



(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR).

**B.E. COMPUTER SCIENCE AND ENGINEERING  
REGULATION – 2021  
AUTONOMOUS SYLLABUS  
CHOICE BASED CREDIT SYSTEM  
VII TO VIII SEMESTER CURRICULUM**

**VISION:**

To make the Department of Computer Science and Engineering the unique of its kind in the field of Research and Development activities in this part of world.

**MISSION:**

To impart highly innovative and technical knowledge to the urban and unreachable rural student folks in Computer Science and Engineering through "Total Quality Education".

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

- PEO 1:** Apply the necessary mathematical tools and fundamental knowledge of computer science & engineering to solve variety of engineering problems.
- PEO 2:** Develop software based solutions for real life problems and be leaders in their profession with social and ethical responsibilities.
- PEO 3:** Pursue life-long learning and research in selected fields of computer science & engineering and contribute to the growth of those fields and society at large.

**PROGRAM OUTCOMES:**

After going through the four years of study, the Computer Science and Engineering graduates will have the ability to

<b>POs</b>	<b>Graduate Attribute</b>	<b>Programme Outcome</b>
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	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.
3	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.
4	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
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	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

7	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.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	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.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

**PSO1 :** Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

**PSO2 :** Problem - Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

**SEMESTER VII**

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	CS2401	Cryptography and Network Security	PC	3	3	0	0	3
2	GE2401	Universal Human Values and Ethics	HS	2	2	0	0	2
3		Management Elective	HS	3	3	0	0	3
4		Open Elective – II*	OE	3	3	0	0	3
5		Open Elective – III*	OE	3	3	0	0	3
6		Open Elective – IV*	OE	3	3	0	0	3
<b>PRACTICALS</b>								
7	CS2402	Security Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>21</b>	<b>17</b>	<b>0</b>	<b>4</b>	<b>19</b>

\* Open Elective Shall be chosen from the list of open electives offered by other Programmes

**SEMESTER VIII**

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>PRACTICALS</b>								
1	CS2451	Project Work	EM	20	0	0	20	10

### MANAGEMENT ELECTIVES

SL. NO.	COURSE CODE	COURSE NAME	CATE GORY	CONTACT PERIODS	L	T	P	C
1	GE2491	Principles of Management	HS	3	3	0	0	3
2	GE2492	Total Quality Management	HS	3	3	0	0	3

### OPEN ELECTIVE – III (Offered to ECE, EEE, BT, CIVIL, MECH, MTR)

SL. NO.	COURSE CODE	COURSE NAME	CATE GORY	CONTACT PERIODS	L	T	P	C
1	OCS701	Introduction to Networking	OE	3	3	0	0	3
2	OCS702	Object Oriented Analysis and Design	OE	3	3	0	0	3

### OPEN ELECTIVE – IV (Offered to ECE, EEE, BT, CIVIL, MECH, MTR)

SL. NO.	COURSE CODE	COURSE NAME	CATE GORY	CONTACT PERIODS	L	T	P	C
1	OCS703	Machine Learning Fundamentals	OE	3	3	0	0	3
2	OCS704	Software Testing	OE	3	3	0	0	3

Course Code	Course Name	L	T	P	C
CS2401	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

**Category: Professional Core Course**

**a. Preamble**

This course enables the students to understand the cryptography algorithms and to know the importance of security mechanisms to secure computer networks. This course focuses on security practices to build system security.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain the classical symmetric cryptosystem to provide data security	K2
CO2	Apply the mathematical concepts for symmetric block ciphers and stream ciphers	K3
CO3	Choose an appropriate asymmetric cryptosystem and key management to ensure a secure data transmission	K3
CO4	Apply hash functions and digital signatures to provide authentication and integrity to a cryptosystem	K3
CO5	Infer real time practices that provide Email security, network security and system security	K2

**c. Course Syllabus**

**Total: 45 Periods**

**CLASSICAL CRYPTOSYSTEM**

**9**

OSI security architecture: Security services, Security mechanism, Security attacks - Network Security model - Introduction to cryptosystem: Symmetric cryptosystem, Asymmetric cryptosystem - Perfect Secrecy - Classical symmetric techniques: Substitution Techniques, Transposition Techniques, Steganography, Foundations of modern cryptography: Perfect Security - Information theory - Product cryptosystem - Cryptanalysis.

**SYMMETRIC CRYPTOSYSTEM**

**9**

Mathematics of Symmetric key cryptography: Algebraic structures - Modular arithmetic - Congruence and matrices - Groups, Rings, Fields, Finite fields - Euclid's algorithm - Block Ciphers: Block cipher design principles - Mode of operations - Standard Data Encryption Standard (SDDES) - Data Encryption Standard (DES) - Advanced Encryption Standard (AES) – RC4.

## **ASYMMETRIC CRYPTOSYSTEM**

**9**

Mathematics of Asymmetric key cryptography: Primes - Primality Testing - Factorization, Euler's totient function - Fermat's and Euler's Theorem - Chinese Remainder Theorem, Exponentiation and logarithm - Asymmetric key ciphers: RSA - Key distribution - Diffie Hellman - ElGammal cryptosystem - Elliptic curve arithmetic - Elliptic curve cryptography.

## **MESSAGE AUTHENTICATION AND INTEGRITY**

**9**

Authentication requirements - Authentication function - Message Authentication Code (MAC) - Hash function - Secure Hash Algorithm (SHA) - HMAC and CMAC - Digital signature and authentication protocols - DSS - Entity authentication: Biometrics, Passwords, Challenge Response protocols - Kerberos - X.509.

## **SYSTEM SECURITY AND SECURITY PRACTICES**

**9**

Intrusion Detection System (IDS) - Malicious software - Firewalls - E-mail security: PGP, S/MIME - IP security - Web security: SSL, TLS, SET, Zero Trust Security Practices

### **d. Activities**

Students shall be exposed to fundamentals of cryptography and real time security approaches through case studies.

### **e. Learning Resources**

#### **Text Book**

1. William Stallings, *Cryptography and network Security*, 7<sup>th</sup> edition, Pearson Education, 2017.

#### **Reference Books**

1. Behrouz A Foruzan, *Cryptography and Network Security*, Tata McGraw Hill, 2007.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, *Network Security: PRIVATE Communication in a PUBLIC World*, 3<sup>rd</sup> Edition Prentice Hall, 2022.
3. Wade Trappe and Lawrence C Washington, *Introduction to Cryptography with coding theory*, 3<sup>rd</sup> Edition, Pearson Education, 2020.

Course Code	Course Name	L	T	P	C
GE2401	UNIVERSAL HUMAN VALUES AND ETHICS	2	0	0	2

**Category: Science and Humanities**

**Preamble**

This course is intended to provide much-needed orientational input in value education to the young, enquiring minds.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Define the essential complementarily between 'VALUES' and 'SKILLS' for ensuring happiness and prosperity.	K2
CO2	Explore Human being as the Co-existence of the Self and the Body.	K3
CO3	Develop holistic perspective towards value-based living in a natural way.	K3
CO4	Explain the interconnectedness of the four orders of Nature and existence.	K2
CO5	Comprehend the ethics of human values, Humanistic education and constitution, strategies of value-based life and profession.	K2

**c. Course Syllabus**

**Total : 30 Periods**

**INTRODUCTION TO VALUE EDUCATION 6**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity - Current Scenario, Method to Fulfil the Basic Human Aspirations.

**HARMONY IN THE HUMAN BEING 6**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

**HARMONY IN THE FAMILY AND SOCIETY 6**



Harmony in the Family - the Basic Unit of Human Interaction, 'Trust' - the Foundational Value in Relationship, 'Respect' - as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

**HARMONY IN THE NATURE/EXISTENCE** **6**

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

**IMPLICATIONS OF THE HOLISTIC UNDERSTANDING - A LOOK AT PROFESSIONAL ETHICS** **6**

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

**d. Activities**

**Practice Sessions - Introduction to Value Education**

- 1 Sharing about Oneself
- 2 Exploring Human Consciousness
- 3 Exploring Natural Acceptance

**Practice Sessions– Harmony in the Human Being**

- 4 Exploring the difference of Needs of Self and Body
- 5 Exploring Sources of Imagination in the Self
- 6 Exploring Harmony of Self with the Body

**Practice Sessions– Harmony in the Family and Society**

- 7 Exploring the Feeling of Trust
- 8 Exploring the Feeling of Respect
- 9 Exploring Systems to fulfil Human Goal

**Practice Sessions– Harmony in the Nature (Existence)**

- 10 Exploring the Four Orders of Nature
- 11 Exploring Co-existence in Existence

**Practice Sessions– Implications of the Holistic Understanding – a Look at Professional Ethics**

- 12 Exploring Ethical Human Conduct
- 13 Exploring Humanistic Models in Education
- 14 Exploring Steps of Transition towards Universal Human Order

### e. Learning Resources

[https://fdp-si.aicte-india.org/UHV-II\\_Lectures\\_PPTs.php](https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php)

<https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php>

#### **Text Books**

1. R R Gaur, R Asthana, G P Bagaria., *The Textbook A Foundation Course in Human Values and Professional Ethics*, 2<sup>nd</sup> Revised Edition, Excel Books, New Delhi, 2019.
2. R R Gaur, R Asthana, G P Bagaria., *The Teacher's Manual A Foundation Course in Human Values and Professional Ethics*, 2<sup>nd</sup> Revised Edition, Excel Books, New Delhi, 2019.

#### **Reference Books**

1. EkParichaya, A Nagaraj., *JeevanVidya*, JeevanVidyaPrakashan, Amarkantak, 1999.
2. A.N. Tripathi ., *Human Values*, New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi ., *The Story of My Experiments with Truth*. 2009.
4. J C Kumarappa., *Economy of Permanence*. 2017.
5. Maulana Abdul Kalam Azad., *India Wins Freedom*. 1988.

Course Code	Course Name	L	T	P	C
CS2402	SECURITY LABORATORY	0	0	4	2

**Category: Professional Core Course**

**a. Preamble**

The course is designed to impart practical knowledge on Cryptographic algorithms. This course enables the students to implement symmetric and asymmetric cryptosystems. Students are able to demonstrate the open source security tools.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Identify appropriate classical symmetric cryptosystem to provide data security	K3
CO2	Construct modern symmetric and asymmetric cryptosystem to enhance data security	K3
CO3	Select the key exchange algorithm to exchange symmetric keys in secured manner	K3
CO4	Apply hash algorithm and digital signature to provide integrity and authentication	K3
CO5	Experiment with the open source tools to assess the security of the network system	K3

**c. List of Experiments**

1. Alice wants to send a message to Bob which has to be encrypted by a key and Bob needs to decrypt the message using the same key. Apply the following Classical Substitution techniques to provide Confidentiality.
  - a. Caesar Cipher and Shift Cipher
  - b. Playfair Cipher
  - c. Vigenere Cipher
  - d. Hill Cipher
2. Alice wants to send a message to Bob which has to be encrypted by a key and Bob needs to decrypt the message using the same key. Apply the following Classical Transposition techniques to provide Confidentiality.
  - a. Row - Columnar Transformation

- b. Rail fence
3. Apply Symmetric block key cryptosystem for practical applications.
  - a. DES algorithm
  - b. AES algorithm
4. Implementation of RSA Public Key Cryptosystem to provide Confidentiality and Authentication
5. In an insecure world, communication can be carried out successfully through shared secret key. To establish a shared secret key, implement a suitable mechanism and exchange the secret keys between Bob and Alice.
6. Implement a suitable Hash algorithm which takes the input of any length and produces the output of fixed length hash value. Let the output be 160 bits.
7. Alice, Project Manager signs a document for a new project and Bob, CEO needs to verify the document signed by Alice so that he can approve the project. Suggest a suitable algorithm to verify the signature.
8. Demonstration of Open Source Tools in Securing a System
  - a. Demonstration of providing secure data storage, securing data transmission and for creating digital signatures (GnuPG)
  - b. Demonstrate intrusion detection system (ids) using any tool Eg. Snort or any other software.
  - c. Setup a honey pot and monitor the honeypot on network (KF Sensor)
  - d. Automated Attack and Penetration Tools
  - e. Defeating Malware i) Building Trojans ii) Rootkit Hunter

#### d. Learning Resources

##### Reference Book

1. Michael Gregg, *Build Your Own Security Lab*, Wiley India.

#### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1.	Hardware Requirements Personal Computers (Intel Core i3, 500 GB, 4 GB RAM)	30
2.	Printer	1
3.	Software: C / C++ / Java or equivalent compiler Tools: GnuPG, Snort, KF sensor, N-Stalker, GMER	30

Course Code	Course Name	L	T	P	C
GE2491	PRINCIPLES OF MANAGEMENT	3	0	0	3

**Category: Management Elective**

**a. Preamble**

This course introduces fundamental principles of management, emphasizing their universal applicability in diverse organizations. It covers core managerial functions, explores organizational structures, and provides insights into effective global leadership qualities and skills.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Discuss the trends and challenges of management in global scenario, the different types of organization and its effectiveness.	K2
CO2	Describe the strategies and policies which are involved in process planning and decision making.	K2
CO3	Illustrate the structure, purpose, selection and recruitment process in organizations.	K2
CO4	Elucidate the various motivational theories and processes of management including its functions.	K2
CO5	Explain the process and control techniques for budgeting and inventory management.	K2

**c. Course Syllabus**

**Total : 45 Periods**

**INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**

**9**

Definition of Management - Nature, Scope and Functions of Management - Evolution of Management - Contributions of FW Taylor (14 principles of Management), Henri Fayol, Elton Mayo, Roethlisberger, H.A.Simon and P.F Drucker- Management theories - Science or Art - Manager Vs Entrepreneur- types of managers managerial roles and skills - Evolution of Management - Scientific, human relations , system and contingency approaches - Current trends and issues in Management.

**PLANNING**

**9**

Nature and purpose of planning - Planning process – Types of planning - Objectives - Setting objectives - Policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

## **ORGANISING**

**9**

Nature and purpose – Formal and informal organization - Organization chart - Organization structure - Types - Line and staff authority - Departmentalization - delegation of authority - Centralization and decentralization - Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

## **DIRECTING**

**9**

Directing meaning - importance - principles of directing - Motivation - Motivation theories - Motivational techniques - Job satisfaction - Job enrichment - Leadership - 14 types and theories of leadership - Communication - Process of communication, types of communication and its uses - Barrier in communication - Effective Communication - Communication and IT.

## **CONTROLLING**

**9**

System and process of controlling - Budgetary and non - Budgetary control techniques - Use of computers and IT in Management control - Productivity problems and management - Inventory Management - PERT, CPM – Application - Control and performance - Direct and preventive control.

### **d. Activities**

Students shall be given exposure to various concepts of delegation of authority, centralization, and decentralization within the college premises.

### **e. Learning Resources**

#### **Text Books**

1. Harold Koontz and Heinz Weihrich, *Essentials of Management*, Tata McGraw Hill, 2020.
2. Stephen P. Robbins and Mary Coulter, *Management*, Pearson, 2019.

#### **Reference Books**

1. Robert Kreitner and Mamata Mohapatra, *Management*, Biztantra, 2008.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, *Fundamentals of Management*, Pearson Education, 9<sup>th</sup> Edition, 2016.
3. Tripathy PC and Reddy PN, *Principles of Management*, Tata McGraw Hill, 2021.

Course Code	Course Name	L	T	P	C
GE2492	TOTAL QUALITY MANAGEMENT	3	0	0	3

**Category: Management Elective**

**a. Preamble**

Quality is the mantra for success or even for the survival of any organization in this competitive global market. Total Quality Management (TQM) is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world class competition. It integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach. At the end of the course the students are expected to recognize the quality issues in an organization and analyze the ways to solve those using TQM techniques, and demonstrate skills in using modern TQM tools.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the concepts of TQM for an enterprise.	K2
CO2	Comprehend the TQM principles and its implementation.	K2
CO3	Discuss the various traditional and new TQM tools.	K2
CO4	Examine the fundamental concepts of QFD and TPM with applications.	K3
CO5	Apply QMS and EMS in business organization.	K3

**c. Course Syllabus**

**Total : 45 Periods**

**INTRODUCTION**

**9**

Concept of Quality and Quality Management - Determinants of quality of a product & Service - Reliability - Definition of TQM - Basic concepts of TQM - TQM Framework - Barriers to TQM - Benefits of TQM - Gurus of TQM (Brief Introduction) - Quality statements - vision, mission, and policy.

**TQM PRINCIPLES**

**9**

Continuous Improvement Process - Deming Philosophy - Juran Trilogy - PDSA cycle - Kaizen - Concepts of Quality circle - Japanese 5S principles and 8D methodology.

## **TQM TOOLS & TECHNIQUES I**

**9**

The seven traditional tools of quality - New management tools - Six-sigma Process Capability - Bench marking: Reasons for benchmarking , Benchmarking process, Understanding Current Performance, Planning, Pitfalls and Criticisms of Benchmarking - FMEA: Intent, Documentation, Stages: Design FMEA and Process FMEA.

## **TQM TOOLS & TECHNIQUES II**

**9**

Quality circles - Quality Function Deployment: QFD Team - Benefits of QFD - Voice of the customers - Organization of Information - House of Quality - QFD Process - Taguchi quality loss function - TPM: Concepts, improvement needs - Performance measures - Cost of Quality - Applications.

## **QUALITY AND ENVIRONMENTAL MANAGEMENT SYSTEM**

**9**

Introduction - Benefits of ISO Registration - ISO 9000 Series of Standards - Sector Specific Standards: AS 9100, TS16949 and TL 9000 - ISO 9001 Requirements - Implementation - Documentation - Internal Audits - Registration - ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction - ISO 14000 Series Standards - Concepts of ISO 14001 - Requirements of ISO 14001 - Benefits and applications of EMS.

### **d. Activities**

Students shall be exposed to learn the knowledge and skills necessary to drive organizational excellence through the implementation of effective quality management strategies.

### **e. Learning Resources**

#### **Text Books**

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield, Mary B.Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe., *Total Quality Management*, Revised 3<sup>rd</sup> Edition, Pearson Education Asia, 2013.
2. Suganthi L & Anand Samuel., *Total Quality Management*, Prentice Hall Publications, 2004.

#### **Reference Books**

1. Kiran. D.R., *Total Quality Management: Key concepts and case studies*, Butterworth – Heinemann Limited, 2016.
2. Shridhara Bhat K., *Total Quality Management: Text and Cases*, Himalaya Publishing House India, 2<sup>nd</sup> Edition, 2016.



Course Code	Course Name	L	T	P	C
CS2451	PROJECT WORK	0	0	20	10

**Category: Employability Enhancement Course**

**a. Preamble**

This course develops the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. It is used to train the students in preparing project reports and to face reviews and viva voce examination.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Identify challenging engineering problems/societal needs to propose project-based solutions	K3
CO2	Build critical-thinking and analytical decision-making capabilities to find solution by formulating proper methodology	K3
CO3	Analyze various algorithmic strategies using technological tools to provide software solutions	K4
CO4	Discover solutions to identified problems	K5
CO5	Build an independent project, resulting in at least a publication in reputed journals or conference proceedings	K6

**TOTAL: 300 PERIODS**

The students will be working in single or group of 3 to 4 on a scientific problem approved by the Head of the Department under the guidance of the faculty member and prepare a comprehensive report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on project evaluation process as recommended in the respective regulation.

The student can also be permitted to work on the project in Industry/Research organization with the due permission from Head of the Department. The Engineer/Scientist from Industry/ Research Organization can jointly act as supervisor in addition to the Project Supervisor. The student should undergo project evaluation process as recommended in the respective regulation.

Course Code	Course Name	L	T	P	C
OCS701	INTRODUCTION TO NETWORKING	3	0	0	3

**Category: Open Elective**

**a. Preamble**

This course enables the students to infer the importance of computer networks and distinguish the functionalities of TCP & UDP protocols in the transport layer and summarize the functionalities and real time usage of various application layer protocols.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Infer the importance of computer networks with OSI and TCP/IP architectures.	K2
CO2	Apply error checking and error correction mechanisms in data Link layer for error free data transmission	K3
CO3	Make use of various routing protocols and their strategies in the network	K3
CO4	Compare the functionalities of TCP & UDP protocols in the transport layer during data transmission.	K2
CO5	Summarize the functionalities of various application layer protocols and their real time usage.	K2

**c. Course Syllabus**

**Total : 45 Periods**

**INTRODUCTION**

**9**

Network applications, Networking: Topology - Types, Reference models: OSI, TCP/IP - THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission.

**DATALINK LAYER**

**9**

Layers: MAC - HDLC - Frame - Types of Frames - Framing - Services: Error Detection and Correction - Ethernet, IEEE 802.11, Bluetooth.

**NETWORK LAYER**

**9**

IP address: IPv4 and IPv6 - Subnetting - Packet switching - Services: Routing - Intra domain: Distance Vector - RIP, DHCP, ICMP

## **TRANSPORT LAYER**

**9**

Services: Flow Control, Congestion Control – QoS - Port Addressing, Protocols: TCP and UDP.

## **APPLICATION LAYER**

**9**

Protocols: HTTP, DNS, SMTP, POP, S-FTP, TELNET

### **d. Activities**

Students shall be practiced to draw the UML diagrams for real word problems.

### **e. Learning Resources**

#### **Text Books**

1. Larry L Peterson & Bruce S Davie, *Computer Networks: A Systems Approach*, 5th Edition, Morgan Kaufmann Publishers Inc, 2011.
2. Behrouz A Forouzan, *Data Communications and Networking*, 5th Edition, TMH, 2013.

#### **Reference Books**

1. William Stallings, *Data and Computer Communications*, 10<sup>th</sup> Edition, Pearson Education, 2014.
2. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, *Computer Networks: An Open Source Approach*, McGraw Hill, 2012.

Course Code	Course Name	L	T	P	C
OCS702	OBJECT ORIENTED ANALYSIS AND DESIGN	3	0	0	3

**Category: Open Elective**

**a. Preamble**

This course enables the students to familiarize the basic concepts, tools and techniques that required for analyzing and designing a solution to a real word application using object oriented concepts. This course also explains about different design patterns for object orientation software.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Demonstrate the unified process approach and use case modeling.	K2
CO2	Illustrate the various static UML diagrams of a software system.	K2
CO3	Construct dynamic UML diagrams for real world problems.	K3
CO4	Build implementation UML diagrams for real time applications.	K3
CO5	Explain the different Design Patterns of Object Oriented software.	K2

**c. Course Syllabus**

**Total : 45 Periods**

**UNIFIED PROCESS AND USE CASE MODELING**

**9**

Introduction to OOAD with OO Basics - Unified Process - UML diagrams - the Next Gen POS system, Inception - Use case Modeling - Relating Use cases - include, extend and generalization - When to use Use-cases.

**STATIC UML DIAGRAMS**

**9**

Class Diagram - Elaboration - Domain Model - Finding conceptual classes and description classes - Associations - Attributes - Domain model refinement - Finding conceptual class Hierarchies - Aggregation and Composition - When to use Class Diagrams.

**DYNAMIC UML DIAGRAMS**

**9**

Dynamic Diagrams - UML interaction diagrams - System sequence diagram - Collaboration diagram - State machine diagram and Modelling - Activity diagram - When to use activity diagrams.

## **IMPLEMENTATION UML DIAGRAMS**

**9**

Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams - When to use Component and Deployment diagrams.

## **DESIGN PATTERNS**

**9**

GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling - High Cohesion - Controller Design Patterns - creational - factory method - structural - Bridge - Adapter - Behavioural - Strategy - observer - Applying GoF design patterns - Mapping design to code.

### **d. Activities**

Students shall be practiced to draw the UML diagrams for real word problems.

### **e. Learning Resources**

#### **Text Books**

1. Craig Larman, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*, 3<sup>rd</sup> Edition, Pearson Education, 2012.

#### **Reference Books**

1. A.A.Puntambekar, *Object Oriented Analysis and Design*, First Reprint, Technical Publications, 2022.
2. Ali Bahrami, *Object Oriented Systems Development*, Paperback, McGraw Hill Edition, 2017.

Course Code	Course Name	L	T	P	C
OCS703	MACHINE LEARNING FUNDAMENTALS	3	0	0	3

**Category: Open Elective**

**a. Preamble**

This course enables the students to understand the basic concepts of Machine Learning. The students get familiarized with various supervised and unsupervised Machine Learning algorithms. This course is also focuses on ensemble learning method to boost the model performance.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain the basic concepts of machine learning	K2
CO2	Construct supervised learning models for an application	K3
CO3	Develop neural networks models for the real time applications	K3
CO4	Apply ensemble learning algorithms to boosting the performance of the models	K3
CO5	Build the model for the applications using unsupervised clustering algorithms	K3

**c. Course Syllabus**

**Total : 45 Periods**

**INTRODUCTION TO MACHINE LEARNING**

**9**

Introduction and motivation for machine learning-Types of Machine Learning- Machine learning Process- Performance Measures-Bias variance trade-off.

**SUPERVISED LEARNING**

**9**

Linear Regression- Logistic Regression-Decision Tree- Naive Bayes - KNN – Classification.

**NEURAL NETWORKS**

**9**

Perceptron - Perceptron Learning- activation functions - Feed Forward Network - Backpropagation.

**ENSEMBLE LEARNING**

**9**

Ensemble Methods – Bagging- Stacking- Random Forests- Ada Boosting.

Introduction to Clustering- Partition Clustering- Hierarchical Clustering- Expectation maximization.

**d. Activities**

Students shall be exposed to core concept of Machine Learning and its associated algorithms using case study.

**e. Learning Resources****Text Books**

1. Dr S. Sridhar & Dr M. Vijayalakshmi, *Machine Learning*, 1<sup>st</sup> Edition, Oxford University Press, 2021.

**Reference Books**

1. Christopher Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.
2. Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.
3. Tom Mitchell, *Machine Learning*, McGraw-Hill, 2017.



Course Code	Course Name	L	T	P	C
OCS704	SOFTWARE TESTING	3	0	0	3

**Category: Open Elective**

**a. Preamble**

This course enables the students to understand the basic concepts about software testing processes. The students get familiarized with the test management and test automation techniques. This course focuses on various testing concepts and testing strategies.

**b. Course Outcome**

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain the concepts of software testing and defect classes	K2
CO2	Outline the approaches of test case design suitable for testing the software	K2
CO3	Demonstrate the levels of testing for testing the Object Oriented system	K2
CO4	Illustrate test management strategies and organization structure of test team	K2
CO5	Apply selenium tool to test the Software	K3

**c. Course Syllabus**

**Total : 45 Periods**

**INTRODUCTION**

**9**

Testing as an Engineering Activity - Testing as a Process - Testing maturity model - Software Testing Principles-The Tester's Role in a Software Development Organization - Origins of Defects - Cost of Defects – Developer & Tester Support for Developing a Defect Repository.

**TEST CASE DESIGN**

**9**

Test case Design Strategies - Using Black Box Approach to Test Case Design - Boundary Value Analysis - Equivalence class Partitioning - State Based Testing, Cause-effect graphing - Using White - Box Approach to Test design - Test Adequacy Criteria - Coverage and Control Flow Graphs - Covering Code Logic - Code Complexity Testing.

## **LEVELS OF TESTING**

**9**

The Need for Levels of Testing - Unit Test Planning - Designing the Unit Tests - Integration Tests - Designing Integration Tests - Integration Test Planning - System Testing - Acceptance Testing - Performance Testing - Regression Testing - Compatibility Testing, Testing the Documentation - Website Testing.

## **TEST MANAGEMENT**

**9**

People and Organizational Issues in Testing - Organization Structures for testing teams - Testing Services - Test Management - Test Process - Reporting Test Results - Building a Testing Group - Structure of Testing Group - Google Extension - The technical training program.

## **SELENIUM**

**9**

Introduction – Selenium IDE, RC - Selenium WebDriver -Selenium Components - Selenium IDE – TestNG- Maven - UI elements Locators – Xpath - CssSelector - TestNG Annotations and Data Providers – Jenkins – Modular Framework – Paramitarization- Hybrid Framework.

### **d. Activities**

Students shall be exposed to the concepts of software testing using case study.

### **e. Learning Resources**

#### **Text Books**

1. Paul C, Jorgensen, *Software Testing: A Craftsman's Approach*, 5<sup>th</sup> Edition, Auerbach Publications, 2022.
2. Yogesh Singh, *Software Testing*, Cambridge University Press, 2012.

#### **Reference Books**

1. Glenford J. Myers, Corey Sandler, Tom Badgett, *The Art of Software Testing*, 3<sup>rd</sup> Edition, John Wiley & Sons, Inc, 2012.
2. Satya Avasarala, *Selenium WebDriver Practical Guide*, Packt Publishing, 2014.