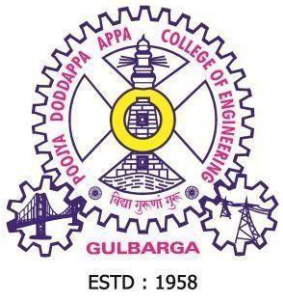
CURRICULUM
FOR THE ACADEMIC YEAR 2023-2024

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. (Computer Science & Design)

V SEMESTER



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

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

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

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

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

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

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This

is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

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

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

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state- of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

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

Mission of the Institution

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

Vision of the Department

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

Mission of the Department

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

Program Educational Objectives (PEO):

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

Program Outcomes:

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs):

PSO1:	Acquire competency in hardware and software working principles to analyze andsolve computing problems.
PSO2:	Design quality software to develop scientific and business applications followingSoftware Engineering practices.
PSO3:	Apply cutting edge technologies using modern tools to find novel solutions ethicallyto existing problems.

SCHEME OF TEACHING FOR V SEMESTER – 21 SERIES for Academic year 2023-2024

Sl. No	Course	Course Code	Course Title	Teaching Hours/Week				Examination				Credits
				Theory Lecture(L)	Tutorial(T)	Practical	Self Study (S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PC	21CG51	Software Engineering and Project Management	3	0	0	0	3	50	50	100	3
2	IPCC	21CG52	Computer Networks	3	0	2	0	3	50	50	100	4
3	PCC	21CG53	Operating System	3	0	0	0	3	50	50	100	3
4	PCC	21CG54	Database Management System Design	3	0	0	0	3	50	50	100	3
5	PCCL	21CGL55	Database Management System Design Lab	0	0	2	0	3	50	50	100	1
6	AEC	21RMI56	Research Methodology & Intellectual Property Rights	2	0	0	0	3	50	50	100	2
7	HSMS	21CIV57	Environmental Studies	0	2	0	0	2	50	50	100	1
8	AEC	21CGAE581	Python Programming	0	0	2	0	3	50	50	100	1
			Total	**14**	**2**	**6**	**0**	**23**	**400**	**400**	**800**	**18**

AUTONOMOUS SYLLABUS FOR B.E V SEMESTER 2023 - 2024

Course Title: SOFTWARE ENGINEERING AND PROJECT MANAGEMENT		
Subject Code : **21CG51**	Credit : 03	CIE: 50
Number of Lecture Hours/Week (L:T:P)	**3:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: NIL		

Course Objectives:

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

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

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

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

Text Books/References Books

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

References Books

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

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

Course Code	CO #	Course Outcome (CO)
21CG51	CO1	Identify the different project contexts and suggest an appropriate management strategy.
	CO2	Practice the role of professional ethics in successful software development.
	CO3	Identify and describe the key phases of project management.
	CO4	Determine an appropriate project management in organizing and planning .
	CO5	Analyze the concepts of Project control and Process instrumentation

Course Title: COMPUTER NETWORKS		
Subject Code : **21CG52**	Credit : 4	CIE: 50
Number of Lecture Hours/Week(L:T:P)	**3:0:2 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisites: Nil

Course Objectives:

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

MODULES	**Teaching Hours**
Module I **Introductory concepts& Physical Layer:** Network Hardware, Network Software, Reference Models, Example Networks, The Theoretical Basis for Data Communication, Guided Transmission Media ,Wireless Transmission.	**08 Hrs**
Module II **Data Link Layer & Medium Access Control Sub-layer:** Data link layer design issues, Error detection & correction, Elementary data link protocols, Sliding window protocols, Example data link protocols**,** Th**e** channel allocation problem, Multiple access protocols.	**08Hrs**
Module III **Medium Access Control Sub-layer:** Ethernet, Wireless LANS, Broadband Wireless, Bluetooth, Data link layer switching.	**08 Hrs**
Module IV **The Network Layer:** Network layer design issues**,** Routing Algorithms, Congestion control algorithms, Internetworking, The network layer in the internet.	**08 Hrs**
Module V **The Transport Layer and Application Layer protocols:** The transport services. Elements of transport protocols, The internet transport protocols: UDP The internet transport protocols: TCP, DNS-The Domain name system, Electronic mail, The world wide web .	**10 Hrs**

List of Programs:

1. Experimental study of various network components and devices.

a. Study different network cables and Prepare , test straight over and cross over cabling using crimping tool.

b. Install and configure wired and wireless NIC . Demonstrate file transfer in wired and wireless LAN.

c. Install and configure network devices hub, switch and routers.

d. Use CISCO packet tracer to
   - Build a Local Area Network of 4 to 6 nodes using hub /repeater.
   - Build a Local Area Network of 4 to 6 nodes using switch.
   - Build a Local Area Network of 4 to 6 nodes using hub and a switch and study the differences between repeater, hub and switch.
   - Build a peer to peer network
   - identify broadcast and collision domain
   - to investigate Spanning Tree Protocol

2. Use CISCO packet tracer to
   a. Design and apply IP addressing scheme for a given topology
   b. Connect two or three LAN's via a router. Trace how routing happens via simulation, and study the working of router.
   c. Design multiple subnets with suitable number of hosts
   d. Demonstrate static routing and dynamic routing for given topology
   e. Configure DHCP server
   f. Create subnets , Configure Host IP, Subnet Mask and Default Gateway in a LAN
   g. Configure RIP/OSPF
3. Use wireshark to
   a. examine Ethernet packets and ARP packets
   b. analyze IP Datagram and IP fragmentation received during the execution of trace route command.
   c. Run ping command and examine ICMP packets using wireshark
   d. Examine UDP and TCP ports and handshake segments
   e. Use packet tracer to configure DHCP server, DNS server, SMTP server
4. Study network monitoring tools

Question paper pattern:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO#**	**Course Outcome(CO)**
21CG52	**CO1**	Understand basic concepts, study OSI, TCP/IP model with functions of each layer and understand wired and wireless transmission fundamentals.
	CO2	Describe error detection, correction methods, data link layer functions and evaluate channel access mechanisms.
	CO3	Study and compare medium access protocols for wired and wireless LAN's
	CO4	Demonstrate routing layer functions, issues and routing protocols in internet.
	CO5	Explore transport layer functions, issues and application layer protocols.

Course Title: OPERATING SYSTEM		
SubjectCode:**21CG53**	Credit:3	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0Hrs**	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisites: Microprocessor		

Course Objectives:

- Learn services provided by the operating system and design of operating system
- Gain knowledge on how processes are synchronized and scheduled how different resources are managed.
- Understand structure and organization of file system and approaches to memory management.

MODULES	**Teaching Hours**
Module– I **Introduction:** Operating Systems, Computer-System Organization, Computer-System Architecture, Operating-System Operations, Process Management, Memory Management, Storage Management, Security and Protection, Kernel Data Structures, Computing Environments. **Operating-System Structures:** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating System Structure. **Case Studies:** Architecture of UNIX, The Kernel of Unix; The Kernel of Solaris; Architecture of Windows.	**08 Hrs**
Module-II **Process Management**: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client–Server Systems. **Multithreaded Programming:** Overview, Multicore Programming, Multi threading Models, Thread Libraries, Implicit Threading, Threading Issues	**08 Hrs**
Module– III **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multi-Processor Scheduling, Real-Time CPU Scheduling **Process Synchronization:** The Critical-Section Problem, Petersons Solution, Synchronization hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization ,Monitors.	**09 Hrs**
Module– IV **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. **Memory Management:** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.	**08 Hrs**
Module– V **Virtual Memory:** Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory mapped files, Allocating Kernel Memory **File System: File-System Interface:** File Concept, Access Methods, Directory and disk Structure, File system Mounting, File Sharing, and Protection.	**09 Hrs**

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

Textbook:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 9th Edition, Wiley-India,2018.
2. D.M Dhamdhere, Operating systems-A concept based Approach,3rd Edition, Tata MC Sraw-Hill,2012.

Reference Books:

1. P.C.P. Bhatt: OperatingSystems,2nd Edition,PHI,2006.
2. Harvey M Deital: Operating systems, 3rd Edition,AddisonWesley, 2003.

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

Course code	CO#	Course Outcome(CO)
21CG53	**CO1**	Describe the functions of operating systems and its structures
	CO2	Illustrate process concepts and management models.
	CO3	Apply Scheduling algorithms and different concurrency control techniques to provide co-ordination among processes for the global data.
	CO4	Apply deadlock detection and prevention algorithms and memory management and illustrate the concept of paging, segmentation and swapping policies.
	CO5	Discuss Virtual memory management and describe file system interface.

Course Title: DATABASE MANAGEMENT SYSTEM DESIGN		
Subject Code :**21CG54**	Credit :3	CIE: 50
Number of Lecture Hours/Week(L:T:P)	**3:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: knowledge of C, C++ Programming Principles, Data Structures		
Course Objectives: • Learn and practice data modeling using entity relationship and developing database design • Understand the use of SQL • Understand the functional dependency and Normalization Techniques. • Understand the online transaction processing and recovery methods.		
MODULES		**Teaching Hours**
Module I **Introduction:** An example, Characteristics of Database approach, Actors on the screen, Workers behind the scene, 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. 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.		**09 Hrs**
Module II Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two, Subclasses, Super Classes and Inheritance, Specialization and Generalization **Relational Model:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. The Relational Algebra and relational calculus		**09 Hrs**
Module III SQL-99: Schema Definition, Constraints, Queries, and Views, SQL Programming Techniques. **Database Design -** 1: Informal Design Guidelines for Relation Schemas, Functional Dependencies, And Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Code Normal Form.		**08 Hrs**
Module IV Database Design – 2: Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms **Transaction Processing Concepts:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL. Concurrency Control Techniques: Two- Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques, Validation Concurrency Control Techniques,		**08 Hrs**

Module V	
Transaction Processing contd.. Granularity of Data items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes. **Database Recovery Techniques :** Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm Recovery in Multi database Systems, Database Backup and Recovery from Catastrophic Failures. Database Security and Authorization: Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges.	**08 Hrs**

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

Text books:

1. Fundamentals of DatabaseSystems-ElmasriandNavathe,7th Edition, Addison-Wesley,2016.
2. SQL – The Complete Reference- James R Groff, Paul N. Weinberg and Andrew J. Oppel, 3rd Edition, Mc-Graw Hill, 2009.(Module-II)

Reference Books:

1. Data Base System Concepts- Silberschatz, Korth and Sudharshan, 5th Edition, Mc-Graw Hill,2006.
2. Database Management Systems -Raghu Ramakrishnan and Johannes Gehrke – 3rd Edition. MCSraw- Hill,2003.
3. An Introduction to Database Systems - C.J. Date, A. Kannan, S. Swamynatham, 8th Edition,Pearson Education,2006.

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

Course Code	CO #	Course Outcome (CO)
21CG54	CO1	Understand the fundamentals and applications of data base management system.
	CO2	Implement and Interact database with SQL statements.
	CO3	Design data base by applying ER diagram, relational model, functional dependency and Normalization Techniques
	CO4	Illustrate and understand the basic issues of transaction processing and concurrency control.
	CO5	Demonstrate different recovery techniques and security issues

Course Title: DATABASE MANAGEMENT SYSTEM DESIGN LAB		
Subject Code :**21CGL55**	Credits: 1	CIE: 50
Number of Practical Hours/Week/batch (L:T:P)	**0:0:2 Hrs**	SEE: 50
		SEE Hours: 03

Prerequisite: Knowledge of C, C++ Programming Principles, Data Structures

Course Objectives:

The student should be made to:

- Learn to create and use a database
- Be familiarized with a query language
- Have hands on experience on DDL Commands
- Have a good understanding of DML Commands and DCL commands
- Familiarize advanced SQL queries.
- Be Exposed to different applications.

List of programs:

1. Implementation of DDL commands of SQL with suitable examples.
    - Create table
    - Alterable
    - Drop Table
2. Implementation of DML commands of SQL with suitable examples
    - Insert
    - Update
    - Delete
3. Implementation of different types of function with suitable examples
    - Number function
    - Aggregate Function
    - Character Function
    - Conversion Function
    - Date Function
4. Implementation of different types of operators in SQL
    - Arithmetic Operators
    - Logical Operators
    - Comparison Operator
    - Special Operator
    - Set Operation
5. Implementation of different types of Joins
    - Inner Join
    - Outer Join
    - Natural Join etc.

6. Study and Implementation of
    - Group By &having clause
    - Order by clause
    - Indexing
7. Study & Implementation of
    - Sub queries
    - Views
8. Study & Implementation of different types of constraints.
9. Study & Implementation of Database Backup & Recovery commands, Rollback, Commit, Savepoint.
10. Creating Database/Table Space, Managing Users: Create User, Delete User, Managing roles:- Grant, Revoke
11. Study & Implementation of PL/SQL.
12. Study & Implementation of SQL Triggers.

Mini project (Application Development using: Front end: VB/VC ++/JAVA or Equivalent Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent).

1. Inventory Control System.
2. Core Banking system
3. Hospital Management System.
4. Railway Reservation System.
5. Personal Information System.
6. Web Based User Identification System.
7. Timetable Management System.
8. Hotel Management System.
9. Library management
10. Electricity bill.
11. Hostel management.
12. Air reservation
13. Company management system.
14. Student information system.
15. University database system.

Guidelines for implementation of mini project

1. Draw ER Diagram.
2. Convert ER diagram to table/schema.
3. Apply normalization.
4. Design and implementation.
5. Generate report.

Note: Mini Projects will be considered for CIE and SEE

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
21CGL55	**CO1**	Design and implement a database schema for a given problem domain, Populate and query a database.
	CO2	Design database using PL/SQL, Triggers, Exception Handling
	CO3	Create and maintain tables using SQL.
	CO4	Design database with constraints
	CO5	Design and implement database for real world problem

Course Title: RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
SubjectCode:**21RMI56**	Credits:2	CIE:50
Number of Lecture Hours/Week(L:T:P)	**2:0:0 Hrs**	SEE:50
Total Number of Lecture Hours	28	SEE Hours:03

Pre-requisites:

Course 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.	**06 Hrs**
Module-II **Defining the research problem -** Selecting the problem. Necessity of defining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	**06 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.	**06 Hrs**
Module– IV **Basic Concepts** of Intellectual Property (IP), Classification of IP, Need for Protection of IP, International regime of IPRs - WIPO , TRIPS. Patents: Meaning of a Patent – Characteristics/ Features. Patentable and Non-Patentable Invention. Procedure for obtaining Patent. Surrender of Patent,	**05 Hrs**

revocation & restoration of Patents, Infringement of Patents and related remedies (penalties) . Different prescribed forms used in Patent Act. Patent agents-qualifications and disqualifications Case studies on patents - Case study of Neem 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..	**05 Hrs**

Question paper pattern:

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

TEXTBOOKS:

1. Research Methodology: Methods and Techniques C.R .Kothari, Gaurav Garg New Age International 4thEdition,2018
2. Dipankar Deb• Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN1868- 4394ISSN 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

REFERENCEBOOKS:

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press,978-1-107-03488- 4-
2. Nishith Desai Associates - Intellectual property law in India – Legal, Regulatory & Tax NPTEL:
3. INTELLECTUAL PROPERTY by PROF.FEROZ ALI , Department of Humanities and Social Sciences IIT Madras
4. https://nptel.ac.in/content/syllabus_pdf/109106137.pdf
5. www.wipo.int
6. www.ipindia.nic.in

Course outcomes:

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

Course Code	CO#	Course Outcome (CO)
21RMI56	**CO1**	To know the learning 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.

Course Title: ENVIRONMENTAL STUDIES		
SubjectCode:**21CIV57**	Credits:1	CIE:50
Number of Lecture Hours/Week	**0:2:0 Hrs**	SEE:50
Total Number of Lecture Hours	28	SEE Hours:02

Prerequisite:

Course 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.	**05 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 studying, and Carbon Trading	**05 Hrs**
Module-III **Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Groundwater 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.	**06 Hrs**
Module-IV **Global Environmental Concerns** (Concept, policies and case-studies):Groundwater depletion/ recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem In drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	**06 Hrs**
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 in the form of report.	**06 Hrs**

Question paper pattern:

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

Textbook:

1. Environmental studies, Benny Joseph, Tata Mcgraw -Hill 2nd edition 2012·
2. Environmental studies, SM Prakash , pristine publishing house, Mangalore 3rd edition-2018.

Reference Books:

1. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009·
2. M. Ayi Reddy Text book of environmental science and Technology, B S publications 2007·
3. Dr.B.S Chauhan, Environmental studies, university of science press 1st edition

Course outcomes:`

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

Course Code	CO#	Course Outcome(CO)
21CIV57	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 components.
	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.

Course Title: PYTHON PROGRAMMING		
SubjectCode:**21CGAE581**	Credit:1	CIE:50
Number of Practical Hours/Week(L:T:P)	**0:0:2 Hrs**	SEE:50
		SEE Hours: 03

Pre-requisites: Knowledge of C and (or) C++ programming language, Concepts of Object oriented programming.

Course objectives:

- Write, test, and debug simple Python programs to solve scientific problems.
- Use Python lists, tuples, sets and dictionaries for representing compound data.
- Develop structured Python programs by defining functions and calling them.
- Develop object oriented programming concepts in Python.
- Basic data analysis and visualization by Numpy and matplotlib libraries.

List of Programs

1. The structure of Python Programming through example programs.
2. Demonstrate the working of all kinds of operators.
3. Demonstrate the decision making and Iterative statements in Python
   i) "if" and its variants ii) while and for loops.
4. Demonstrate the use of various string functions like count (), replace (), split (), join (), upper (), lower (), capitalize () etc.
5. Demonstrate the file operations in python.
6. Demonstrate creation and different operations on List data structure in python.
7. Demonstrate creation and different operations on Tuple data structure in python.
8. Demonstrate creation and different operations on Set data structure in python.
9. Demonstrate creation and different operations on Dictionary data structure in python.
10. Demonstrate creation and use of Functions in python with all kinds of "parameters" used with functions.
11. Demonstrate different sorting operations in python and complex time difference.
12. Demonstrate creating objects and inheritance.
13. Demonstrate NumPY library – Array Operations, Mathematical Functions, Sort, Search and Counting Functions.
14. Demonstrate Matplotlib Library – Introduction, PyplotAPI, Types Of Plots, Histogram Using Matplotlib , I/O With Numpy.

Textbooks:

1. Learning Python, Mark Lutz, Orielly, 3rd Edition 2007.
2. Think Python, 2nd Edition, 2017 Allen Downey, Green Tea Press

Reference Links:

https://www.w3schools.com/python/

https://www.geeksforgeeks.org/python-programming-language/

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

Course Code	CO #	Course Outcome (CO)
21CGAE581	CO1	Understand python structure and use of operators, string functions, conditional and looping statements.
	CO2	Use of Python lists, tuples, sets and dictionaries for representing compound data.
	CO3	Develop modular python programs by defining functions.
	CO4	Implement programs with object oriented concepts.
	CO5	Develop program to utilize Numpy libraries for data analysis and visualize data with matplotlib library.