P D A College of Engineering

B.E. in Information Science and Engineering

Scheme of Teaching and Examinations 2022

Outcome Based Education(OBE)and Choice Based Credit System(CBCS)

(Effective from the academic year2023-24)

VSEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD)and Question Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PC	22IS51	Software Engineering	TD-Respective Dept. PSB- Respective Dept.	3	2	0	0	03	50	50	100	4
2	IPCC	22IS52	Data Base Management System	TD-Respective Dept. PSB- Respective Dept.	3	0	2	0	03	50	50	100	4
3	PCC	22IS53	Operating System	TD-Respective Dept. PSB- Respective Dept.	3	0	0	1	03	50	50	100	4
4	PCCL	22ISL54	Operating System Lab	TD-Respective Dept. PSB- Respective Dept.	0	0	2	0	03	50	50	100	1
5	PEC(I)	22IS55A	Introduction to Artificial Intelligence	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
6	PROJ	22ISMP56	Mini Project	TD-Respective Dept. PSB- Respective Dept.	0	0	4	0	-	50		50	2
7	AEC	22RMI57	Research Methodology and Intellectual Property Rights	Any Department	2	2	0	0	03	50	50	100	3
8	BSC	22ES58	Environmental Studies	TD:CV/ Env / Chem PSB:CV	2	0	0	0	03	50	50	100	2
9	NCMC	22NS59	Mandatory Course	NSS coordinator	0	0	2	0		50		50	0
		22PE59	Mandatory Course	Physical Education Director									
		22YO59	Mandatory Course	Yoga Teacher									
				Total	**16**	**04**	**10**	**01**	**21**	**450**	**350**	**800**	**23**

Professional Elective Course			
22IS55A	Introduction to Artificial Intelligence	22IS55C	Image and Video Processing
22IS55B	Computer Vision		
PCC:ProfessionalCoreCourse,**PCCL**:ProfessionalCoreCourselaboratory,**UHV**:Universal Human Value Course, **MC**: Mandatory Course(Non-credit), **AEC**: Ability			

Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K:**Theletterinthecoursecodeindicates commontoalthestreamofengineering.**PROJ**:Project/MiniProject.**PEC**:ProfessionalElective Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as(3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering/Technology (B.E./B.Tech.)2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. Theeventsshallbeappropriatelyscheduledbythecollegesandthesameshallbereflectedin the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Mini-project work: Mini Project is a laboratory-oriented / hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/ abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinaryMini- project can be assigned to an individual student or to agrouphavingnotmorethan4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25.The marks awarded for the project report shall be the same for all the batches mates.

(ii) Inter disciplinary: Continuous Internal Evaluationshallbegroup-wiseatthecollegelevelwiththeparticipationofalltheguidesoftheproject.

The CIE marks awarded for the Mini-project shall be based on the evaluation of the project report, project presentation skill, and question and answer session in theratio50:25:25.Themarks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Eachgroupwillprovideanoptiontoselectonecourse.Theminimumnumberofstudents'strengths for offering a professional elective is 10.However,this conditional shall Not be applicable to cases where the admission to the program is less than 10.

P D A College of Engineering

B.E. in Information Science and Engineering

Scheme of Teaching and Examinations 2022

Outcome Based Education(OBE) and Choice Based Credit System(CBCS)

(Effective from the academic year2023-24)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	22 HU61	Entrepreneurship, Management and Finance	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
2	PCC	22IS62	Computer Network	TD-Respective Dept. PSB- Respective Dept.	3	2	0	0	03	50	50	100	4
3	PEC(II)	22IS63A	Machine Learning	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
4	OEC	22ISOE641	Software Testing and Tools	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
5	PROJ	22IS65	Major Project Phase – I	TD-Respective Dept. PSB- Respective Dept.	0	0	4	0	03	50	--	50	2
6	PCCL	22ISL66	Computer Networks Lab	TD-Respective Dept. PSB- Respective Dept.	0	0	2	0	03	50	50	100	1
7	AEC	22ISIKS67	Indian Knowledge Systems	TD-Respective Dept. PSB- Respective Dept	If the course is offered as a Theory: 0	2	0		02	50	50	100	1
					If a course is offered as a practical: 0	0	2						
8	NCMC	22NS68	Mandatory Course (Non-credit),	NSS coordinator	0	0	2			50	---	50	0
		22PE68	Mandatory Course (Non-credit),	Physical Education Director									
		22YO68	Mandatory Course (Non-credit),	Yoga Teacher									
				Total	**12**	**4**	**10**	**0**	**20**	**400**	**300**	**700**	**17**

Professional Elective Course			
22IS63A	Machine Learning	22IS63C	Digital Image Processing
22IS63B	Natural Language Processing		
Open Elective Course			
22ISOE641	Software Testing and Tools		

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: AbilityEnhancement Course, **SEC**:Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**:SemesterEndEvaluation.**K:**Theletterinthecoursecodeindicatescommontoalthestreamofengineering.**PROJ**:Project/MiniProject.**PEC**:ProfessionalElective Course.**PROJ**:ProjectPhase-I,**OEC**:OpenElectiveCourse

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as(3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall beevaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE questionpaper. For more details, the regulationgoverningtheDegreeofBachelorofEngineering/Technology(B.E./B.Tech.)2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), andYoga(YOG) with the concerned coordinator of the course during the first week of III semesters.Activities shall be carried out between IIIsemester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. Theeventsshallbeappropriatelyscheduledbythecollegesandthesameshallbereflectedin thecalendarpreparedfortheNSS,PE,andYogaactivities.Thesecoursesshall notbeconsidered forvertical progressionaswell asfor thecalculationofSGPAandCGPA, butcompletionofthecourseismandatoryfortheawardofdegree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering andTechnology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Eachgroupwillprovideanoptiontoselectonecourse.Theminimumnumberofstudents'strengthsforofferingprofessionalelectivesis10.However,thisconditionalshall notbeapplicableto caseswheretheadmissionto theprogramis lessthan10.

OpenElectiveCourses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they canopt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under theguidanceoftheProgramCoordinator/Advisor/Mentor.Theminimumnumbersofstudents'strengthforofferingOpenElectiveCourseis10.However,thiscondition shallnotbeapplicabletoclasswhere theadmissiontotheprogramislessthan10.

ProjectPhase-I: Studentshave todiscusswiththementor/guideandwiththeir helphe/shehastocompletetheliteraturesurveyandpreparethe reportandfinally definetheproblemstatementfortheprojectwork.

SOFTWARE ENGINEERING		
Course Code:	22IS51	Credits:4
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:03Hrs (Theory) + 2Hrs (Tutorial)		Total Hours:52 Hrs.
Prerequisite: The students should have the knowledge of Computer Organization, Programming Principles, Data Structure and Algorithms.		
Course Learning Objectives To enable the students to obtain the knowledge on. • Software engineering principles and activities involved in building large software programs. • Identify ethical and professional issues and explain why they are of concern to software engineers. • Recognize the importance of software maintenance and describe the intricacies Involved in software evolution. • Apply estimation techniques, schedule project activities and compute pricing.		
Modules		**Teaching Hours**
Module I Overview Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people, and computer systems. Critical System, Software Processes: Critical Systems: A simple safety-critical system; System depend on ability; Availability and reliability.		10 Hrs.
Module II Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation.		11 Hrs.
Module III System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods. Project Management: Management activities; Project planning. Software Design: Architectural Design: Architectural design decisions; System		11 Hrs.

organization; Modular decomposition styles; Control styles.	
Module IV Object-Oriented design: Objects and Object Classes; An Object-Oriented Design process. Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes.	10 Hrs.
Module V Verification and Validation: Verification and Validation: Planning: Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing. Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling.	10 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1. Software engineering 9th edition by Ian Somervlle. 29 October 2017

Reference:

1. Roger. S. Pressman: Software Engineering A Practitioners approach, 7th Edition, Tata Mc Graw Hill.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Illustrate software development life cycle processes.
CO2	Analyze software requirements and generate SRS.
CO3	Describe design concepts and develop design document.
CO4	Describe SQA tasks, goals, and metrics, and test strategies.
CO5	Demonstrate Project management concepts and metrics.

DATABASE MANAGEMENT SYSTEM

Course Code:	22IS52	Credits:4
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:04(T+L)		Total hours:(40 +12)=52

Prerequisite:

The students should have the knowledge of Data Structures, Computer Organization and Object Oriented Principles.

Course Learning Objectives

To enable the students to obtain the knowledge of Data Base Management System in the following topics.

- Understand the Data Base Management Principles and relational models.
- Understand the relational algebraic approach and database implementation and interaction techniques using SQL.
- Understand the functional dependency and Normalization Techniques.
- Understand the online transaction processing and recovery methods.

Modules	Teaching Hours
Module I Introduction: Introduction; An example Characteristics of Database approach Actors on the screen; Workers behind the scenes; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-Schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.	8 Hrs.
Module II Entity-Relationship Model: Using High-Level Conceptual Data Models For Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming. Conventions and Design Issues; Relationship types of degree higher than two.	8 Hrs.
Module III Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra	8 Hrs.

Operations from Set Theory; Binary Relational. Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER-to Relational Mapping. SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL.	
Module IV Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.	8 Hrs.
Module V Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock–Based Concurrency Control; Performance of locking; Transaction support in SQL. Introduction to Crash Recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Check pointing; Recovering from a System Crash.	8 Hrs.
Question paper pattern: 1. The question paper will have TEN questions. 2. There will be TWO questions in each module, covering all the topics. 3. The student need to answer FIVE full questions, selecting ONE full question from each module.	
Textbooks: 1. **Fundamentals** of **database systems** / Ramez **Elmasri**, Shamkant B. **Navathe**.—6th **ed** 2. Database Management Systems- Raghu Ramakrishnan and Johannes Gehrke–3rdEdition. McGraw-Hill, 2014.	
Reference: 1. Data Base System Concepts-Silberschatz, KorthandSudharshan,7thEdition, Mc GrawHill,2019. 2. An Introduction to Database Systems-C. J. Date, A.Kannan,S.Swamynatham,8thEdition, Pearson Education.	
Course Outcome At the end of the course the student will be able to:	
CO#	**Course Outcome**

CO1	Express the fundamentals and applications of data base management system.
CO2	Apply good database design principles for the design of ER diagram and relational models.
CO3	Implement and interact data base using SQL and relational algebra.
CO4	Design data base by applying the functional dependency and Normalization techniques.
CO5	Demonstrate the data base transaction and recovery management process.

DATABASE MANAGEMENT SYSTEMS LABORATORY

Prerequisite : The Students should have the knowledge of Data structure and C++

Course Objectives: To enable the students to obtain the knowledge of Databasemanagement systems in the following topics.

- Understand the Data Base Management System Environment
- Understand the techniques to design the data base and populate there cords
- Understand the DML operations.
- Understand the query optimization and error handling techniques.
- Understand the DCL and TCL statements

DATA BASE LABORATORY

PART-A

Consider the following relations :

Student (Stud_number: integer, class: integer,

major:char)Course (Course_name: Char,

Course_number: varchar, Credit_hours:int,

Department: char) Section(Secton_id:varchar,

Course_number:varchar, Semester:char, Year:int,

Instructor:char)

Grade_Report (Stud_number:varchar, Section_id:int, Grade:char)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

i) What are the referential integrity constraints that should hold on the schema.

ii) Retrieve the names of all senior students majoring in'CS'

iii) Retrieve the names of all courses thought by particular professor in year 2017 and2018

iv) For each section taught by particular professor, retrieve the course number,semester,year and number of students who took the section.

v) Retrieve the names and major of all students who do not have a grade of A in any of their courses

vi)Insert a new student in the database

vii) Change the class of particular student.

viii)Insert a new course to the database

ix) Delete the record of the student whose name start with'S'

x) Delete the record of the students whose name contains 'a' and'e'

xi) Delete the record of the students whose name ends with'a'

xii) Count the total number of students with Grade and Major wise.

xiii) Remove all the referential integrity constraints on the schema

xiv) Delete all the rows from thetables

xv) Drop all the tables.

PART-B

1. Consider the followingrelations:

Student (snum: integer, sname: string, major: string, level: string, age: integer)Class (name: string, meets at: string, room: string, d: integer)

Enrolled (snum: integer, cname: string)

Faculty (fid: integer, fname: string, deptid: integer) The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc) Write the following queries in SQL. No duplicates should be printed in any of the answers. Find the names of all Juniors (level = JR) whoare enrolled in a class taught by Prof. Harshith.

i. Find the names of all classes that either meet in room R128 or have five or more Studentsenrolled.

ii. Find the names of all students who are enrolled in two classes that meet at the sametime.

iii. Find the names of faculty members who teach in every room in which some class istaught.

iv. Find the names of faculty members for whom the combined enrollment of the coursesthat they teach is less than five

2. The following relations keep track of airline flight information:Flights (no: integer, from: string, to: string, distance: integer, Departs: time, arrives: time, price: real) Aircraft (aid: integer, name: string, cruising range:

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well;bbnmbcfEvery pilot is certified for someaircraft, and only pilots are certified to fly.Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate

them have salaries morethan Rs.80,000.

ii. For each pilot who is certified for more than three aircrafts, find the eid and themaximum cruising range of the aircraft for which she or he iscertified.

iii. Find the names of pilots whose salary is less than the price of the cheapest route fromBengaluru toFrankfurt.

iv. For all aircraft with cruising range over 1000 Kms, .find the name of the aircraft andthe average salary of all pilots certified for thisaircraft.

v. Find the names of pilots certified for some Boeingaircraft.

vi. Find the aids of all aircraft that can be used on routes from Bengaluru to NewDelhi.

3. Consider the following database of student enrollment in courses & books adopted foreachcourse.

STUDENT (regno: string, name: string, major: string,
bdate:date)COURSE (course #:int, cname:string,
dept:string)
ENROLL (regno:string, course#:int, sem:int,
marks:int) BOOK _ ADOPTION (course# :int,
sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreignkeys.

ii. Enter at least five tuples for eachrelation.

iii. Demonstrate how you add a new text book to the database and make this book beadopted by some department.

iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than twobooks.

v. List any department that has all its adopted books published by a specificpublisher.

vi. Generate suitablereports.

vii. Create suitable front end for querying and displaying the results

4. The following tables are maintained by a book dealer. AUTHOR (author-id:int, name:string, city:string,country:string)

PUBLISHER (publisher-id:int, name:string, city:string, country:string)

CATALOG (book-id:int, title:string, author-id:int, publisher-id:int,category-id:int, year:int, price:int)

CATEGORY (category-id:int, description:string)

ORDER-DETAILS (order-no:int, book-id:int, quantity:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.

ii. Enter at least five tuples for each relation.

iii. Give the details of the authors who have 2 or more books in the catalog and the price ofthe books is greater than the average price of the books in the catalog and the year of publication is after2000.

iv. Find the author of the book which has maximum sales.

v. Demonstrate how you increase the price of books published by a specific publisher by10%.

vi. Generate suitable reports.

vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise BRANCH(branch-name:string, branch-city:string, assets:real)ACCOUNT(accno:int, branch-name:string, balance:real) DEPOSITOR(customer-name:string, accno:int) CUSTOMER(customer-name:string, customer-street:string, customer-city:string) LOAN(loan-number:int, branch-name:string, amount:real)BORROWER(customer-name:string, loan-number:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys

ii. Enter at least five tuples for eachrelation

iii. Find all the customers who have at least two accounts at the Main branch.

iv. Find all the customers who have an account at all the branches located in a specificcity.

v. Demonstrate how you delete all account tuples at every branch located in a specificcity.

vi. Generate suitable reports.

vii. Create suitable front end for querying and displaying the results.

OPERATING SYSTEM		
Course Code:	22IS53	Credits:4
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:04Hrs (Theory)		Total Hours:52 Hrs.
Prerequisite: The students should have the knowledge of Computer Organization, Programming Principles, Data Structure and Algorithms.		
Course Learning Objectives To enable the students to obtain the knowledge of Operating System in the following topics. • The basic components and fundamentals of Operating system. • The mechanisms to handle processes and threads and their communication. • To gain knowledge on scheduling, process synchronization, deadlock handling techniques. • To understand file handling, memory management, and OS mechanisms.		
Modules		**Teaching Hours**
Module I **Introduction to operating systems:** What operating systems do; Operating System structure; Operating System operations. **System Structures:** Operating System Services; User -Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; **Process Management**: Process concept; Process scheduling; Operations on processes; Inter-process		10 Hrs.

communication. **Multi-Threaded Programming**: Overview; Multithreading models; Thread Libraries; Threading issues.	
Module II **Process Scheduling:** Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple Processor scheduling; Thread scheduling. Process synchronization: Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **Deadlocks:** System model; Dead lock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock	11 Hrs.
Module III **Memory Management:** Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing	10 Hrs.
Module IV **Storage Management:** File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. **Implementing File System:** File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **Secondary storage structures:** Overview of Mass storage structures; Disk structure; Disk attachment, Disk scheduling; Disk management; Swap space management.	11 Hrs.
Module V **System Protection:** Goals of protection; Principles of protection; Domain of protection; Access matrix; Implementation of access matrix; Access control; Revocation of access rights; Capability-Based systems. **Case Studies:** The Linux System: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Inter process Communication.	10 Hrs.
Question paper pattern: 1. The question paper will have TEN questions. 2. There will be TWO questions in each module, covering all the topics. 3. The student need to answer FIVE full questions, selecting ONE full question from each module.	
Textbooks: 1. Operating System Concepts - Abraham Silber Schatz, Peter Baer Galvin, Greg Gagne	

9th edition, Wiley-India, 2013.

2. **Silberschatz's Operating System Concepts, Global ed** Abraham Silber Schatz, Peter Baer Galvin, Greg Gagne

Reference:

1. Operating Systems: A Concept Based Approach - D.M. Dhamdhere, 9th Edition, TataMcGraw-Hill,2012.
2. Tanenbaum A. S., Modern Operating Systems, 3rd Edition, Pearson Education,2008.
3. Operating Systems-P. C. P. Bhatt, 2nd Edition, PHI,2006

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Interpret the fundamental concepts of operating system and its functions
CO2	Analyze Scheduling algorithms and measure their performance
CO3	Implement the system model for accessing shared data and handling deadlock in process synchronization
CO4	Analyze the memory management strategies, file organizations and disk scheduling algorithms.
CO5	Analyze the information protection mechanisms in OS and illustrate the working of modern operating system.

OPERATING SYSTEM LAB

Course Code:	22ISL54	Credits:1
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:02Hrs (Practical)		Total Hours:28 Hrs.

Prerequisite:

Students should have the knowledge of C, Data Structure and Algorithm.

Course Learning Objectives

To enable the students to obtain the knowledge of Operating System laboratory in the following topics.

- To implement CPU scheduling algorithms
- To develop bankers algorithm used for deadlock avoidance and prevention.
- To implement page replacement and memory management algorithms.

1. Write a C program to compute average waiting time and average turn around time for First-Come First-Served (FCFS) Scheduling algorithm, the program should accept the arrival time and burst time as input.

2. Write a C program to compute average waiting time and average turn around time for Shortest-Job-First Scheduling algorithm, the program should accept the arrival time and

burst time as input.
3. Write a C program to compute average waiting time and average turn around time for Priority Scheduling algorithm, the program should accept the arrival time and burst Time and priority as input.
4. Write a C program to compute average waiting time and average turn around time for Round- Robin Scheduling algorithm, the program should accept the arrival time and burst time and assume suitable time quantum as input.
5.Write a C program for Producer Consumer problem and hence demonstrate multithreading process.
6. Write a C program to detect whether the system is in safe state, the program should accept allocation, max and available matrices. Generate the need matrix.
7. Write a C program that implements FIFO page replacement algorithm.
8. Write a C program that implements optimal page replacement algorithm.
9. Write a C program that implements LRU page replacement algorithm.
10. Write a C program to implement Disk Scheduling
11. Write a C program to implement thread synchronization using mutual exclusive lock.
12. Write a C program to implement thread synchronization using condition variable.

Question paper pattern:

In SEE, students will be asked to execute the program which may be related to t the above list of programs.

Reference:

Lab Manual

Course Outcome

At the end of the course the student will be able to:

CO#	**Course Outcome**
CO1	Write a c program to implement process Scheduling algorithms.
CO2	Implement process synchronization techniques using C Program.
CO3	Write a c program to implement deadlock handling techniques.
CO4	Implement page replacement algorithms using C program.
CO5	Write a C program to implement disk scheduling techniques, Thread synchronization using mutual exclusion and condition variables..

Introduction to Artificial Intelligence		
Course Code	**22IS55A**	Credits:03
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week:03Hrs (Theory)		Total Hours:42 Hrs.
Prerequisites: The student should have the knowledge of fundamentals of algorithms, statistics & Probability.		

Course Objectives:

To enable the students to obtain the knowledge of Introduction to Artificial Intelligence in the following topics.

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving
- Get to know approaches of inference, perception, knowledge representation, and learning

Module-I	**Teaching Hours**
Introduction: What is AI? Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. Text book 1: Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4	**9 hrs**
Module-II	
Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search. Text book 1: Chapter 3- 3.1, 3.2, 3.3, 3.4	**8 hrs**
Module-III	
Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic Text book 1: Chapter 3-3.5,3.6 Chapter 4 – 4.1, 4.2 Chapter 7- 7.1, 7.2, 7.3, 7.4, 7.5	**8 hrs**
Module-IV	

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic. Inference in First Order Logic :Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution Text book 1: Chapter 8- 8.1, 8.2, 8.3 Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5	**9 hrs**
Module-V	
Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited Expert Systems: Representing and using domain knowledge, ES shells. Explanation, knowledge acquisition Text Book 1: Chapter 13-13.1, 13.2, 13.3, 13.4, 13.5, 13.6 Text Book 2: Chapter 20	**8 hrs**

Question paper pattern:

• The question paper will have ten questions.

• Each full question consists of 20 marks.

• There will be 2 full questions (with a maximum of four sub questions) from each module.

• Each full question will have sub questions covering all the topics under a module. The

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

Text Books:

1. Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015

2. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013

Reference Books:

1. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011

2. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980 3. Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

E books and online course materials:

Course outcomes:

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

Course Code	CO #	Course Outcome (CO)
	CO1	Apply knowledge of agent architecture, searching and reasoning techniques for different applications.
	CO2	Compare various Searching and Inferencing Techniques.
	CO3	Develop knowledge base sentences using propositional logic and first order logic
	CO4	Describe the concepts of quantifying uncertainty.
	CO5	Use the concepts of Expert Systems to build applications.

Computer Vision		
Course Code:	22IS55B	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42

Prerequisite: The student should have the knowledge of computer organization , analysis and design of algorithms.

Course Learning Objectives

To enable the students to obtain the knowledge of Computer vision in the following topics.

• Uunderstand of the fundamental concepts related to multidimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc.

. Explore and contribute to research and further developments in the field of computer

vision	
Modules	**Teaching Hours**
Module I CAMERAS-Pinhole Cameras, **Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases, **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Inter reflections: Global Shading Models, **Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.	8 Hrs.
Module II **Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges, **Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.	8 Hrs.
Module III **The Geometry of Multiple Views:** Two Views, **Stereopsis:** Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, **Segmentation by Clustering:** What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering	9 Hrs.
Module IV **Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, **Segmentation and Fitting Using Probabilistic Methods:** Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models,	8 Hrs.

Kalman Filtering, Data Association, Applications and Examples.	
Module V **Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, **Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, **Model- Based Vision:** Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.	9 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

David A. Forsyth and Jean Ponce: – A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference:

E. R. Davies: and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Implement fundamental image processing techniques required for Perform shape analysis
CO2	Implement boundary tracking techniques and Apply chain codes and other region descriptors
CO3	Apply Hough Transform for line, circle, and ellipse detections and Apply 3D vision techniques.
CO4	Implement motion related techniques
CO5	Develop applications using computer vision techniques.

Image and Video Processing		
Course Code:	22IS55C	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42
Prerequisite: The students should have the knowledge of Fourier transformation and probabilistic approach.		
Course Learning Objectives To enable the students to obtain the knowledge of **Image and Video Processing** in the following topics. • Understand of the fundamental concepts related to multidimensional video processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. • Explore and contribute to research and further developments in the field of image and video processing		
Modules		**Teaching Hours**
Module I **Fundamentals of Image processing and Image Transforms**: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms		8 Hrs.
Module II **Image Processing Techniques: Image Enhancement**: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation		8 Hrs.
Module III **Image Compression Image compression fundamentals** – coding Redundancy, spatial and temporal redundancy. Compression models : Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards		9 Hrs.
Module IV Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals,		8 Hrs.

filtering operations **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.	
Module V **2-D Motion Estimation**: Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding	9 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1. Gonzaleze and Woods ,"Digital Image Processing ", 3rd edition , Pearson
2. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication ",1st edition , PHI

Reference:

1. M. Tekalp ,"Digital video Processing", Prentice Hall International

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Comprehend the image processing fundamentals and enhancement techniques in spatial and frequency domain.
CO2	Describe the color image fundamentals, models and various restoration techniques.
CO3	Design and Analyze the image compression systems.
CO4	Outline the various image segmentation and morphology operations
CO5	Comprehend the basics of video processing and video coding.

MINI - PROJECT

Course Code:	22ISMP56	Credits:2
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:02Hrs		Total Hours:28 Hrs.

Prerequisite:

The students should have thorough knowledge of Software Engineering and Mastering any one programming language.

Course Learning Objectives

- To understand the current requirement of the industries.
- To understand the different software development and testing methodologies.
- To understand and apply architectural model, data flow and control flow diagrams.
- To acquire good documentation, demonstration skills and impact of application on society.

Project comprises of:

1. Literature Survey
2. Requirement Analysis - S/w Requirement - H/w Requirements
3. Design Module presentation
4. Application
5. System Requirement Specification document SRS document contains synopsis, problem formulation and requirement analysis based on above factors.

Document should be submitted by the end of Semester

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Demonstrate the skills of performing surveys on current industrial requirements.
CO2	Analyze the requirements and apply appropriate software development methodology.
CO3	Implement and validate the architectural model, dataflow and control flow structures.
CO4	Demonstrate the documentation and presentation skills.
CO5	Implement the Societal and Ethical systems.

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code:	22RMI57	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:03Hrs		Total Hours:42

Course Learning Objectives

- 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.	8Hrs.
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.	8 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.	9Hrs.
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	8 Hrs.

patents - Case study of Neem petent, Curcuma (Turmeric)patent and Basmati rice patent, Apple inc.v Samsung electronics co.Ltd	
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.	9 Hrs.

Question paper pattern:

Assessment Details(both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of 20Marks(duration 01hour)

1.First test at the end of 5th week of the semester

2.Second test at the end of the 10th week of the semester

3.Third test at the end of the15th week of the semester

Two assignments each of 10Marks

4.First assignment at the end of 4th week of the semester

5. Second assignment at the end of 9th week of the semester Groupdiscussion/ Seminar/quizanyoneofthreesuitablyplannedtoattaintheCOsandPOsfor20 Marks (duration 01 hours)

6.At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy as per the Outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will be set for 100marks.Marks scored shall be proportionally

reduced to50 marks

2. The question paper will have ten questions. Each question is set for 20marks.

3. There will be 2questions from each module .Each of the two questions is under a module (with a maximum of 2 sub-questions).

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

Marks scored by the students will be proportionally scaled down to 50 marks

Textbooks:

1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4thEdition,2018

2.DipankarDeb•RajeebDey,ValentinaE.Balas

"EngineeringResearchMethodology",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).

4. Dr. R Radha Krishna and Dr. S Balasubramanain "Text book of Intellectual Property Right". First

edition, New Delhi 2008. Excel books.

5. P Narayan "Text book of Intellectual Property Right". 2017 ,Publisher: Eastern Law House

Reference:

1. DavidV.Thiel"ResearchMethodsforEngineers"CambridgeUniversityPress,978-1-107-03488- 4-

2. Nishith Desai Associates - Intellectual property law in India – Legal, Regulatory & Tax

NPTEL:

INTELLECTUAL PROPERTY by PROF.FEROZ ALI , 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 Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
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	Analyse and verify the procedure for Registration of Industrial Designs & Copyrights.

ENVIRONMENTAL STUDIES		
Course Code:	22ES58	Credits:2
CIE: 50 Marks	SEE: 50 Marks	SEE: 02 Hrs.
Hours/Week:03Hrs (2hr Tutorial)		Total Hours:28 Hrs.
Prerequisite:		
Course Learning Objectives • To create environmental awareness among the students. • To gain knowledge on different types of pollution in the environment.		
Modules		**Teaching Hours**
Module I Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.		5 Hrs.
Module II Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, case studies ng, and Carbon Trading.		5 Hrs.
Module III Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.		6 Hrs.
Module IV Global Environmental Concerns (Concept, policies and case-studies):		6 Hrs.

Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	
Module V Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. Field work: Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Waste water treatment Plant; ought to be Followed by understanding of process and its brief documentation.	6 Hrs.

Question paper pattern:

Continuous Internal Evaluation:

Three Unit Tests each of 20Marks (duration 01 hour)
1. First test at the end of 5th week of the semester
2. Second test a the end of the10th week of the semester
3. Third test at the end of the15thweek of the semester Two assignments each of 10 Marks
4. First assignment at the endof4thweek of the semester
5. Second assignment at the end of 9thweek of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the Cos and Pos for 20 Marks (duration01hours)
6. At the end of the13thweek of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be

Scaled down to 50 marks (to have less tresses CIE, the portion of the syllabus should not be common/repeated for any of the method of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods/question paper is designed to attain the different levels of Bloom' s taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 01 hours)

Question paper pattern:
1. The Question paper will have 50 objective questions.
2. Each question will before 01marks
3. Students will have to answer all the questions on an OMR Sheet.
4. The Duration of the Exam will be 01 hour

Textbooks:

1. Environmental studies, Benny Joseph, Tata McGraw-Hill 2nd edition 2012
2. Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018

Reference:

1. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009
2. M.Ayi Reddy Textbook of environmental science and Technology, BS publications

2007.

3. Dr. B.S Chauhan, Environmental studies, university of science press 1st edition.

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic component.
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
CO5	Understand Latest Developments in Environmental Pollution Mitigation Tools Concept and Applications of G.I.S. & Remote Sensing.

NATIONAL SERVICE SCHEME		
Course Code	**22NS59**	CIE:50
Semester:3	Credits NCMC – Non Credit Mandatory Course (Completion of the course shall be mandatory for the award of degree)	
SEE: Activities Report Evaluation by College NSS Officer at the end of every semester (3rd to 6th semester)		

Course objectives:

National Service Scheme (NSS) will enable the students to:

1. Understand the community in general 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.

5. Develop capacity to meet emergencies and natural disasters & practice national integration

and social harmony in general.

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Developing Sustainable Water management system for rural areas and implementation approaches
2. 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.
3. Spreading public awareness under rural outreach programs.(minimum5 programs).
4. Social connect and responsibilities

Topics or activities to be covered

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

Suggested Learning material:

Books : 1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, nss cell, Activities reports and its manual.

Course outcomes:

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

Course Code	CO #	Course Outcome (CO)
	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.
	CO5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

PHYSICAL EDUCATION AND SPORTS		
Course Code:22PE59	CIE Marks 50	Credits 0
SEE Marks 00	Course Type Practical Lecture	Hours/Week (L-T-P) 0-0-3
Total Marks 50	Total Hours 24	Hours SEE Hours --

Guideline for Athletic and Sports			
Semester	Course Title	Content	No. of Hours
Vth sem	Module I : Orientation	A. Fitness B. Food & Nutrition	4 Hours
	Module II: General Fitness & Components of Fitness	A. Agility – Shuttle Run B. Flexibility – Sit and Reach C. Cardiovascular Endurance – Harvard step Test	4 Hours
	Module III :	Specific games (Any one to be selected by the student) 1. Badminton (Fore hand low/high service, back hand service, smash, drop) 2. Basketball (Dribbling, passing, shooting etc.) 3. Athletics (Field events – Throws)	16 Hours

YOGA AND MEDITATION		
Course Code-22YO59	Credits: 0	
CIE:50	SEE: 00	SEE:--
Hours/Week: (L:T:P: S):0-0-3(Practical)	Total Marks:50	Total hours:28 hours
Prerequisite: NIL		

Course objectives: The Course will Enable students to

- To enable the student to have good health.
- To practice mental hygiene
- To possess emotional stability.
- To integrate moral values.
- To attain higher level of consciousness.

Semester V	Patanjali'sAshtanga Yoga its need and importance. Ashtanga Yoga 1. Asana 2. Pranayama 3. Pratyahara Asana its meaning by name, technique, precautionary measures and benefits of each asana Different types of Asanas a. Sitting 1. Ardha Ushtrasana 2. Vakrasana 3. Yogamudra in Padmasana b. Standing 1. UrdhvaHastothanasana 2. Hastapadasana 3. ParivrittaTrikonasana 4. Utkatasana c. Prone line 1. Padangushtha Dhanurasana 2. Poorna Bhujangasana / Rajakapotasana d. Supine line 1. Sarvangasana 2. Chakraasana 3. Navasana/Noukasana 4. Pavanamuktasana Revision of practice 60 strokes/min 3 rounds Meaning by name, technique, precautionary measures and benefits of each Pranayama 1. Ujjayi 2. Sheetali 3. Sheektari

ENTREPRENEURSHIP, MANAGEMENT AND FINANCE		
Course Code:	22HU61	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:03Hrs (Theory)		Total Hours:42 Hrs.
Prerequisite: (None)		

Course Learning Objectives

To enable the students to obtain the knowledge of in the following topics.

- The Meaning, Functions, Characteristics, Types, Role and Barriers of Entrepreneurship, Government Support for Entrepreneurship
- Management–Meaning, nature, characteristics, scope, functions, role etc
- 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–and 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	9 Hrs.
Module II MANAGEMENT: Introduction–Meaning– nature and characteristics of Management, Scope and functional areas of management, Roles of Management, Levels of Management, Henry Fayol Principles to Management, Engineers Social responsibility, and Ethics.	8 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).	8 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	9 Hrs.

Profit and Loss Account, Balance sheet.	
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) and various stock level (Reorder level, Minimum level, Maximum level, Average level and Danger level)	8 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1.Industrial Organization & Engineering Economics-T R Banga & S C Sharma-Khanna Publishers, Dehli.

Reference:

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Develop Entrepreneurship skills
CO2	Apply the concepts of management and Engineers Social responsibility& Ethics practice.
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.

COMPUTER NETWORK		
Course Code:	22IS62	Credits:4
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:04 hrs		Total hours:52

Prerequisite: The students should have basic knowledge of digital system design and organization.

Course Learning Objectives

To enable the students to obtain the knowledge of computer networking in the following topics

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To clarify network terminology and to provide an opportunity to do network programming using TCP/IP.
- To provide a WLAN measurement experience.
- To expose students to emerging technologies and their potential impact.

Modules	Teaching Hours
Module I Packet Switching Networks: Network services and internal network operations; Packet network topology; Datagrams and virtual circuits Routing in packet networks; Shortest-path routing; ATM networks. Packet Switching Networks -2: TCP / IP - 1: Traffic management at the packet level; Traffic management at the flow level; Traffic management at the flow-aggregate level. The TCP /IP architecture; The Internet protocol.	10 Hrs.
Module II TCP / IP - 2: IPv6: User datagram protocol; Transmission control protocol; Internet routing protocols; Multicast routing, DHCP, NAT, and Mobile IP. ATM Networks: Why ATM? BISDN reference model; ATM layer; ATM adaptation layer; ATM signaling; PNNI routing; classical IP over ATM.	11 Hrs.
Module III Network Management Security: Network management overview; SNMP; Structure of Management information; MIB; Remote network monitoring. Security and cryptographic algorithms; Security protocols; Cryptographic algorithms.	10 Hrs.
Module IV	10 Hrs.

QOS, Resource Allocation, VPNS, Tunneling, Overlay Networks: Overview of QOS; Integrated services QoS; Differentiated services QoS; Resource allocation. Virtual Private Networks; Multi-protocol Label switching; Overlay networks. Compression of Digital Voice and Video, VOIP, Multimedia Networking: Overview of data compression, digital voice, and compression, still images and jpeg compression, moving images and MPEG compression, limits of compression methods without loss, case study: FAX compression for transmission.	
Module V Mobile AD-HOC Networks , Wireless Sensor Networks :Overview of wireless adhoc networks; Routing in adhoc networks; Routing protocols for adhoc networks; security of adhoc networks, Sensor networks and protocol structures.	11 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1. Communication Networks-Fundamental Concepts and Key Architectures-Alberto Leon-Garcia and Indra Widjaja, 2nd Edition, Tata McGraw-Hill,2004.
2. Computer and Communication Networks-Nader F. Mir, Pearson Education,2007.

Reference:

1. Data Communications and Networking-Behrouz A. Forouzan,4th Edition, TataMcGraw-Hill,2006.
2. Data and Computer Communication - William Stallings, 8thEdition, Pearson Education, 2007.
3. Computer Networks a Systems Approach Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
4. Introduction to Data Communications and Networking-Wayne Tomasi, Pearson Education, 2005.

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks switching networks.
CO2	Analyze the internals of different protocols such as TCP, UDP, IP, TCP/ IP and SNMP.

CO3	Analyze network management Issues.
CO4	Describe the contemporary issues in networking technologies like compression, QOS, Resource allocation.
CO5	Apply the wireless networking concepts and routing algorithms.

Machine Learning		
Course Code:	22IS63A	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42

Prerequisite: The Students should have basic knowledge of algebra, discrete mathematics and algorithms.

Course Learning Objectives

To enable the students to obtain the knowledge of Machine Learning in the following topics.

- To introduce students to the basic concepts and techniques of machine learning.
- To develop skills of using recent machine learning software for solving practical problems.

To gain experience of doing independent study and research.

Modules	**Teaching Hours**
Module-I Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias	8 Hrs.
Module-II Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning	8 Hrs.
Module-III Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation	9 Hrs.

algorithm.	
Module-IV Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm	8 Hrs.
Module-V Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, Reinforcement Learning: Introduction, Learning Task, Q Learning	9 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1.Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1.EthemAlpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd.,2013

.

2.T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer;1st edition, 2001

e-Books:

1. http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/understanding-machinelearning-theory-algorithms.pdf
2.http://alex.smola.org/drafts/thebook.pdf

MOOCS :

1. https://www.coursera.org/learn/machine-learning
2. https://www.udacity.com/course/intro-to-machine-learning--ud120
3. Introduction to Machine Learning - Course https://onlinecourses.nptel.ac.in/noc22_cs29

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Demonstrate the designing of a learning system and issues in machine learning
CO2	Apply decision tree learning to solve machine learning problems
CO3	Apply neural network techniques to solve complex problems
CO4	Analyze Bayesian learning techniques for predicting probabilities
CO5	Analyze and evaluate the hypothesis accuracy using sampling and probability theory

Natural Language Processing		
Course Code:	22IS63B	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42

Prerequisite: The students should have the knowledge of linear algebra , probability and calculus.

Course Learning Objectives: To enable the students to obtain the knowledge of Natural Language processing in the following topics

- Learning the fundamental tasks of NLP and how to explain them
- Learning about algorithms that can be used to solve NLP tasks, and how to implement them
- Learning about statistical approaches to machine translation.
- Learning about literary-historical NLP-based analytic techniques, such as stylometry, topic modeling, synsetting, and named entity recognition

Modules	**Teaching Hours**
Module I **Overview and language modeling:** Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model. Textbook 1: Ch. 1,2	8 Hrs.

Module II **Word level and syntactic analysis:** Word Level Analysis: Regular Expressions-FiniteState Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free GrammarConstituency- Parsing-Probabilistic Parsing. Textbook 1: Ch. 3,4	8 Hrs.
Module III **Extracting Relations from Text: From Word Sequences to Dependency Paths:** Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. **Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles:** Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. **A Case Study in Natural Language Based Web Search:** InFact System Overview, The GlobalSecurity.org Experience. Textbook 2: Ch. 3,4,5	9 Hrs.
Module IV **Evaluating Self-Explanations in iSTART:** Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems, **Textual Signatures:Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures:** Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. **Automatic Document Separation:A Combination of Probabilistic Classification and Finite-State Sequence Modeling:** Introduction, Related Work, Data Preparation, Document Separation as	8 Hrs.

a Sequence Mapping Problem, Results. **Evolving Explanatory Novel Patterns for Semantically-Based Text Mining:** Related Work, A Semantically Guided Model for Effective Text Mining. Textbook 2: Ch. 6,7,8,9	
Module V **INFORMATION RETRIEVAL AND LEXICAL RESOURCES:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame NetStemmers-POS Tagger- Research Corpora. Textbook 1: Ch. 9,12	9 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

2. Anne Kao and Stephen R. Poteet (Eds), "Natural LanguageProcessing and Text Mining", Springer-Verlag London Limited 2007.

Reference:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: Anintroduction to Natural Language Processing, Computational Linguistics and SpeechRecognition", 2nd Edition, Prentice Hall, 2008.

2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummingspublishing company, 1995.

3. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Analyze the natural language text.
CO2	Define the importance of natural language.
CO3	Understand the concepts Text mining
CO4	Illustrate information retrieval techniques.
CO5	Extract meaningful information from a piece of text

Digital Image Processing		
Course Code:	22IS63C	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42

Prerequisite: The student should have the knowledge of basic understanding of linear algebra and Fourier transforms.

Course Learning Objectives

To enable the students to obtain the knowledge of Digital Image processing in the following topics.

- Learning the basics of digital image processing, including its components, sampling, and quantization
- How to apply image processing algorithms in practical situations
- Developing a Fourier transform for image processing in the frequency domain
- Learning about methodologies for image restoration

Modules	Teaching Hours
Module-I **Introduction** Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.	8 Hrs.
Module II **Image Enhancement In The Spatial Domain:** Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters,	8 Hrs.

Combining Spatial Enhancement Methods.	
Module III **Image Enhancement In Frequency Domain:** Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT , Discrete Cosine Transform (DCT), Image filtering in frequency domain.	9 Hrs.
Module IV **Image Segmentation:** Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.	8 Hrs.
Module V Introduction, coding Redundancy , Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.	9 Hrs.

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:

1. Rafael C G., Woods R E. and Eddins S L, Prentice Hall, 3rd edition, 2008.

Reference:

1. Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.

2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.

3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

Course Outcome

At the end of the course the student will be able to:

CO#	Course Outcome
CO1	Describe the fundamentals of digital image processing.

CO2	Understand image formation and the role human visual system plays in perception of gray and color image data.
CO3	Apply image processing techniques in both the spatial and frequency (Fourier) domains.
CO4	Design and evaluate image analysis techniques
CO5	Conduct independent study and analysis of image Enhancement and restoration techniques.

SOFTWARE TESTING TOOLS & TECHNIQUES		
Course Code:	22ISOE641	Credits:3
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week-3 Hrs		Total hours:42

Prerequisite: The students should have the knowledge of Software Engineering Fundamentals and Object Oriented programming languages

Course Objectives: To enable the students to obtain the knowledge of Software Testing Tool s and Techniques

• To understand the Software Engineering processes and Models for Various test processes and continuous quality improvement.

• To understand the Verification and Validation techniques, Project planning and Cost Estimations techniques.

• To understand the Architectural Design decisions and Object Oriented Design Processes

. • To make use of various test tools and Application of software testing techniques in commercial environments.

Modules	**Teaching Hours**
Module I Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility. Software processes: Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. Requirements: Software Requirements: Functional and Nonfunctional requirements; User requirements; System requirements; Interface specification; The software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management	8 Hrs.
Module II Software design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. Object Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution. Development: Rapid	8 Hrs.

Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.	
Module III Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. Management: managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques.	9 Hrs.
Module IV A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper. Boundary Value Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Guidelines for Boundary value Testing.	8 Hrs.
Module V Path Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Define/Use testing, Slice-based testing, Guidelines and observations. Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. Integration Testing: A closer look at the SATMsystem, Decomposition-based Integration, calls graph-based Integration..	9 Hrs.
Question paper pattern: 1. The question paper will have TEN questions. 2. There will be TWO questions in each module, covering all the topics. 3. The student need to answer FIVE full questions, selecting ONE full question from each module.	
Textbooks: 1.Software Engineering – Ian Somerville, 8th Edition, Pearson Education, 2007.(Listedtopics only from Chapters 1, 4,6, 7, 11, 14, 17, 21, 22) 2.Software Testing, ACraftsman'sApproach-PaulC.Jorgensen:,3rdEdition, AuerbachPublications,2008. (Listed topics only from Chapters1,2, 5,6,7, 9,12,13).	
Reference Books: 1.Software testing Principles and Practices –GopalaswamyRamesh,SrinivasanDesikan,2 nd Edition, Pearson, 2007. 1. SoftwareTesting–RonPatton,2ndedition,PearsonEducation,2004. 2. TheCraftofSoftwareTesting–BrianMarrick,PearsonEducation,1995. 3. AnirbanBasu,SoftwareQualityAssurance,TestingandMetrics,PHI,2015. 4. Naresh Chauhan,	

Software Testing, Oxford University press.	
Course Outcome At the end of the course the student will be able to:	
CO#	**Course Outcome**
CO1	Demonstrate Software Engineering processes models, Requirement collection and analysis process.
CO2	Illustrate Software Design for Architectural Design decisions and Object Oriented Design Processes
CO3	Apply Verification and Validation,, Project Planning and Cost Estimation Techniques.
CO4	Design test cases and analyze different Levels of functional Testing.
CO5	Designtest-casesandanalyzedifferentnon-functionaltestingprocedures

MAJOR PROJECT WORK PHASE - 1		
Subject Code	**22IS65**	Credits:02
CIE:50	SEE:--	SEE:
Prerequisite: The students should have Thorough knowledge of Software Engineering and Mastering any one programming language.		
Course Objectives: • To understand the current requirement of the Industries. • To understand the different software development and testing methodologies. • To understand and apply architectural model, data flow and control flow diagrams. • To acquire good documentation, demonstration skills and impact of application on society		
Project Phase – I comprises of:		Teaching Hours

1. Literature Survey 2. Requirement Analysis - S/w Requirements - H/w Requirements 3. Design Module presentation 4. Application 5. System Requirement Specification document SRS document contains synopsis, problem formulation and requirement analysis based on above factors. Document should be submitted by the end of VII Sem. Project Phase-I would be evaluated for 2 credits by means of presentation.	

Course outcomes:

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

Course Code	CO #	Course Outcome (CO)
	CO1	Demonstrate the skills of performing surveys on current industrial requirements.
	CO2	Analyze the requirements and apply appropriate software development methodology.
	CO3	Implement and Validate the architectural model, data flow and control flow structures.
	CO4	Demonstrate the documentation and presentation skills
	CO5	Implement the Societal and Ethical systems.

COMPUTER NETWORK LAB		
Course Code:	22ISL65	Credits:1
CIE: 50 Marks	SEE: 50 Marks	SEE: 03 Hrs.
Hours/Week:02Hrs (Practical)		Total Hours:28 Hrs.

The following experiments shall be conducted using either NS / OPNET/NCTUNES or any other suitable simulator.

PART – A

1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the links connected asfollows:
3. n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDPbetween n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
4. Simulate the different types of Internet traffic such as FTP and TELNETover a network and analyze the throughput.
5. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
6. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and determine collision across different nodes.
7. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
8. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets .

PART – B

Implement the following in C/C++:

1. Write a program for error detecting code using CRC-CCITT (16-bits).
2. Write a program for frame sorting technique used in buffers.
3. Write a program for distance vector algorithm to find suitable path for transmission.
4. Using TCP/IP sockets, write a client – server program to make the clientsend the file name and to make the server send back the contents of the requested file if present.
5. Implement the above program using as message queues or FIFOs as IPCchannels.

6. Write a program for simple RSA algorithm to encrypt and decrypt thedata.
7. Write a program for Hamming code generation for error diction and correction.
8. Write a program for congestion control using leaky bucket algorithm.

INDIAN KNOWLEDGE SYSTEMS		
Course Code	22ISIKS67	Credits:01
CIE: 50 Marks	SEE: 50 Marks	SEE: 02 Hrs.
Hours/Week-1		Total hours:15
Prerequisite:		
Course 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 analyzee it and apply it to their day-to-day life		
Modules		**Teaching Hours**
Module I Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.		5 Hrs.
Module II Traditional Knowledge in Humanities and Sciences: Lingistics, Number and measurements- Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.		8 Hrs.
Module III 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.		9 Hrs.

Course Outcome At the end of the course the student will be able to:	
CO#	**Course Outcome**
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, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93- 91818-21-0 Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,

2 Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334, Suggested Web Links: 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-developmentgoals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	50% (CIE)	50%(SEE)
QUIZZES		
Quiz-I	Each quiz is evaluated for 05 marks adding up to 10 Marks.	********
Quiz-II		

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, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)		
Video based seminar (4-5 minutes per student)		
Maximum Marks for the Theory	******	50 Marks
Practical	****	****
Total Marks of the Course	50	50

NATIONAL SERVICE SCHEME		
Course Code	**22NS68**	CIE:50
Semester:3	Credits NCMC – Non Credit Mandatory Course (Completion of the course shall be mandatory for the award of degree)	
SEE: Activities Report Evaluation by College NSS Officer at the end of every semester (3rd to 6th semester)		

Course objectives:

National Service Scheme (NSS) will enable the students to:

1. Understand the community in general 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.

5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods 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.

Topics or activities to be covered

1. Plantation and adoption of plants. Know your plants.

2. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs)

3. Govt. school Rejuvenation and helping them to achieve good infrastructure.

Suggested Learning material:

Books : 1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.

2. Government of Karnataka, NSS cell, activities reports and its manual.

3. Government of India, nss cell, Activities reports and its manual.

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
	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.
	CO5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

PHYSICAL EDUCATION AND SPORTS		
Course Code 22PE68	CIE Marks 50	Credits 0
SEE Marks 00	Course Type Practical Lecture	Hours/Week (L-T-P) 0-0-3
Total Marks 50	Total Hours 24	Hours SEE Hours --

Guideline for Athletic and Sports			
Semester	Course Title	Content	No. of Hours
VIth sem	Orientation	1. Postural deformities. 2. Stress management	Total 24 hrs 2 hrs / week

	Specific Games	(Any one to be selected by the student) 1. Throw ball 2. Table Tennis 3. Athletics (Field Events- Jumps) – Any event as per availability of Ground.	
	Aerobics	Aerobics	

YOGA AND MEDITATION		
Course Code	**22YO68**	Credits:0
CIE:50	SEE: 00	SEE:--
Hours/Week: (L:T:P: S):0-0-3(Practical)	Total Marks:50	Total hours:28 hours
Prerequisite:NIL		

Course objectives: The Course will Enable students to

- To enable the student to have good health.
- To practice mental hygiene
- To possess emotional stability.
- To integrate moral values.
- To attain higher level of consciousness.

	Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi Asana by name, technique, precautionary measures and benefits of each asana Different types of Asanas a. Sitting 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogamudra in Vajrasana b. Standing 1. Vatayanasana 2. Garudasana c. Balancing 1. Veerabhadrasana 2. Sheershasana d. Supine line 1. Sarvangasana

	2. Setubandha Sarvangasana 3. Shavasanaa (Relaxation poisture). Revision of Kapalabhati practice 80 strokes/min - 3 rounds Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama 1. Bhastrika 2. Bhramari Meaning, Need, importance of Shatkriya. Different types. Meaning by name, technique, precautionary measures and benefit

Suggested Books

·Swami Kuvulyananda : Asma (Kavalyadhama, Lonavala)
·Tiwari, O P : Asana Why and How
·Ajitkumar : Yoga Pravesha (Kannada)
·Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha
(Bihar School of yoga, Munger)
·Swami Satyananda Saraswati : Surya Namaskar
(Bihar School of yoga, Munger)
·Nagendra H R : The art and science of Pranayama
·Tiruka : Shatkriyegalu (Kannada)
·Iyengar B K S : Yoga Pradipika (Kannada)
·Iyengar B K S : Light on Yoga (English)

Course outcomes:

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

Course Code	CO #	Course Outcome (CO)
	CO1	Understand the meaning, aim and objectives of Yoga.
	CO2	Perform Suryanamaskar and able to teach its benefits.
	CO3	Understand and teach different Asanas by name, its importance, methods and benefits
	CO4	Instruct Kapalabhati and its need and importance
	CO5	Teach different types of Pranayama by its name, precautions, procedure and uses
	CO6	Coach different types of Kriyas , method to follow and usefulness