiar tools for individuals with disabilities
	CO5	Create an interface or device in terms of its usability for easy accessibility among humans

COURSE TITLE: OBJECT ORIENTED MODELLING AND DESIGN		
Subject Code:**22CG633**	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0Hrs**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisites:		

Course Objectives:

- Describe the concepts involved in Object-Oriented modelling and their benefits.
- Demonstrate concept of use-case model, sequence model and state chart model for a given problem
- Explain the facets of the unified process approach to design and build a Software system.
- Translate the requirements into implementation for Object Oriented design
- Choose an appropriate design pattern to facilitate development procedure.

MODULES	**Teaching Hours**
Module-I Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages. State Modeling: Events, States, Transistions and Conditions, State Diagrams, State diagram behaviour.	**09 Hrs**
Module-II Use Case Modelling and Detailed Requirements: Overview; Detailed object-oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models.	**08Hrs**
Module–III Process Overview, System Conception and Domain Analysis: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.	**08 Hrs**
Module–IV Use case Realization :The Design Discipline within up iterations: Object Oriented Design-The Bridge between Requirements and Implementation; Design Classes and Design within Class Diagrams; Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams; Updating the Design Class Diagram; Package Diagrams-Structuring the Major Components; Implementation Issues for Three-Layer Design.	**09Hrs**
Module–V Design Patterns: Introduction; what is a design pattern?, Describing design patterns, the catalogue of design patterns, Organizing the catalogue, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns: prototype and singleton (only); structural patterns adaptor and proxy (only).	**08 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005

2. Satzinger, Jackson and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning, 2005.

3. Erich Gamma, Richard Helm, Ralph Johnson and john Vlissides: Design Patterns –Elements of Reusable Object-Oriented Software, Pearson Education,2007.

Reference Books:

1. Grady Booch et. al.: Object-Oriented Analysis and Design with Applications,3rd Edition,Pearson Education,2007.

2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michel Stal: Pattern – Oriented Software Architecture. A system of patterns , Volume 1, John Wiley and Sons.2007.

3. Booch, Jacobson, Rambaugh : Object-Oriented Analysis and Design with Applications, 3rd edition, pearson, Reprint 2013

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG633	CO1	Describe the concepts of object-oriented and basic class modelling.
	CO2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
	CO3	Illustrate the models for system development
	CO4	Demonstrate the process of designing the class, interaction, usecase and package diagrams.
	CO5	Choose and apply a befitting design pattern for the given problem.

Course Title: DIGITAL FORENSICS		
Subject Code :**22CGOE641**	Credit :3	CIE: 50
Number of Lecture Hours/Week(L:T:P)	**3:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Nil		

Course Objectives: This course will enable students to

- To explore the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- To understand how to examine digital evidences such as the data acquisition, identification analysis.

MODULES	**Teaching Hours**
Module I **Understanding Incident Response**: The IR process, The role of digital forensics, The IR frame work, The IR charter, CSIRT team, The IR plan, Incident classification, The IR playbook/handbook ,Escalation process, Testing the IR framework **Managing Cyber Incidents:** Engaging the incident response team**,** CSIRT engagement models, Investigating incidents**,** The CSIRT war room**,** Communications**,** Rotating staff**,** SOAR**,** Incorporating crisis communications**,** Internal communications**,** External communications**,** Public notification**,** Incorporating containment strategies, Getting back to normal eradication, recovery, and post-incident activity **Fundamentals of Digital Forensics:** An overview of forensic science**,** Locardas exchange principle ,Legal issues in digital forensics, Law andregulations**,** Rules of evidence**,** Forensic procedures in incident response **,**A brief history of digital forensics**,** The digital forensics process**,** The digital forensics lab.	**09 Hrs**
Module II **Investigation Methodology:** An intrusion analysis case study: The Cuckooâs Egg, Types of incident investigation analysis**,** Functional digital forensic investigation methodology**,** Identification and scoping**,** Collecting evidence**,** The initial event analysis**,** The preliminary correlation**,** Event normalization**,** Event deconfliction**,** The second correlation**,** The timeline**,** Kill chain analysis**,** Reporting**,** The cyber kill chain**,** The diamond model of intrusion analysis**,** Diamond model axioms**,** A combined diamond model and kill chain intrusion analysis**,** Attribution **Collecting Network Evidence:** An overview of network evidence**,** Preparation**,** A network diagram**,** Configuration**,** Firewalls and proxy logs**,** Firewalls**,** Web application firewalls**,** Web proxy servers ,NetFlow,, Packet capture, tcpdump, WinPcap and RawCap, ,Evidence collection	**08 Hrs**

Module III **Acquiring Host-Based Evidence:** Preparation, Order of volatility, Evidence acquisition, Evidence collection procedures, Acquiring volatile memory, FTK Imager, WinPmem, RAM Capturer, Virtual systems, Acquiring non-volatile evidence, FTK obtaining protected files, The CyLR response tool Kroll Artifact Parser and Extractor **Remote Evidence Collection:** Enterprise incident response challenges,	**08 Hrs**
Endpoint detection and response, Velociraptor overview and deployment, Velociraptor server, Velociraptor Windows collector, Velociraptor scenarios, Velociraptor evidence collection, CyLR, WinPmem. **Forensic Imaging:** Understanding forensic imaging, Image versus copy, Logical versus physical volumes, Types of image files, SSD versus HDD, Tools for imaging, Preparing a staging drive, Using write blockers, Imaging techniques, Dead imaging, Live imaging, Virtual systems, Linux imaging.	
Module IV **Analyzing Network Evidence**: Network evidence overview, Analyzing firewall and proxy logs, SIEM tools, The Elastic Stack, Analyzing NetFlow, Analyzing packet captures, Command-line tools, Real Intelligence Threat Analytics, Network Miner, Arkime, Wireshark **Analyzing System Memory:** Memory analysis overview, Memory analysis methodology, SANS six-part methodology, Network connections methodology, Memory analysis tools, Memory analysis with Volatility, Volatility Workbench, Memory analysis with Strings, Installing Strings, Common Strings searches **Analyzing System Storage:** Forensic platforms, Autopsy, Installing Autopsy, Starting a case, Adding evidence, Navigating Autopsy, Examining a case,Master File Table analysis, Prefetch analysis, Registry analysis **Analyzing Log Files:** Logs and log management, Working with SIEMs, Splunk, Elastic Stack, Security Onion, Windows Logs, Windows Event Logs, Analyzing Windows Event Logs, Acquisition, Triage, Detailed Event Log analysis.	**09 Hrs**
Module V **Writing the Incident Report:** Documentation overview, What to document, Types of documentation, Sources, Audience, Executive summary, Incident investigation report, Forensic report, Preparing the incident and forensic report, Note-taking, Report language **Ransom ware Preparation and Response** :History of ransom ware: Crypto Locker, CryptoWall, CTB-Locker, Tesla Crypt, Sam Sam: Locky, Wanna Cry, Ryuk, Conti ransom ware case study: Background, Operational disclosure, Tactics and techniques, Exfiltration, Impact, Proper ransom ware preparation, Ransom ware resiliency, Prepping the CSIRT, Eradication and recovery, Containment, Eradication, Recovery **Ransomware Investigation**s: Ransom ware initial access and execution, Initial access, Execution, Discovering credential access and theft, Proc Dump, Mimikatz, Investigating post-exploitation frameworks, Command and Control, Security Onion ,RITA, Arkime, Investigating lateral movement techniques.	**08 Hrs**

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text books:
1.Gerard johansen, Digital Forensics and Incident Response: Incident response techniquesand procedures to respond to modern cyber threats, 2nd Edition

Reference Books:
1. Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CGOE641	**CO1**	Develop skills to manage incident response and study fundamental of digital forensics
	CO2	Describe the process of conducting intrusion analysis and collection of network evidence
	CO3	Explore tools for evidence collection and forensic images.
	CO4	Analyze digital evidence and examine various aspects of analyzing system memory, storage and log files
	CO5	Prepare incident report study tools and technique used by Ramsomware.

Course Title: MAJOR PROJECT PHASE –I		
Subject Code: **22CG65**	Credit:2	CIE:50
Number of Practical Hours/Week	**2Hrs**	SEE:
		SEEHours:03

Course Objectives:

- Identify real-world problems by performing the Literature survey
- Awareness of design and proposed methodologies and its analysis
- Design architectural Models and identity the functional & nonfunctional requirements by all team members
- Prepare quality technical report and present in a well-organized manner

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG65	**CO1**	Apply basic engineering knowledge and identify the problem either individually or as a group
	CO2	Evaluate the knowledge of contemporary issues through literature survey and formulate the problems.
	CO3	Apply Engineering skills to solve problems of Engineering applications.
	CO4	Design the problem using software methodology.
	CO5	Prepare well organized report.

Course Title: DIGITAL IMAGE PROCESSING LAB		
SubjectCode:**22CGL66**	Credit:1	CIE:50
Number of Practical Hours/Week	**2Hrs**	SEE:50
		SEE Hours:03

Prerequisites: C, Python

Course Objectives:

- Understand and explain Digital Image and its properties.
- Apply Image processing arithmetic operations.
- To Study the Image fundamental and mathematical transformations necessary for image processing.
- Understand the image enhancement techniques, image restoration and segmentation techniques.

List of Programs

1. Find and list the properties of a Digital Image and demonstrate arithmetic operations (plus and Minus) on two images of same properties.
2. Demonstrate bit wise operations like, AND, OR, XOR on two images
3. Demonstrate image preprocessing by reducing noise using image blurring technique.
4. Demonstrate image rotation
5. Demonstrate image translation
6. Demonstrate edge detection of image
7. Demonstrate Morphological Image Processing
8. Apply histogram equalization for enhancing the given images.
9. Image segmentation by different thresholding technique
10. Image segmentation by Otsu's technique
11. Convert a RGB image to YCrCb, HSV and LAB formats and display converted image
12. Implement smoothing of images by averaging, Gaussian and mean filter for image restoration

Question paper pattern: For SEE, two programs from the Exercise programs list will be asked.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Design experiments to undersign different image formats and different operations on image.
	CO2	Demonstrate the techniques for Image enhancement in Spatial a

22CGL66	**CO3**	Analyze Images restoration and Segmentation operations.
	CO4	Design experiments to demonstrate Image Smoothening Filters
	CO5	Design experiments to demonstrate Image Segmentation

INDIAN KNOWLEDGE SYSTEMS (Theory)						
Course Code	**:**	**22IKSAE67**		**CIE**	**:**	**50Marks**
Credits :L:T:P	**:**	**1:0:0**		**SEE**	**:**	**50Marks**
Total Hours	**:**	**15 L**		**SEE Duration**	**:**	**02Hours**

Course Learning Objectives: The students will be able to	
1	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2	To make the students understand the traditional knowledge and analyze it and apply it To their day-to-day life.

Modules	
Module-I	**05Hrs**
Introduction to Indian Knowledge Systems(IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-à-vis indigenous knowledge, Traditional knowledge vs. western knowledge.	
Module–II	**05Hrs**
Traditional Knowledge in Humanities and Sciences: Linguistics, Number and Measurements - Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.	
Module-III	**05Hrs**
Traditional Knowledge in Professional domain: Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2:	Appreciate the need and importance of protecting traditional knowledge.
CO3:	Recognize the relevance of Traditional knowledge in different domains.
CO4:	Establish the significance of Indian Knowledge systems in the contemporary world.

Reference Books	
1	**Introduction to Indian Knowledge System-concepts and applications**, B Mahadevan, VinayakRajatBhat,NagendraPavanaRN,2022,PHILearningPrivateLtd,ISBN-978-93-91818-21-0
	Traditional Knowledge System in India, AmitJha,2009,AtlanticPublishersandDistributors (P)Ltd.,ISBN-13:978-8126912230,
2	**Knowledge Traditions and Practices of India**, KapilKapoor, AvadeshKumarSingh,Vol.1, 2005,DKPrintWorld(P)Ltd.,ISBN81-246-0334,
	Suggested WebLinks:
1.	**https://www.youtube.com/watch?v=LZP1StpYEPM**

2.	**http://nptel.ac.in/courses/121106003/**
3.	http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63(Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4.	https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5.	https://unctad.org/system/files/official-document/ditcted10_en.pdf
6.	http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
7.	https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%(CIE)**	**50%(SEE)**
QUIZZES		
Quiz-I Quiz-II	Each quiz is evaluated for 05 marks adding upto**10 Marks.**	*****
THEORY COURSE-(Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test–I Test–II	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced To **20 Marks**	*****
EXPERIENTIAL LEARNING	**20**	*****
Case Study-based Teaching-Learning	--	*****
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)	--	
Video based seminar(4-5minutes per student)	--	
Maximum Marks for the Theory	---	**50Marks**
Practical	--	--
Total Marks for the Course	**50**	**50**

Course Title : PHYSICAL EDUCATION AND SPORTS		
Subject Code : 22PE68	**Credits :00**	**CIE: 50**
Number of Lecture Hours/Week(L:T:P)	**0:0:2 Hrs**	**SEE: 00**
Total Number of Lecture Hours	**28**	**SEE Hours: 00**

SEMESTER	COURSE
V	Athletics / Football/Hockey
VI	Athletics / Cricket/Base ball
VII	Athletics / Netball/Basketball
VIII	Individual Games / Handball/ Badminton

Notes:

- One Hour of Lecture is equal to 1 Credit
- One Hour of Tutorial is equal to 1 Credit (Except Languages)
- Two Hours of Practical is equal to 1 Credit
- SEE: Semester End Examination
- CIE: Continuous Internal Examination
- L+T+P : Lecture + Tutorial + Practical

SEMESTER	COURSE TITLE	CONTENT	NO. HOURS
VI	CRICKET	**A. Fundamental Skills** 1. Batting - Forward Defense Stroke, Backward Defense Stroke, Off Drive, On Drive, Straight Drive, Cover Drive, SquareCut. 2. Bowling -Out-swing, In-swing, Off Break, Leg Break and Googly. 3. Fielding: Catching - The High Catch, The Skim Catch, The Close Catch and throwing at the stumps from different angles. Long Barrier and Throw, Short Throw, Long Throw, Throwing on the Turn. 4. Wicket Keeping B. Rules and their interpretation and duties of officials	Total 32Hrs 2 Hrs/ Week
	BASEBALL	A. Fundamental Skills Player Stances – walking, extending walking, L tance, cat stance Grip – standard grip, choke grip Batting – swing and bunt. Pitching Baseball : slider, fast pitch, curve ball, drop ball, rise ball, change up, knuckle ball, screw ball, Rules and their interpretation and duties of officials.	

	Athletics Combined Events Heptathlon & Decathlon Jumps- Pole Vault Throws -Hammer Throw	Combined Events: Heptathlon all the 7 events Decathlon: All 10 Events Pole Vault: Approach Run, Planting the Pole,Take-off, Bar Clearance and Landing. HammerThrow: Holding the Hammer, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).	

REFERENCES

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.
3. Petipus, et al. Athlete's Guide to Career Planning, Human Kinetics.
4. Dharma, P.N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi.
5. Jain, R. Play and Learn Cricket, Khel Sahitya Kendra, New Delhi.
6. Vivek Thani, Coaching Cricket, Khel Sahitya Kendra, New Delhi.
7. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
8. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata
9. Naveen Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
10. Dubey, H. C. Basketball, Discovery Publishing House, New Delhi.
11. Rachana Jain, Teach Yourself Basketball, Sports Publication.
12. Jack Nagle, Power Pattern Offences for Winning asketball, Parker Publishing Co., NewYork.
13. Renu Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
14. Sally Kus, Coaching Volleyball Successfully, Human Kinetics.
15. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani. 16 Bandopadhyay, K.Sarir Siksha Parichay, Classic Publishers, Kolkata
16. Test and Measurement (by Cleark and Cleark)
17. Evaluation in Physical Education (by Dr. Devendraya Kausal)
18. Methods of Physical Education (by Haridrash & Prof. Tirumalay Swamy)
19. Athletics (by Hardayal Singh)
20. Efficienting and Coaching (by Dr. Anand Nadigri)
21. Modern and Ancient History of Physical Education (by Dr. D. M. Jyothi)
22. Organization and Administration (by K. G. Nadigir or Vastrad)