WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
for
T. Y. B. Tech. Electronics & Computer Engineering

W.E.F. 2023-24
V1.2

Electronics and Computer Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the Electronics and Information Technology fields

Department Mission

1. To inculcate and stimulate Electronics & Computer proficiency amongst students through quality education and innovative educational practices
2. To create engineering professionals with social consciousness
3. To foster technical skills of students through creativity and critical thinking
4. To enhance soft skill set of students which is crucial for career success through effectual training

Electronics and Computer Engineering
Undergraduate Program
Program Educational Objectives (PEOs)

Graduate will -

1. Have a successful professional career in Electronics & Information Technology fields
2. Leverage his fundamental knowledge to pursue higher education and will continue his professional development in Electronics & Information Technology fields
3. Exhibit professional ethics, team spirit and effective communication skills to be successful leader and manager with a holistic approach.
4. Be sensitive to ethical, societal & environmental issues while conducting his professional work.

Program Outcomes (POs)

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 lifelong learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

1. **Algorithms :** Graduate will able to develop, realize and validate algorithms for different electronic systems and programming applications
2. **Systems:** Graduate will able to develop, implement and test different electronic systems and computer applications
3. **Self Learning:** Graduate with his sound fundamentals is prepared to comprehend applications of the Electronics and Computer engineering through self learning mode

Legends used–

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanities and Social Sciences
NPTEL	National Program on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B.Tech.	Bachelor of Technology

Course Code Format:

2	1	E	C	U/P	2	C	C	1	T / L
Year of Syllabus revision		Program Code		U-Under Graduate, P-Post Graduate	Semester No. / Year 1/2/3/…8	Course Type		Course Serial No. 1-9	T- Theory, L-Lab session

Program Code EC	Electronics and Computer Engineering
Course Types	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning N* indicates the serial number of electives offered in the respective category
EN*	Core Elective N* indicates the serial number of electives offered in the respective category
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Program Code:

21ECU1BS1T	Engineering Physics (Group A)

Walchand Institute of Technology, Solapur

Structure of T.Y. B. Tech. Electronics and Computer Engineering
(W.E.F. 2023-24)
Semester V

	Theory Course Name	***Engagement Hours***			***Credits***	***FA***	***SA***		
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	***Total***
21ECU5CC1T	Embedded Systems	3	_	_	3	60	40		100
21ECU5CC2T	Database Management Systems	3	_	_	3	60	40	_	100
21ECU5CC3T	VLSI Design	3	_	_	3	60	40	_	100
21ECU5HU4T	Information Systems and Management	3	-	_	3	60	40		100
21ECU5HU4A	Information Systems and Management Tutorial	-	1	-	1	-	-	25	25
21ECU5CC5T	Design and Analysis of Algorithms	3	-	_	3	60	40	-	100
21ECU5CC5A	Design and Analysis of Algorithms Tutorial	-	1	-	1			25	25
21ECU5SN*7T	Self-Learning I – HSS#	_	_	_	2	50	_	_	50
Sub Total		**15**	**2**	**_**	**19**	**350**	**200**	**50**	**600**
Course Code	***Laboratory Course Name***								
						ESE			
						POE	***OE***		
21ECU5CC1L	Embedded Systems	_	_	2	1	25	_	_	25	50
21ECU5CC2L	Database Management Systems			2	1	25	-	_	25	50
21ECU5CC3L	VLSI Design	_	_	2	1	_	_	_	25	25
21ECU5CC6P	Programming with Java	2	_	4	4	25	_	50	-	75
Sub Total		**2**	**_**	**10**	**7**	**75**		**50**	**75**	**200**
Grand Total		**17**	**2**	**10**	**26**	**425**		**250**	**125**	**800**

N* *indicates the serial number of electives offered in the respective category*

Walchand Institute of Technology, Solapur

Structure of T.Y. B. Tech. Electronics and Computer Engineering

(W.E.F. 2023-24)

Semester VI

	Theory Course Name	***Engagement Hours***			***Credits***	***FA***	***SA***		
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	***Total***
21ECU6CC1T	Software Engineering	3	-	_	3	60	40	-	100
21ECU6CC1A	Software Engineering Tutorial	-	1		1			25	25
21ECU6CC2T	Operating Systems	3	_	_	3	60	40	_	100
21ECU6CC3T	Image Processing	3	-	_	3	60	40		100
21ECU6CC3A	Image Processing Tutorial	-	1		1			25	25
21ECU6CC4T	Machine Learning	3	_	_	3	60	40	_	100
21ECU6EN*5T	Core Elective I	3	-	_	3	60	40	-	100
21ECU6EN*5A	Core Elective I Tutorial		1		1			25	25
Sub Total		**15**	**3**	**_**	**18**	**300**	**200**	**75**	**575**
Course Code	***Laboratory Course Name***								
						ESE			
						POE	***OE***		
21ECU6CC2L	Operating Systems	_	_	2	1	_		_	25	25
21ECU6CC4L	Machine Learning	_	_	2	1	50	_	_	25	50
21ECU6CC6P	JavaScript Programming	2	-	2	3	25	-	-	25	50
21ECU6MP7L	Mini Project	_	_	2	1	_	25	_	25	50
Sub Total		**2**	**_**	**8**	**6**	**100**		**_**	**100**	**175**
Grand Total		**17**	**3**	**8**	**24**	**400**		**200**	**175**	**750**

N* *indicates the serial number of electives offered in the respective category*

List of Self Learning I – HSS at Sem V

Course Code	*Self-Learning I*
21ECU5S17T	Economics
21ECU5S27T	Intellectual Property Rights for Technology Development and Management
21ECU5S37T	Introduction to Sociology
21ECU5S47T	Stress and Coping
21ECU5S57T	Professional Ethics & Human Value

List of Core Electives at Sem VI

Core Elective I at Sem VI	
Course Code	*Course*
21ECU6E15T	Power Electronics
21ECU6E25T	Artificial Intelligence
21ECU6E35T	Network Security

- **Note** –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Student shall select one self Learning I Humanities and Social Sciences (HSS) at T.Y. Sem V. Curriculum for Humanities and Social Sciences, Self-Learning (HSS) is common for all under graduate engineering programs.

   Student can select a Self Learning Course from Course List given above and appear for its examination as and when conducted by the institute

   OR

   Student can enroll for MOOC course(s) authorized by the department and complete the necessary certification. The score of the student in this certification examination will be accepted for the credits of 'Self Learning Course' at T.Y. Sem V

3. Project group for T.Y. Sem VI Mini Project shall not be of more than **three** students.

4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

Walchand Institute of Technology, Solapur

T.Y. B. Tech (Electronics and Computer Engineering) Semester-V

21ECU5CC1T EMBEDDED SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures– 3 Hours/week, 3 Credits	**ESE** - 60 Marks
Practical – 2 Hours/week, 1 Credit	**ISE** - 40 Marks
	ICA - 25 Marks
	POE - 25 Marks

This course provides a thorough introduction to the architecture of ARM7TDMI core-based microcontroller. The course also introduces assembly and C programming for microcontroller and enables student to write programs addressing high level programming skills and also interfacing with different peripherals. The real time operating system concepts are also introduced.

Course Prerequisite:

Student has completed a course in microcontroller and its interfacing and has an adept knowledge of assembly language and C language programming. Student also has knowledge of interfacing techniques and working of different peripherals.

Course Objectives:

1. To make student aware of hardware and software architecture of embedded system
2. To make student learn architecture of ARM7TDMI core.
3. To make student write assembly and C language programs for ARM7TDMI core based microcontroller.
4. To make student learn interfacing of different peripherals with microcontroller.
5. To make student learn architecture of real time operating system and its services.

Course Outcomes:

After completing this course, student shall be able to -

1. Describe hardware and software architecture of embedded system.
2. Describe ARM7TDMI core architecture
3. Write assembly and C program for different applications for microcontroller.
4. Interface different peripherals with microcontroller.
5. Explain and use different services of real time operating system.

SECTION I

Unit 1 - Introduction to Embedded system No of lectures – 06

Concept of embedded system**,** RISC and ARM design philosophy, embedded system hardware and embedded system software

Unit 2 – ARM7 Core Fundamentals No of lectures – 08

ARM7TDMI core programmer's model: data types, processor modes, registers, exceptions, memory format support, unaligned access support, pipeline concept, core extensions and ARM7TDMI instruction set: data processing instructions, branch instructions, load/store instructions, software interrupt instruction, program status register instructions, and loading constants, arm addressing modes

Unit 3 –Architecture of ARM7TDMI based Microcontroller No of lectures – 07

ARM7TDMI based microcontroller architecture: study of on-chip peripherals like I/O ports, timers, interrupts, on-chip ADC, DAC, RTC, PLL, SPI, I2C

SECTION II

Unit 4 – Microcontroller Interfacing and Programming No of lectures – 07

Basic embedded C programs for ARM7TDMI based microcontroller's on-chip peripherals of like ADC, DAC, I / O devices interfacing and serial communication, analog interfacing & data acquisition

Unit 5 – Real Time Operating System Concepts No of lectures – 08

Concepts of real time operating system, need of RTOS, comparison of traditional and embedded OS, foreground/background systems, multitasking, tasks, context switching, kernel structure, schedulers, mailboxes, task management, time management, inter-task communication, interrupts, clock tick

Unit 6 - RTOS Programming No of lectures – 07

Introduction to µC/OS-II RTOS, features of µC / OS-II, kernel structure of µC/OS-II, system services related to task management, time management, semaphore management, and mailbox management, programs by using above system services

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- **Internal Continuous Assessment (ICA) :**
  ICA consists of minimum 8 practical based on curriculum. Recommended practicals:
  1. Program to interface LCD & Keypad to microcontroller.
  2. Program to interface analog input devices using on-chip ADC.
  3. Program to generate different waveforms using on-chip DAC.
  4. Program to introduce timer based events for microcontroller.
  5. Program to interface different peripherals using I2C protocol.
  6. Program to introduce interfacing using UART for microcontroller.
  7. Program to interface different peripherals using SPI/SSP protocol.
  8. Multitasking in µC/OS RTOS using different tasks.
  9. Semaphore as signaling & synchronizing on microcontroller.
  10. Mailbox implementation for message passing on microcontroller.

- **Textbooks**

1. ARM System Developers Guide, Andrew Sloss, Elsevier.
2. MicroC/OS-II: The Real Time Kernel, Jean J Labrose, CMP Books.
3. ARM System On Chip Architecture, Steve Furber, Addison-Wesley.

- **Reference Books**

1. ARM7TDMI based microcontroller's datasheet.
2. Embedded systems software primer, David Simon, Pearson.
3. Embedded Systems: Architecture, Programming and Design, Raj Kamal, McGraw Hill India.

Walchand Institute of Technology,Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V
21ECU5CC2T DATABASE MANAGEMENT SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hours/week, 3 Credits	**ESE –** 60 Marks
Practical – 2 Hour/week, 1 Credit	**ISE -** 40 Marks
	POE - 25 Marks
	ICA - 25 Marks

Database management has evolved from a specialized computer application to a central component of a modern computing environment, and, as a result, knowledge about database systems has become an essential part of education in almost every domain of engineering. This basic course is designed to provide the fundamental concepts of database management and provides the necessary basics to the beginner. This course focuses on the fundamentals of database modeling and design, the languages and models provided by database management systems.

Course Prerequisite:

Students shall have adept knowledge of basic data structures, computer organization, and a high-level programming language such as C, C++ or Java.

Course Objectives:

1. To introduce to students the concept of computerized database and database management systems (DBMS)
2. To introduce data modeling using the Entity–Relationship (ER) model and the relational data model
3. To make the students understand the and use Structured Query Language to query, update, and manage a database.
4. To learn techniques for concurrency control and recovery methods, fundamentals of database transaction processing, and apply normalization techniques to normalize the database.

Course Outcomes:

After completing this course, the student shall be able to -

1. Introduce the basics of database design, structure, implementation, and applications
2. Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams and relational model.
3. Formulate query, using SQL to create tables and indexes, insert/update/delete data, and query data in a relational DBMS
4. Apply normalization techniques to normalize the database.
5. Understand database storage structures and searching using indices, hashing.
6. Familiarize the students with the fundamentals of database transaction processing and learn techniques for concurrency control.

SECTION I

Unit 1: Introduction to Database Management Systems No. of lectures – 03

Database- system applications, the purpose of database systems, view of data, database languages, database architectures, database users and administrators, history of databases system

Unit 2: Entity –Relational Model No of lectures –07

Overview of the design process, E-R Model, constraints, E-R diagrams, E-R design issues, weak entity sets, extended E-R features, reduction to relational schema

Unit 3: Relational Model and SQL No of lectures –12

Relational Model: Basic structure of relational databases, database schema, keys, schema diagrams, relational query languages, relational algebra-fundamental, additional and extended relational algebra operations, SQL: overview, SQL data definition, SQL data types, Types of SQL Commands: DDL, DML, DCL and TCL statements, Basic SQL clauses [select, from, where, group by, having, order by, etc.], the basic structure of SQL queries, additional basic operations, set operations, NULL values, aggregate functions, nested sub-queries, modification of the databases, join operations, views, integrity constraints, authorization

SECTION II

Unit 4: Normalization No of lectures –07

Features of good relational designs, atomic domains, first normal form, keys and functional dependencies, second normal form, Boyce-Codd normal form, third normal form, functional dependency theory

Unit 5: Indexing and Hashing No of lectures –06

Basic concepts, ordered indices, B+ tree index files, B tree index files, multiple key access, static hashing, dynamic hashing, comparison of indexing and hashing, index definition in SQL

Unit 6: Transactions and Concurrency Control No of lectures – 08

Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, serializability, recoverability, testing of serializability, lock-based protocol: locks, granting of locks, two-phase locking protocol, time stamp-based protocols, validation-based protocols, deadlock handling

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- **Internal Continuous Assessment (ICA):**

ICA consists of a minimum of eight experiments requiring students to implement and validate.

Implementation of Basic SQL DDL commands

1. Implementation of SQL DML commands
2. Draw E-R diagram for any specific database application
3. Write simple queries in SQL on the schema created for a specific application
4. Write SQL queries using aggregate function and nested sub queries
5. Write SQL queries using Views and Join operation
6. Write SQL queries for different integrity constraints and authorization commands.
7. Implement queries on embedded SQL, functions and procedures, triggers
8. Write a Java program for Database Connectivity using JDBC.
9. Convert the created database into 1NF, 2NF, 3NF and BCNF.
10. Write a program to implement dynamic hashing on the database previously created.
11. Write a program to simulate log based protocol using immediate database modification.
12. Write a program to simulate log based protocol using deferred database modification.
13. Write a program to simulate (any one) concurrency control protocol.
14. Given a set of functional dependencies, fine canonical cover and closure of functional dependency

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- **Textbooks:**
  1. Fundamentals of Database Systems (7th Edition) by Ramez Elmasri,Shamkant B. Navathe. Publisher: Pearson
  2. Database system concepts by Peter Rob, Carlos Coronel (Cengage Learning) ninth edition.

- **Reference Book:**
  1. Database System Concepts by Silberschatz, Korth and Sudarshan (6th Edition) Publisher: Tata McGraw Hill Education
  2. Database Management Systems by Ramkrishnan Gehreke (Tata McGraw Hill) third edition.
  3. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
  4. Advanced Database Management System by Rini Chakrabarti, Shilbhadra Dasgupta (Dreamtech Press Publication).

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

21ECU5CC3T VLSI DESIGN

Teaching Scheme	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Practical –2 Hours / week , 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

This course provides a thorough introduction to hardware description language (VHDL). The course intends to cover VHDL modeling and testing of various combinational and sequential circuits. The course also introduces the architectures of complex programmable logic device and field programmable gate arrays. CMOS logic, CMOS fabrication and layout and testing of logic circuits are also covered.

Course Prerequisite:

Student has completed a course in digital techniques and has an adept knowledge of various combinational and sequential circuits. Student also has knowledge about PLDs and MOS transistors.

Course Objectives:

1. To introduce to student VHDL language.
2. To make student understand modeling combinational circuits and sequential circuits usingVHDL.
3. To make student understand impediments of synchronous design.
4. To introduce to student architecture of CPLD and FPGA.
5. To make student understand CMOS logic and CMOS fabrication.
6. To make student understand the importance and method for digital circuit testing.

Course Outcomes:

After completion of this course, student will be able to

1. Explain VHDL features with suitable example.
2. Write VHDL code & test bench for modeling and testing combinational and sequential circuits
3. Elaborate steps in the high level design flow and implement some functions using CPLD/FPGA.
4. Explain the characteristics of CMOS and implement digital functions using CMOS logic and gates.
5. Describe the testing methods and design the minimal test set required for testing the circuits.

Section I

Unit 1 –VHDL No of lectures – 10

Introduction, design flow, features & capabilities of VHDL, entity, architectures, configuration, library, package, data types, operators, multi valued logic, transport and inertial delays, concurrent signal assignment, signal driver, process statement, wait statement, sequential statements, signal assignment within sequential construct, signal & variable, subprograms, generate statement, generics, operator overloading, test benches

Unit 2 – VHDL Modeling No of lectures – 06

VHDL modeling of combinational circuits such as decoder, encoder, tri state buffer, multiplexer, parity checker, parity generator, comparator, adder, multiplier, VHDL modeling of RAM & ROM.

Unit 3 – Synchronous Design No of lectures – 06

Review of FSM design, VHDL modeling of flip flops, counters, and shift registers, LFSRs, Mealy and Moore machines

Section II

Unit 4 – Programmable Logic Devices No of lectures – 05

Xilinx 9500 series CPLD architecture, Xilinx Spartan 4000 FPGA architecture, programmable logic block architectures, implementing functions in FPGAs

Unit 5 – High Level Design Flow No of lectures – 05

RTL simulation, synthesis, gate level verification, place and route, post layout timing simulation

Unit 6 – CMOS No of lectures – 06

MOS transistors, CMOS logic, CMOS fabrication and layout, CMOS inverters- DC characteristics, beta ratio effects, transmission gates, characteristics of digital circuits (power dissipation, noise margin, and fan in, fan out)

Unit 7 – Testing of Logic Circuits No of lectures – 06

Fault model, complexity of a test set, path sensitizing, random tests, testing of sequential circuits, built in self-test, boundary scan

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- **Internal Continuous Assessment :**
  ICA consists of minimum ten experiments based on following designs. Student shall test the designs using VHDL test bench.

  Simulation, synthesis and implementation of:

1. Combinational logic: decoder, priority encoder, comparator, adder, multiplier, multiplexer
2. Sequential logic: counters with synchronous / asynchronous reset signal, cascading of counters, shift registers, Melay & Moore state machines
3. A mini-project to implement one of the processor peripherals in FPGA / CPLD

- **Text Books:**

1. Fundamentals of Digital Logic with VHDL Design, Stephan Brown and Z Vranesic, TMH
2. Digital Systems Design using VHDL, Charles H Roath, Lizy John, Cengage Learning Second Edition
3. VHDL Programming by Example ,Douglas Perry, TMH
4. CMOS VLSI Design A Circuits and Systems Perspective, Neil Weste, David Haris, 3rd Edition, Pearson Education

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- **Reference Books:**

1. Digital Design, Principles and Practices, John F Wakerly, PHI
2. The Designer's Guide to VHDL, Peter J. Ashenden, Morgan Kaufmann Publishers
3. A VHDL Primer , Jayaram Bhasker

Walchand Institute of Technology, Solapur

T.Y. B. Tech (Electronics and Computer Engineering) Semester-V

21ECU5HU4T INFORMATION SYSTEMS AND MANAGEMENT

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Tutorial –1 Hour / week , 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

This course provides the basic tactical and strategic principles of information technology uses for management information systems and its various applications to the organizations. It also addresses changing face of business with proliferation of electronic commerce and ethical & social issues arising with it.

Course Prerequisite:

Student shall have basic knowledge of computer hardware, software, programming and communication.

Course Objectives:

1. To introduce to student concepts of information systems and its impact on business and organization.
2. To make student comprehend necessity and fundamentals of data management and its benefits for business and organizations.
3. To show how e-commerce helps organization to increase productivity and competitive advantage.
4. To give overview of ethical and social issues concerning information systems.

Course Outcomes:

After completing this course, student shall be able to -

1. Present case studies about changing face of business and importance of management information system for today's business.
2. Explain different e-commerce mechanisms along with the examples.
3. Describe necessity and benefits of data management for business and organizations.
4. Present examples of primary and higher organizational applications of information system.
5. Describe various social and ethical issues related to information Systems.

SECTION-I

Unit 1-Information Systems in Global Business Today No of lectures – 09

Business in digital economy & information age, information concepts – data, information & knowledge, information systems: concepts and definitions, classification and types of information systems, what is an organization, features of organizations, organizational structure, organizations and information systems, how information systems impact organizational practices and support people

Unit 2 – Databases and Information Management No of lectures – 07

Data hierarchy, problems with traditional file environment, database approach, database management system, creating database, relational DBMS, logical vs physical view, DBMS components, data warehouse, data mart, data mining, text mining, web mining

Unit 3 – IT Infrastructure and Emerging Technologies No of lectures – 06

IT infrastructure ecosystem, contemporary hardware platforms – mobile, cloud computing and services, virtualization, green computing, contemporary software platforms- Linux and open source software, web services and service oriented architecture

SECTION II

Unit 4– Global E-business and Collaboration No of lectures – 07

Overview of e-business and e-commerce, major e-commerce and e- business mechanisms, E-Government and public sector IT trends, e-commerce supports services, infrastructure support required, e-payment systems

Unit 5– Modern Organizational Applications No of lectures – 08

Management levels and information systems, OLTP, OLAP, enterprise content management, introduction to ERP, supply chain management, CRM, introduction to decision support systems, introduction to business intelligence

Unit 6 – Information Systems and Ethical & Social Issues No of lectures – 06

Moral dimensions of information age, ethical principles, intellectual property rights- trade secrets, copyrights, patents, privacy, workplace behavior and health, de-skilling and alienation, telecommuting, E waste, green IT

- **Internal Continuous Assessment (ICA)**

ICA consists of minimum one assignment based on each unit - may be comprising of case studies, group discussion and information survey.

- **Textbooks:**
  1. Information Technology for Management – Transforming Organizations into Digital Economy, Efraim Turban, Linda Volonino, Wiley Student Edition, Wiley India Pvt. Ltd.
  2. Management Information Systems Managing the Digital Firm, Kenneth C. Laudon Jane P. Laudon, Pearson, Thirteenth Edition
  3. Information Technology for Management - Advancing Sustainable, Profitable Business Growth, Efraim Turban, Linda Volonino, Gregory R Wood, Wiley, Ninth Edition

- **Reference Books:**
  1. Introduction to Information Technology, Turban, Rainer, Potter, Wiley Student Edition, 2nd Edition.
  2. Information Systems, Ralph Stair, George Reynolds, Cengage Learning, 10th Edition.
  3. Management Information System (MIS), Rahul De, Wiley India Pvt. Ltd.

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

21ECU5CC5T DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Tutorial –1 Hour / week, 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

Algorithm design and analysis helps engineers to solve complex problems and design efficient solutions. Effective algorithms can lead to reduced computational time and increased efficiency in systems and devices. A deeper understanding of algorithms can improve an engineer's understanding of how computer systems work and how to optimize their performance. Knowing how to analyze and design algorithms helps engineers to communicate technical ideas and solutions effectively with their peers and other technical professionals. This course introduces the algorithms, strategies of algorithm and analysis of algorithm which will help to compare and determine good algorithm.

Course Prerequisite:

Student should have knowledge of basic programming. They should also have basic knowledge of data structure and graph theory.

Course Objectives:

1. Understanding of different algorithms and their applications, including sorting, searching, graph algorithms, and dynamic programming.
2. Ability to analyze the time and space complexity of algorithms, and to compare and choose between different algorithms for a given problem.
3. Knowledge of algorithm design techniques, such as greedy algorithms, divide-and-conquer, and dynamic programming.
4. Ability to use algorithmic tools such as recursion, asymptotic analysis, and complexity theory to solve problems.
5. Understanding of the relationship between algorithms and data structures, and the ability to use data structures such as arrays, linked lists, trees, and graphs to implement algorithms.
6. Development of problem-solving skills, including the ability to recognize and apply algorithmic techniques to real-world problems.

Course Outcomes:

After completing this course, students will be able to,

1. Analyze and compare the efficiency of different algorithms and choose the best algorithm for a given problem.
2. Design and implement efficient algorithms to solve problems in a variety of areas, including computer science, engineering.
3. Analyze the time and space complexity of algorithms, and to use asymptotic analysis to evaluate their efficiency.
4. Use data structures such as arrays, linked lists, trees, and graphs to implement algorithms, and to analyze the efficiency of different data structures for a given problem.
5. Apply algorithmic techniques such as divide-and-conquer, greedy algorithms, dynamic programming, and backtracking to solve problems.

SECTION-I

Unit 1 - Introduction No of lectures – 07

Algorithm Specification: Pseudo code Conventions, Recursive Algorithm,
Performance Analysis: Space Complexity, Time Complexity, Calculating worst case, best case and average case complexities, Asymptotic Notations, Performance Measurement

Unit 2 - Elementary Data Structures No of lectures – 06

Stack and Queues, Trees, Dictionaries, Priority Queues, Heap and Heap Sort, Sets, Disjoint Sets and operations, Graph.

Unit 3 – Divide and Conquer No of lectures – 06

The general method, Binary search, Finding the maximum and minimum, Performance measurement of Quick sort, Selection Sort, Merge Sort.

SECTION II

Unit 4 – The Greedy Method No of lectures – 08

The general method, Knapsack Problem, Job Sequencing with deadlines, Minimum —cost spanning trees — Prim's and Kruskal's Algorithms, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths.

Unit 5 – Dynamic Programming No of lectures – 08

The general method, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 Knap sack, Reliability design, The Traveling Sales person problem. Flow shop scheduling.

Unit 6 – Backtracking No of lectures – 07

The general method, 8-queen problem, Sum Of subsets, Knapsack Problem, Hamilton Cycle, and Graph Coloring.

- **Internal Continuous Assessment (ICA)**
  ICA consists of a minimum of eight tutorials based on the above curriculum. Few guidelines can be as given bellow:
  1. The nature of the problems shall be with objectives to assess student's ability to compare and choose an appropriate algorithm design paradigm on time and space complexity.
  2. Comparing the performance of different sorting algorithms, such as bubble sort, insertion sort, quick sort, and merge sort.
  3. Solving dynamic programming problems, such as the knapsack problem
  4. Analyzing greedy algorithms, such as the fractional knapsack problem and the minimum spanning tree problem.
  5. Analyzing the efficiency of algorithms through the use of asymptotic analysis and experimental testing.

- Te**xtbooks:**
  1. Fundamentals of Computer Algorithms, Horowitz, Sahni & Rajasekaran (Galgotia Publications)
  2. Fundamental of Algorithm, Gilles Brassard, Paul Bratley (Pearson Publication)
  3. Introduction to Algorithms, Thomas Cormen (Pearson Publication)
- **Reference Books:**
  1. Introduction to Design and Analysis of Algorithm, Goodman (McGrawhi11)
  2. Design and analysis of algorithms, Aho, Hopfcraft and Ullman (Addison Wesley)
  3. Design & Analysis of Algorithms, Sharma, Khanna Publishing House, N.Delhi
  4. Design& Analysis of Algorithms, S. Sridhar, Oxford

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

21ECU5CC6P PROGRAMMING WITH JAVA

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hours/week, 2 Credits	**ISE—**50 Marks
Practical – 4 Hours/week, 2 Credits	**POE-** 25 Marks

Students can benefit from learning Java programming language because it is widely used in software development, particularly for building applications, mobile apps, and web development. Java is also commonly used in enterprise systems and big data processing, providing a wide range of career opportunities. Additionally, Java has a large and active community, making it easier to find support and resources for learning and troubleshooting. Furthermore, Java has a strong emphasis on security and robustness, which can be useful for engineers who are developing products for the market.

Course Prerequisite:

Students shall have adept knowledge of programming with C and C++. Students should be acquainted with the basics of procedural and object-oriented programming concepts.

Course Objectives:

1. Introduce core Java programming concepts to students.
2. To make students understand the concept of objects and classes from a Java perspective and use the same for implementing various OOP features.
3. To examine key aspects of the java Standard API library.
4. To learn java's exception handling mechanism, multithreading, etc.

Course Outcomes:

After completing this course, students shall able to -

1. Understand the core Java concepts: Students will learn the fundamental concepts of Java, such as object-oriented programming, data types, variables, control structures, and more.
2. Write and debug Java code: Students will learn to write and debug Java code, and develop their skills in writing effective, efficient, and maintainable code
3. Use classes, Abstract Classes, Interfaces, and OOP principles.
4. Understand and use the Java libraries and APIs: Students will learn about commonly used Java libraries and APIs, such as Exceptions, I/O, Multithreading, and Collection Framework, and understand how to use them to build applications.

SECTION I

Unit 1: Basic programming Using Java No. of Lecture-08

Introduction to OOP, Java as OOP language, Java Runtime Environment (Oracle JDK, Open JDK), Java (JDK) Installation.

Variables - Instance, Static, Local, Primitive data types, identifiers, literals, operators, expressions, precedence rules & associativity, primitive type conversion & casting, the flow of control. Java arrays, multi-dimensional arrays.

String Class and Methods - Immutability of Strings, String Buffer Class and Methods, String Builder class, and Methods.

Unit 2: Classes, Abstract Classes, Interface No. of Lecture-04

Class & Object- class declaration in Java, creating methods, constructors, use of *static*, and *this* keyword. Inheritance in Java, *super*, and *final* keyword. Interface and Abstract Class.

Unit 3: Exceptions, Error Handling No. of Lecture-04

Exceptions and Errors, catching and handling exceptions, the try block, the catch blocks, the finally block, throwing exceptions, chained exceptions, custom exceptions. J Unit testing framework.

SECTION II

Unit 4: Java I/O and Networking No. of Lecture-08

Basic I/O: I/O streams, byte streams, character streams, buffered streams, scanning and formatting, data streams, object streams, file I/O classes: reading, writing, and creating files and directories.
Network programming: Inet Address, URLs, socket (TCP & UDP) communication in java.

Unit 5: Java Collections Framework and Packages No. of Lecture-04

Introduction to collection framework, generics, Iterator class, arrays, array methods, searching and sorting arrays of primitive data types, sorting arrays of objects, the comparable and comparator interfaces, sorting using comparable & comparator, collections: lists, sets, maps, trees, iterators and collections, the collection class
Package: Use of Package, CLASSPATH, Import statement, Static import, Access control

Unit 6: Multithreading No. of Lecture-04

Multithreading: creating threads, thread scheduling and priority, thread interruptions and synchronization.

- **Internal Continuous Assessment (ICA)**
  ICA consists of minimum ten assignments based on the following:

  - **List of Programming Assignments:**
    Minimum 10 to 12 Java programming assignments covering:
    1. Programming with basic program structure of Java
    2. Programming using java classes-methods, constructors
    3. Programming using the concept of constructor overloading and method overloading
    4. Programming using the concept of static and this keywords in Java
    5. Programming using the concept of inheritance in Java and super, final keyword
    6. Programming using the concepts of Interfaces and inheritance.
    7. Programming using the concepts methods, constructors
    8. Programming using the concepts of arrays and strings, buffers in Java
    9. Programming using the concepts of exception handling.
    10. Programming using the concepts of user defined exception.
    11. Programming using the concepts of Java Collections Framework
    12. Programming using the concepts of I/O.
    13. Programming using the concepts socket and networking
    14. Programming using the concepts of multithreading.
  - The assignments should test and develop student's practical proficiency and ability to use Java API Classes correctly for writing code for varied applications scenarios & use case requirements.
  - Use of IDEs like BlueJ, Eclipse, Netbeans or any other FOSS alternative for Interactive development and debugging of Java applications is highly recommended to enhance hands-on skills in Java Programming of Students

  Note: The ISE (3 Programming Examinations of 25 marks each) will be of the 25 marks and Programming Assignment/Activity Submission will carry 25 Marks. Thus Total 50 marks of ISE will be addition of above two.

- **Textbooks:**
  1. Programming with JAVA: A Primer, E. Balagurusamy, Tata McGraw Hill Publication, New Delhi
  2. Programming in JAVA, Sachin Malhotra and Saurabh Choudhary, Oxford University Press, New Delhi
  3. Core JAVA: An Integrated Approach, R. Nageswara Rao, Dreamtech Press

- **Reference Books:**

  1. JAVA: A Beginner's Guide, Herbert Schildt, McGraw-Hill Education
  2. Core JAVA 2: Volume-I Fundamentals, Cay S. Horstmann and Gary Cornell, Prentice Hall PTR
  3. JAVA 2: The complete Reference, Patrick Naughton and Herbert Schildt, McGraw-Hill

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V
SELF LEARNING -I (HSS)

21ECU5S17T ECONOMICS

Teaching Scheme:
Credits: 2 Credits

Examination Scheme
ESE-50 Marks

Course Objectives:

1. To explain to students various theories of economics such as demand supply, production and cost.
2. To acquaint students with fundamentals of microeconomics.
3. To introduce to students concept of inflation with their causes, consequence and remedies.
4. To acquaint students with basics of international trade, foreign exchange.

Course Outcomes:

At the end of this course, students will be able to,

1. Identify the basic economic problems, resource constraints
2. Apply various theories of economics for explaining economic growth
3. Identify causes of inflation, consequence and can explain remedies
4. To assess the impact of international trade and foreign exchange on Indian economy

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Unit 1: Introduction

History of Economic thought, Basic Economic problems, Resource Constraints and Welfare maximization, Nature of Economics: Positive and Normative Economics, Micro and Macro Economics, Basic concepts in Economics, The role of State in economic activity, Market and Government failures, New economic Policy in India.

Unit 2: Theories of Economics

Theory of utility and consumer's choice, Theories of Demand, supply and market equilibrium, Theories of firm, production and costs, Market structures, Perfect and imperfect competitions, oligopoly, monopoly.

Unit 3: Macroeconomics

An overview of Macroeconomics, measurement and determination of national income, Consumption, saving and investment

Unit 4: Banking & Inflation.

Commercial and Central Banking, Relationship between money, output and prices, Inflation causes, consequences and remedies

Unit 5: International Influences on Economics

International Trade, foreign exchange and balance payments, stabilization policies, Monetary, Fiscal and exchange rate policies

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Text books:

1. Economics: P.A. Samuelson & W.D Nordhaus, McGraw Hill, New York, 1995
2. Modern Microeconomics : A. Koutsoyiannis, Macmillan,1975

Reference Books:

1. Microeconomics: R. Pindyck and D.L. Rubinfield, Macmillan New York, 1989
2. Microeconomics: Gordon, 4th edition, Little Brown & Co., Boston, 1987
3. The Organization of Industry: William F. Shughart II, Richard D. Irwin, Illinois, 1990

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

SELF LEARNING -I (HSS)

21ECU5S27T INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY DEVELOPMENT AND MANAGEMENT

Teaching Scheme:
Credits: 2 Credits

Examination Scheme
ESE-50 Marks

Course Objectives:

1. To introduce to student the legal and ethical importance of intellectual property associated with research and intellectual works.
2. To make student understand the overview of the process of acquiring the patent copyrights for the innovative works.
3. To make student aware of Indian IPR system and role of WTO in protecting Property Rights.
4. To make student aware about the plagiarism in the thesis, research papers etc.

Course Outcomes:

At the end of this course, students will be able to,

1. Explain importance of the intellectual property rights associated with research and intellectual works.
2. Explain the overview of process of acquiring the patents and copyrights for the innovative works.
3. Elaborate the role of Indian IPR system and role of WTO in protecting Intellectual Property Rights.
4. Explain how to avoid the plagiarism in the thesis, research papers etc.

Unit 1: Introduction to IPR

Dynamics of Knowledge evolution, creation of ownership domains in the knowledge space using various instruments of IPR

Unit 2: IPR for Engineers and Managers

Outlines concepts of confidentiality and information security, explores their role in technology development and transfer integrating Intellectual Property in project planning, execution & commercialization,

Unit 3: IPR and R&D

Discussion on the shifting paradigms of R&D and their linkage to IPR, Introduction to concepts of Valuation of IP & Value Realization

Unit 4: IPR for India

Comparison the Indian IPR system with international IPR frameworks especially in the context of WTO, followed by a few sessions on IPR litigations both for the enforcement of rights and business strategy

Unit 5: IPR and Contemporary Issues

Discussion on contentious issues of current interest such as Biotechnology and Intellectual Property, Protection of Traditional Knowledge, IPR and Electronic Commerce, TRIPS and Access to Medicines, Copyright issues in creative works, etc

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Text books:

1. Prabuddha Ganguli: Intellectual Property Rights Unleashing the Knowledge Economy. Tata McGraw Hill, New Delhi, 2001
2. Prabuddha Ganguli: Gearing Up for Patents The Indian Scenario. Universities Press India
i. Ltd., Hyderabad, 1998
3. P. Narayan: Patent Law. Eastern Law Co., Calcutta

Reference Books:

1. Global Dimensions of Intellectual Property Rights in Science and Technology, Author:
2. National Research Council, National Academies Press, 1993.
3. Technology Transfer: Intellectual Property Rights, C Sri Krishna, ICFAI University press (2008)

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

SELF LEARNING -I (HSS)

21ECU5S37T INTRODUCTION TO SOCIOLOGY

Teaching Scheme: **Examination Scheme**

Credits: 2 Credits **ESE-**50 Marks

Course Objectives:

1. To introduce to student various social phenomena.
2. To make student aware of effect of urbanization on society.
3. To instill social intuition for better society among student.
4. To make student conscious about impact of modernization on society.

Course Outcomes:

At the end of this course, Students will be able to,

1. Interpret the effect of various social phenomena on sociology.
2. Elaborate the role of urbanization on the society.
3. Evaluate the need of social intuition for better society.
4. Evaluate the role of modernization, industrialization, environmental/ecological changes in the development of society.

Unit 1: Introduction to Sociology

What is sociology, some sociological concepts: social structure, status, role, norms, values etc., Socialization, and culture and change , Social stratification - various approaches and concept of social mobility

Unit 2: Population and Sociology

Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world.

Unit 3: Social Institutions

Major social institutions - Family and marriage, caste and tribe and organizations:

i. Formal organization (bureaucracy)

ii. Informal Organization

Unit 4: Social Changes

Processes of social change- Modernization (including Sanskritization), industrialization, Environmental/ecological changes and development

Unit 5: Social Movements

Social movements - protest movements, reformist movement and radical movements in India

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Text books:

1. Sociology, L. Broom, P. Selznick and D. Dorrock, 11th Edn. 1990 (Harper International).
2. Sociology: Themes and Perspectives, M. Haralambos, Oxford University Press, 1980.
3. General Introduction to Sociology, Guy Rocher, A, MacMillan, 1982.

Reference Books:

1. Social movements in India, vols. 1-2, 1984, M.S.A. Rao, Manohar Publications.
2. Society in India, David Mandelbaum, 1990, Popular Publications.
3. Social change in modern India, M.N. Srinivas, 1991, Orient Longman Publications.

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V
SELF LEARNING -I (HSS)

21ECU5S47T STRESS AND COPING

Teaching Scheme:
Credits: 2 Credits

Examination Scheme
ESE-50 Marks

Course Objectives:

1. To make student aware about nature of stress and its various sources.
2. To make student attentive to effect of various stress.
3. To introduce to student about various means to cope up with stress.
4. To introduce to students basic stress management techniques.

Course Outcomes:

At the end of this course, Students will be able to,

1. Explain nature of stress and identify various sources of stress.
2. Elaborate the effects of medical, psychological and behavioral stress.
3. Explain how social support can mitigate the stress.
4. Explain various stress management techniques.

Unit 1: Introduction to Stress

Concept of stress-current and historical status, the nature of the stress response

Unit 2: Sources of Stress

Common sources of stress biological, personality and environmental

Unit 3: Coping with Stress

Coping styles defensive behaviors and problem-solving. Consequences of stress - medical, psychological and behavioral

Unit 4: Social Support

The role of social support in mitigating stress

Unit 5: Introduction to Stress Management

Stress management techniques-relaxation, meditation, cognitive restructuring, self-control, bio-feedback and time management, Preparing stress profile of a student

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- **Text books:**

1. Walt, S. "Stress Management for Wellness". Harcourt Brace & Jovanovich, N.York, 1994.
2. D. Girdano and G. Everly., "Controlling Stress and Tension", Prentice-Hall, 1986.
3. Monat and R. Lazarus, "Stress and Coping: An Anthology", Columbia Univ. Press, 1985.

- **Reference Books:**

1. Weisman, "The Coping Capacity", Human Services Press, 1984.
2. Stress and Coping: The Indian Experience, D.M. Pestonjee, SAGE India; Second edition, 1998

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-V

SELF LEARNING -I (HSS)

21ECU5S57T PROFESSIONAL ETHICS & HUMAN VALUE

Teaching Scheme:
Credits: 2 Credits

Examination Scheme
ESE-50 Marks

Course Objectives:

1. To emphasize importance of human values among student.
2. To introduce to student engineering ethics for professional practice.
3. To make student aware about safety, responsibility and professional rights in professional Practice.
4. To make student attentive to code of ethics of global professional organizations such as ASME, ASCE, and IEEE.

Course Outcomes:

At the end of this course, Students will be able to,

1. Explain importance of human values in modern society.
2. Explain how to integrate engineering ethics in their professional practice.
3. Explain about safety measures, responsibility and professional rights in professional Practice.
4. Explain the code of ethics of Global organizations such as ASME, ASCE, and IEEE.

Unit 1: Human Values

Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, spirituality

Unit 2: Engineering Ethics

Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest , Customs and Religion.

Unit 3: Safety, Responsibilities and Rights

Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies. Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination

Unit 4: Global Issues

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

Text books:

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006

Reference Books:

1. Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
2. Wuest, D.E.: Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6CC1T SOFTWARE ENGINEERING

Teaching Scheme:
Lectures- 3 Hours/week, 3 Credits
Tutorial –1 Hour/week, 1 Credit

Examination Scheme:
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

Current Software engineering methods and techniques have made us much better at building large and complex systems than we were. However, there are still too many projects that are late, over budget, and do not deliver the software that meets customer's end approaches which are required to develop high-quality software products within schedule and budget. On top of that this course ensures understanding of the complete Software Development needs. The main aim of introducing this course is to understand the methods, processes, techniques, at Life Cycle (SDLC) for the development of software products as per the customer's needs. Further, it ensures the knowledge of various quality standards used in the software system and the Agile Project Management Process.

Course Prerequisite:

Student shall have undergone a course on Object Oriented Programming through C++.

Course Objectives:

1. To make student comprehend various software development models
2. To make student understand software requirement and analysis process
3. To introduce to students software architecture and design
4. To give student overview of various methods for software testing
5. To introduce to student various processes involved in software project planning and management

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Course Outcomes:

After completing this course, student shall be able to -

1. Evaluate appropriate lifecycle model for software development.
2. Prepare SRS and SDS accordingly for a given problem.
3. Select and apply appropriate software testing method.
4. Explain quality management process.

SECTION-I

Unit 1 - Introduction to Software Engineering No of lectures – 08

Introduction, the problem domain, software engineering challenges and approach, software process, characteristics of software process, software development process models: waterfall model, prototype model, iterative development model: incremental model, spiral model, rational unified process model, time boxing model, agile process model

Unit 2 - Software Requirement Analysis & Specification No of lectures – 06

Need of SRS, characteristics of good SRS, requirement process, requirements specification, functional specification with use cases, other approaches for analysis: data flow diagram, entity relationship diagram

Unit 3 - Software Architecture and Design No of lectures – 08

Introduction to software design, software architecture: role of software architecture, architecture views, component & connector view, architecture style for component & connector view, documenting architecture design, design concepts: design principles, conceptual design and technical design,

coupling, cohesion, open closed principle, function-oriented design, object oriented design, high level design, detailed design, verification, metrics

SECTION II

Unit 4 - Testing No of lectures – 05

Testing fundamentals, testing process, black-box testing, white-box testing, object-oriented software testing methods, functional testing, unit testing, system testing, user satisfaction testing.

Unit 5 - Project Planning and Management No of lectures – 08

Project management process, the inspection and audit process, software configuration management process, effort estimation, project schedule and staffing, quality planning: quality concepts, qualitative quality management planning. CMM project management process, risk management planning, project monitoring plan, detailed scheduling

Unit 6 - Agile Project Management No of lectures – 08

Introduction to APM, implementation, iterative project management life cycle, adaptive project management life cycle, adaptive & integrating the APM toolkit, the science of scrum, new management responsibilities

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- **Internal Continuous Assessment (ICA)**

ICA consists of a minimum of eight tutorials based on the above curriculum and the following are the model tutorial assignments that can be included:

1. Create a software development plan for a given project, including project scope, schedule, and budget, and give a presentation.
2. Use version control systems, such as Git, to manage software code and collaborate with team members. Demonstrate the benefits of version control and collaboration tools.
3. Write a technical report on a software development topic, such as software testing strategies, Agile development methodologies or software security practices.
4. Participate in a team project to develop a software system, and contribute to the project's development plan, design, and implementation.
5. Reflect on the ethical, legal, and professional implications of software development and write an essay/ give presentation on a related topic.

- **Textbooks:**

1. An Integrated Approach to Software Engineering, Pankaj Jalote, 3rd Edition (Narosa Publishers)
2. Effective Project Management Traditional, Agile, Extreme, Robert K. Wysocki, 6th Edition, Wiley India
3. Software Project Management in Practice, Pankaj Jalote Pearson India Ltd

- **Reference Books:**

1. Software Engineering, Ian Sommerville, 6th edition, Pearson education Asia
2. Software Engineering Fundamentals, Ali Behforooz and Frederick j. Hudson (Oxford University Press).
3. Project Management with Scrum, Ken Schwaber.
4. Software Engineering-A precise approach, Pankaj Jalote Wiley Precise Precise Textbook

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Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6CC2T OPERATING SYSTEMS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Practical –2 Hours / week, 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

This course introduces fundamental knowledge of operating systems. It also covers process management, deadlock and memory management and file systems.

Course Prerequisite:

Students should have knowledge of computer systems and C programming language.

Course Objectives:

1. To introduce to student structure of operating system and its types
2. To make student realize importance of processes and inter process communication
3. To make student apply the algorithm for process scheduling
4. To make student analyze several classical process-synchronization problems
5. To make student analyze different methods for preventing or avoiding deadlocks
6. To make student analyze memory management during process execution
7. To make student create directory structure and file system in an operating system

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Course Outcomes:

After completing this course, student shall be able to -

1. Identify and describe structure, operations and different types of operating system
2. Describe the concept of process and inter process communication
3. Apply different process scheduling algorithms and analyze several classical process-synchronization problems
4. Evaluate deadlock condition and apply methods to resolve deadlock
5. Analyze memory management techniques for CPU performance
6. Create directory structure and file system

SECTION-I

Unit 1- Introduction and Overview of Operating System No of lectures – 05

Operating system- definition, goals, services and structure of operating system, classes of operating system- simple batch system, multiprogramming system, time sharing system, real time system, distributed operating systems, system calls

Unit 2– Process Management No of lectures – 05

Process concept, process state diagram and process control block, operations on processes-creation & termination, cooperating processes, inter process communication, threads: multi- threading models and threading issues

Unit 3 – Process Scheduling and Synchronization No of lectures – 09

Process scheduling concept, scheduling criteria, scheduling algorithms - non pre-emptive, preemptive, different scheduling algorithm- FCFS, SJF, SRTF, priority based, round robin, multiple processor scheduling, classical problems of synchronization- the critical section problem, semaphore as synchronization tool

SECTION II

Unit 4– Deadlocks No of lectures – 06

Introduction to deadlock, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock

Unit 5– Memory Management and Virtual Memory No of lectures – 10

Logical Versus Physical Address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging, background of virtual memory, demand paging, page replacement, page replacement algorithms, allocation of frames, thrashing

Unit-6– File System No of lectures – 04

File system concept, file access methods, directory structure, file-system mounting, directory implementation, allocation methods, free-space management

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- **Internal Continuous Assessment (ICA)**
  ICA consists of minimum eight experiments based on following topics-
  1. Linux commands
  2. File creation
  3. Finding Process id's
  4. Threads, child processes
  5. Simulation of process scheduling algorithm
  6. Simulation of page replacement algorithm

- **Textbooks:**
  1. Operating System concepts, Silberschatz, Galvin, 7th or 8th Edition - John Wiley Publications
  2. Operating Systems: Internals and Design Principles by William Stallings, 7th Edition, PHI
  3. The design of Unix Operating Systems- Maurice J. Bach , PHI

- **Reference Books:**
  1. Operating system with case studies in UNIX, Netware and Windows NT by Achyut Godbole (TMGH).
  2. Operating Systems, Harvey M. Deitel, David R. Choffnes and Paul J. Deitel, 3rd Edition, by Pearson Education.

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6CC3T IMAGE PROCESSING

Teaching Scheme:
Lectures- 3 Hours /week, 3 Credits
Tutorial –1 Hour /week , 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

Following the explosion of internet during 1970s and 1980s, the last three decades were characterized by a maturing of the field image processing and reflected into significance growth of active applications in the areas of biometrics, biomedical imaging, remote sensing, technical diagnostics, autonomous vehicle guidance and image analytics. This course is designed to understand and learn image processing operations and algorithms. To expose students to current trends in field of digital image processing

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Course Prerequisite:
Student shall have basic knowledge of digital signal processing, Knowledge of Mathematics and matrix theory and operations.

Course Objectives:

1. To activate student's interest for digital image processing fundamentals and applications.
2. To introduce to student image processing operations in spatial and frequency domain.
3. To introduce to student preliminary operations and algorithms for image analysis and description.
4. To make student understand necessity and techniques for image compression.
5. To expose students to current trends in field of digital image processing.

Course Outcomes:
After completing this course, student shall be able to -

1. Review the formation of digital image and its various formats.
2. Compare various filtering techniques in spatial domain and frequency domain.
3. Implement various algorithms on core image processing on MATLAB/Python software
4. Correlate color domain image processing technique with gray level.
5. Create MATLAB / Python program to apply compression operators and Image segmentation.

SECTION I

Unit 1–Fundamentals of Digital Image Processing No of lectures–08

Fields of use of digital image processing, fundamental steps in digital image processing, sampling & quantization, representation, spatial & intensity resolution, neighborhood, connectivity of pixels, distance measurement, matrix operations, spatial operations, and basics of transform domain, color models &conversion

Unit 2–Image Transforms No of lectures–07

Discrete Fourier transform, discrete cosine transforms, wavelet transform, Eigen analysis, singular valued composition, principle component analysis

Unit 3–Image Preprocessing No of lectures –07

Pixel brightness transformations, geometric transformations, local pre processing, preprocessing in frequency domain, detection of maximally stable regions, image restoration in spatial domain &frequency domain

SECTION II

Unit 4– Image Analysis No of lectures –06

Edge detection, line detection, corner detection, boundary detection, Hough transform, threshold, edge based segmentation, region based segmentation-splitting, merging, matching

Unit 5-Image Representation & Description No of lectures –06

Chain code, polygon approximation, signature, skeleton, shape number, Fourier descriptor, regional descriptors, texture and statistical texture description

Unit 6- Color Image Fundamentals: No of lectures –05

Color Models, Representation of Color in Images, Color Image Processing. Basics of Color Image Processing Smoothing and Sharpening

Unit 7–Image Compression No of lectures –05

Transforms for image compressions, predictive compression, vector quantization, hierarchical & progressive compression, coding, JPEG & MPEG

- **Internal Continuous Assessment:**

ICA shall be based on practical's covering MATLAB /Python implementation of above concepts.

- **Text books and Reference books:**

1. Digital Image Processing ; R.C.Gonzalez, R.E.Woods; 2nd Edition; Pearson Education
2. Digital Image Processing using MATLAB ;R.C.Gonzalez, R.E.Woods; 2nd Edition; Pearson Education
3. Digital Image Processing & Computer Vision; Milman Sonka, Vaclav Hlavac, Roger Boyle; Cengage Learning
4. Digital Image Processing-An Algorithmic Approach; Madhuri A. Joshi; Prentice Hall of India Pvt Ltd.

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6CC4T MACHINE LEARNING

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Practical –2 Hours / week,1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks
POE- 50 Marks

Machine learning is concerned with the computer programs that have the ability to automatically learn and improve from experience without being explicitly programmed. ML is the fuel that drives the new age digital world. This course provides a foundational understanding of few preliminary machine learning models of supervised and unsupervised learning as well as demonstrates how these models can solve variety of complex problems.

Course Prerequisite:

Student shall have basic knowledge of probability theory, statistics and Python programming

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Course Objectives:

1. To make student comprehend basics of machine learning
2. To introduce to students' preliminary models for supervised learning
3. To introduce to students' preliminary models for unsupervised learning
4. To give student overview of various complex problems that can be solved using machine learning models

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Course Outcomes:

After completing this course, student shall be able to -

1. Describe basic of machine learning theory.
2. Apply preliminary supervised learning models.
3. Apply preliminary unsupervised learning models.
4. Analyze ANN and deep learning models.
5. Interpret the need and different applications of machine learning.

SECTION-I

Unit 1: Introduction to Machine Learning No. of Lecture-10

Types of ML - supervised, unsupervised, reinforcement, steps in ML, types of data in ML, selecting model, training, testing, validation, under fitting & over fitting bias- variance, features, feature transformation, encoding

Unit 2: Supervised Learning No. of Lectures -12

Classification: Bayes theorem, Naïve Bayes classifier, K nearest neighbor, decision tree

Regression: simple linear, multiple linear, polynomial, logistic

Performance evaluation of supervised learning models

SECTION II

Unit 3: Unsupervised Learning No. of Lecture-07

Clustering, finding patterns using association mining, Performance evaluation of unsupervised learning models

Unit 4: Artificial Neural Networks and Deep Learning No. of Lecture-09

Perceptron, activation functions, multilayer feed forward ANN, back propagation, hyper parameters, convolution neural networks, guided back propagation, transfer learning

Unit 5: Applications of Machine Learning No. of Lecture-06

Overview of applications of machine learning for classification, regression, clustering in the area of image / video processing, speech processing, recommendation systems etc

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- **Internal Continuous Assessment (ICA)**

  ICA consists of minimum eight experiments requiring students to implement and validate machine learning models using Python/R/Weka/MATLAB or any other machine learning toolkits

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- **Textbooks:**
  1. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson
  2. Machine Learning, Tom M. Mitchell, McGraw Hill (India) Pvt Ltd
  3. Machine Learning For Dummies by John Paul Mueller , Luca Massaron (Published by For Dummies; First edition)

- **Reference Books:**
  1. Introduction to Machine Learning, Alpaydin, Ethem, The MIT Press
  2. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer

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Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

CORE ELECTIVE I

21ECU6E15T POWER ELECTRONICS

Teaching Scheme
Lectures –3 Hours/week, 3 Credits
Tutorial –1 Hours/week, 1 Credit

Examination Scheme
ESE–60 Marks
ISE- 40 Marks
ICA–25 Marks

Power electronics deals with the application of solid-state electronics for the control and conversion of electric power techniques, which require switching on and off of power devices. It provides analysis of power electronics applications such as single phase & three phase controlled rectifiers, choppers, inverters and cycloconverters. It also deals with application of power electronics converters like closed loop control of AC and DC.

Course Prerequisite:

Student has completed a comprehensive course in analog electronics circuit shall have an understanding and the ability to analyze circuits containing semiconductor devices. Student also has knowledge of circuit analysis, differential equations and linear algebra.

Course Objectives:

1. To make student understand construction, characteristics of thyristor and different types of protection and commutation circuits for power devices.
2. To make student analyze switching behavior of the single phase and three phase controlled rectifiers.
3. To make student understand the operation and analysis of choppers.
4. To make student analyze switching behavior of single phase and three phase cycloconverter.
5. To make student understand switching behavior and analysis of single phase and three phase voltage source inverters
6. To make student acquainted with the applications of power electronic converters in AC and DC drives.

Course Outcomes:

After completing this course, student shall able to -

1. Illustrate the characteristics of thyristor and analyze different types of protection & commutation circuits.
2. Design and analyze single phase and three phase controlled rectifiers.
3. Design and analyze different types of choppers.
4. Analyze single phase and three phase voltage source inverters and cycloconverters
5. Evaluate power electronics applications to control AC and DC drives

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SECTION I

Unit 1 - Thyristor: Principles and Characteristics: No. of lectures – 08

Construction, V-I characteristics, two transistor analogy, turn on methods of thyristor, thyristor protection circuit: dv/dt, di/dt, over voltage and over current protection circuit, gate protection, design of snubber circuit and di/dt inductance, thyristor commutation techniques- Class A, Class B, Class C, Class D, Class E and Class F

Unit 2 – Single Phase Controlled Rectifier No. of lectures –06

Half wave and full wave controlled rectifiers; half controlled and fully controlled bridge rectifiers with R, R-L load, dual converter, microcontroller / DSP based firing scheme for single phase controlled rectifiers

Unit 3- Three Phase Controlled Rectifiers No. of lectures-06

Analysis of three phase half wave controlled rectifier with R and RL load, expressions for average output voltage, RMS output voltage; bridge converters: analysis of three phase half controlled and full controlled converters with R and RL load: expressions for average output voltage, RMS output voltage; microcontroller/DSP based firing scheme for three phase controlled rectifiers

SECTION II

Unit 4 - Choppers: No. of lectures – 07

Principle of step-down and step-up chopper, control techniques of chopper; chopper classification: single quadrant, two quadrants, four quadrants; thyristor chopper circuits: voltage commutated chopper, current commutated chopper, load commutated chopper, Jones Chopper and Morgan Chopper; multiphase choppers

Unit 5 - Cycloconverter No. of lectures – 04

Single phase to single phase cycloconverter:-mid-point and bridge type cycloconverter; three phase to single phase cycloconverter with R load, three phase to three phase three pulse and six pulse converter, control scheme for cycloconverter

Unit 6- Inverters No. of lectures – 08

Classification of inverters, single phase voltage source inverter: half bridge & full bridge inverter with R and RL load; Fourier analysis of single phase inverter output voltage; three phase bridge inverters – 180 & 120 degree conduction modes, voltage control in single phase inverters; PWM techniques-Single, multiple and sinusoidal PWM; reduction of harmonics in inverter output voltage: PWM, transformer connection and stepped wave inverters; basic series inverter, basic parallel inverter.

Unit 7- Control of AC & DC drive **N**o. of lectures – 03

Closed loop speed control of AC drive: single quadrant, four quadrants, speed control using microcontroller / DSP controller, fuzzy logic control of ac drive, closed loop control of DC drive - voltage and current feedback with microcontroller / DSP controller, fuzzy logic control of DC drive

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- **Internal Continuous Assessment (ICA)**
  ICA consists of minimum one assignment based on each unit - may be comprising of design, analysis and simulation.

- **Text Books:**
  1. Power Electronics; M.H. Rashid; 3rd Edition; Pearson Education
  2. Power Electronics; M. D. Singh & K. B. Khanchandani; 2nd Edition; Tata McGraw Hill
  3. Power Electronics; Dr. P. S. Bimbra; Khanna Publishers

- **Reference Books:**
  1. Industrial and Power Electronics; Dr.Maneesha Gupta and G.K.Mithal; Khanna Publishers
  2. Power Electronics; P.C. Sen; Tata McGraw Hill
  3. Power Electronics; Vedam Subrahmanyam; New Age International Publishers
  4. Power Electronics; Mohan, Undeland, Riobbins; 3rd Edition; Wiley
  5. Power Electronics and its Applications; Alok Jain; Penram International Publishing Pvt Ltd.

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

CORE ELECTIVE I

21ECU6E25T ARTIFICIAL INTELLIGENCE

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Tutorial –1 Hour / week, 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks

This course presents a basic introduction to the techniques used in developing artificial intelligent systems. It is a walkthrough to problem spaces and search algorithms, knowledge representation, reasoning, logic programming and applications of artificial intelligence.

Course Prerequisite:
Student shall have fundamental knowledge of algorithms

Course Objectives:

1. To present to student general overview of AI with its future prospects
2. To make student understand various problem solving methods through search techniques
3. To make student understand the various methods for knowledge representation and reasoning
4. To make student understand the various methods for decision making
5. To make student comprehend learning and knowledge acquisition concepts

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Course Outcomes:

After completing this course, student shall be able to -

1. Formulate and solve sequence of actions for an agent as a search problem.
2. Infer from represented knowledge using logical and probabilistic reasoning methods
3. Solve agent decision problems using probability theory
4. Explain forms of learning and demonstrate their working.

SECTION-I

Unit 1: Overview No. of lectures – 06

Foundations, scope, problems, and approaches of AI, intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents

Unit 2: Problem-Solving through Search No. of lectures – 07

Forward and backward, state-space, blind, heuristic, problem-reduction, A, A, AO, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications

Unit 3: Knowledge Representation and Reasoning No. of lectures – 07

Ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; first order logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications

SECTION II

Unit 4: Representing and Reasoning with Uncertain Knowledge No of lectures – 07

Probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, and sample applications

Unit 5: Decision-Making No of lectures – 06

Basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications

Unit 6: Learning and Knowledge Acquisition No of lectures – 07

A bird's eye view, scalability issues and the streaming scenario, a stroll through some application scenarios

Unit 7: Conclusion No of lectures- 03

Philosophical foundations, AI: the present and future

- **Internal Continuous Assessment (ICA)**

  ICA shall consist of minimum 08 assignments based on the following topics.

  1. Intelligent agents
  2. Problem solving through search
  3. First order logic
  4. Bayesian networks
  5. Decision and game theory
  6. Statistical learning
  7. Q-learning.

- **Text Books:**

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall
2. A First Course in Artificial Intelligence, Deepak Khemani, McGraw Hill Education (India)
3. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.

- **Reference Book:**

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw Hill

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Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

CORE ELECTIVE I

21ECU6E35T NETWORK SECURITY

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Tutorial –1 Hour / week, 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

Network security is a broad term that covers a multitude of technologies, devices and processes. In its simplest term, it is a set of rules and configurations designed to protect the integrity, confidentiality and accessibility of computer networks and data using both software and hardware technologies.

Course Prerequisite:

Knowledge of networking fundamentals and technologies.

Course Objectives:

1. To introduce to students need, basic principles and applications of cryptography and network security
2. To introduce to students various algorithms for public key cryptography
3. To introduce to students various hash function codes
4. To introduce to students various message authentication codes
5. To introduce to students various network access control cloud security and electronic mail security methods

Course Outcomes:

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

1. Evaluate need and applications of cryptography and network security and can explain its basic principles
2. Evaluate various algorithms for public key cryptography
3. Apply various hash function code methods
4. Analyze various message authentication codes
5. Analyze various network access control and cloud security methods
6. Analyze various electronic mail security methods

SECTION - I

Unit 1- Introduction to Network Security No. of Lectures- 10

OSI security architecture, classical encryption techniques: symmetric cipher model, substitution techniques, transportation techniques. block ciphers and data encryption standards: traditional block cipher structure, the data encryption standard, a DES example, the strength of DES. advanced encryption standard: AES transformation functions, AES key expansion, an aes example, AES implementation

Unit 2 -Public Key Cryptography and RSA No. of Lectures- 10

Principles of public-key cryptosystems, the RSA algorithm, other public-key cryptosystems: diffie-hellman key exchange, elgamal cryptographic system, elliptic curve arithmetic, elliptic curve cryptography, pseudorandom number generation based on an asymmetric cipher

Unit 3 -Cryptographic Hash Functions No. of Lectures- 04

Cryptographic hash functions: applications of cryptographic hash functions, two simple hash functions, hash functions based on cipher block chaining, secure hash algorithm (SHA), SHA-3

SECTION - II

Unit 4 -Message Authentication Codes No. of Lectures- 06

Message authentication codes: message authentication requirements, message authentication functions, requirements for message authentication codes, security of MACs, MACs based on hash functions: HMAC, MACs based on block ciphers: DAA and CMAC, authenticated encryption: CCM and GCM, pseudorandom number generation using hash functions and MACs, digital signatures: digital signatures, Elgamal digital signature scheme, Schnorr digital signature scheme, NIST digital signature algorithm, elliptic curve digital signature algorithm, RSA-PSS digital signature algorithm

Unit 5 -Network Access Control and Cloud Security No. of Lectures- 05

Network access control and cloud security: network access control, extensible authentication protocol, IEEE 802.1X port-based network access control, wireless network security: wireless security, mobile device security, IEEE 802.11 wireless lan overview, IEEE 802.11i Wireless LAN Security

Unit 6 -Electronic Mail Security No. of Lectures- 10

Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME, Pretty Good Privacy, DNSSEC, DNS-Based Authentication of Named Entities, Sender Policy Framework, Domain Keys Identified Mail. IP Security: Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange

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- **Internal Continuous Assessment (ICA)**
  Minimum 12 assignments on above topics.

- **Textbooks**

1. Cryptography and Network Security - Principles and Practices, William Stallings Pearson Education Limited, 7th Edition, 2017. ISBN-13: 978-0134444284 ISBN-10: 0134444280.
2. Cryptography and Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, 2008, ISBN-13: 978-0-13-187319-3. RV College of Engineering® Digital Communication Engineering 10
3. Computer Security: Principles and Practice, William Stallings, Lawrie Brown, Pearson Education Limited, 4th Edition. ISBN-10: 9780134794105.
4. Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2003, ISBN-81:203-2186-3

Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6CC6P JAVASCRIPT PROGRAMMING

Teaching Scheme:
Lectures - 2 Hours / week, 2 Credits
Practical –2 Hours / week, 1 Credit

Examination Scheme
ICA- 25 Marks
POE - 25 Marks

JavaScript is a fundamental language for building web applications, which can be useful for building user interfaces for IoT (Internet of Things) devices and other electronic systems. JavaScript is a universal language that can run on multiple platforms, making it a useful tool for developing cross-platform applications. JavaScript can be used to create interactive applications, such as real-time data visualization, which can be useful for monitoring and controlling electronic systems. JavaScript is the default language for various popular frameworks like react and Angular.

Course Prerequisite:
Students should have knowledge of basic programming. They should also have basic knowledge of OOP and interpreted languages like python.

Course Objectives:

1. Fundamentals: Understanding the basics of the JavaScript language syntax, data types, variables, operators, functions, arrays, and objects.
2. Web Development: Knowledge of how to use JavaScript in conjunction with HTML and CSS to create dynamic, interactive web pages.
3. DOM manipulation: Knowledge of how to access and manipulate the Document Object Model (DOM) using JavaScript to dynamically update a web page's content, style, and behavior.
4. Event handling: Understanding how to handle user events such as clicks, hover, and keyboard events and respond to them with JavaScript.
5. Asynchronous programming: Understanding of asynchronous programming concepts and techniques, such as promises, callbacks, and async/await, to handle asynchronous events and network requests.

Course Outcomes:
After completing this course, students will be able to-

1. Describe core concepts of JavaScript such as data types, variables, operators, loops, functions, arrays, and objects.
2. Write, debug and maintain complex JavaScript code.
3. Evaluate JavaScript syntax and features, such as arrow functions, template literals, de-structuring, and more.
4. Implement web development concepts, such as DOM manipulation, event handling, and asynchronous programming.
5. Design interactive web applications using JavaScript, HTML, and CSS.

SECTION-I

Unit 1 - Introduction to JavaScript No of lectures – 08

Introduction to JavaScript, History of JavaScript, ES5 and ES6 standards, The role of JavaScript in web development, Setting up a development environment.

JavaScript Fundamentals: Variables, data types, and operators, arrays, objects, Conditional statements and loops, Functions and scope.

Unit 2 – HTML 5 No of lectures – 03

Introduction to HTML and its history, Basic structure of an HTML document, HTML tags and elements (headings, paragraphs, lists, links, images, etc.), HTML forms and inputs, Semantic HTML and accessibility.

Unit 3 – CSS 3 No. of lectures – 04

Introduction to CSS and its use in styling HTML pages, CSS selectors and units of measurement, CSS box model and layout, CSS properties (color, font, background, text, etc.), CSS frameworks and responsive design

SECTION II

Unit 4 – Understanding Browser and DOM No. of lectures – 06

Understanding the Document, Window, and Event objects, DOM API for Selecting and manipulating HTML elements: document.getElementByXX, document query Selector, and others. Inner HTML, inner Text, and text Content properties of elements, create new elements, remove existing elements, setting CSS properties.

Handling events and user interaction: user events such as clicks, hover, and form submissions, attaching event listeners to elements.

Unit 5 – Advanced JavaScript features No. of lectures – 04

ES5/ES6 features, Arrow functions, template literals, de-structuring, closures and scope chains, prototypes and inheritance, Classes, Modules, and object-oriented programming in JavaScript.

Unit 6 – Asynchronous JavaScript No. of lectures – 04

Understanding asynchronous programming, Callbacks, Promises, Observables, Async/Await, executing network requests using Fetch API, and Introduction to RxJS.

- **Internal Continuous Assessment (ICA)**

  ICA consists of 10 to 12 programming assignments based on the above curriculum. All must follow ES5/ES6 standards. A few guidelines can be given below:

  1. Programming assignments based on identifiers and data types.
  2. Programming assignments based on operators, statements, and expression
  3. Programming assignments based on loops
  4. Programming assignments based on functions
  5. Programming assignments based on arrays and objects
  6. Programming assignments based on ES5/ES6 classes
  7. Programming assignments based on event handling using HTML and CSS
  8. Programming assignments based on async/await and promise
  9. A Simple web Application featuring DOM Manipulation.
  10. A simple web application featuring a browser-based game.
  11. A Simple web application featuring fetch API
  12. A Simple web application featuring Classes and Modules

  At the end of the semester, students are encouraged to submit a small web application as a mini-project assignment. The course instructor can form the group and assign the topics.

- **Textbooks:**

1. JavaScript: The Definitive Guide, Sixth Edition by David Flanagan, O'Reilly Publication
2. Professional JavaScript for Web Developers by Nicholas Zakas, Wrox Publication.
3. Sams Teach Yourself HTML, CSS, and JavaScript All in One, Third Edition, Jennifer Kyrnin, Julie Meloni by Pearson Education, Inc
4. Website Design and Development with HTML5 and CSS3, Hassen Ben Rebah, Hafedh Boukthir, Antoine Chédebois, by Wiley Publications

- **Reference Books and Online Resourses:**

1. HTML5 & CSS3: A Step-by-Step guide for beginners to build and design responsive and engaging websites, by Maurer, Andreas. Pearson Publication
2. HTML, CSS, and JS reference documentation at MDN Web Docs – https://developer.mozilla.org/en

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Walchand Institute of Technology, Solapur

T.Y B. Tech (Electronics and Computer Engineering) Semester-VI

21ECU6MP7L MINI PROJECT

Teaching Scheme:
Practical - 2 Hours / week, 1 Credits

Examination Scheme
OE- 25 Marks
ICA - 25 Marks

This course is designed to give third year Electronics and Computer Engineering students hands-on experience in designing and implementing a mini project in their area of interest. Students will work in small group of three to identify a project idea, conduct background research, and develop a project proposal. The course will cover various aspects of project development including project planning, design, implementation, testing, documentation, and presentation. Students will also learn important project management skills such as teamwork, communication, and time management

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Course Prerequisite:

Students are expected to have a solid foundation in electronics and computer engineering concepts, including programming, circuits, and microcontrollers. Students should also have completed courses in digital electronics and microprocessor systems and various programming language knowledge will help in versatile implementation.

Course Objectives:

1. To enable students to gain hands-on experience in designing and implementing a mini project in their area of interest.
2. To enhance students' skills in testing and debugging a project to ensure it meets the desired specifications.
3. To prepare students for future engineering projects, where they will need to manage a team, communicate effectively, and implement a project to meet specific goals.
4. To provide an opportunity for students to showcase their engineering skills and creativity by presenting their projects to the class and a panel of judges.
5. To promote critical thinking, problem-solving, and creativity in the context of a practical engineering project

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Course Outcomes:

After completing this course, student shall be able to -

1. Identify a problem related to industry and society
2. Describe strategy or methodology to solve the problem undertaken.
3. Select appropriate hardware and software tools to solve problems
4. Test and debug a project to ensure it meets the desired specifications.
5. Document a project effectively and present it clearly and professionally

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Course Curriculum:

Throughout the course, students will work in small groups to identify a project idea, conduct background research, and develop a project proposal. They will then plan and implement their project, and test and debug it to ensure it meets the desired specifications. Students will document their project effectively and present it clearly and professionally to the class and a panel of judges. By the end of the course, students will have gained valuable experience in project development and management, as well as enhanced their engineering skills and creativity.

Guidelines:

1. Project group shall consist of maximum 3 students.
2. Students can choose project topic in the fields mentioned in (not limited) in the following table.

Hardware Based	Software Based
Internet of Things (IoT)	Computer Vision
Robotics	Artificial Intelligence
Embedded Systems	Security and Privacy
Biomedical Engineering	Web Development
VLSI Design	Mobile Application Development

Students are encouraged to select a domain or field that aligns with their interests and expertise, and that addresses a real-world problem or need.

3. Students are encouraged to undertake industry collaborated topics for mini project
4. Undertaking Innovative Product development ideas will be appreciated

Assessment Guidelines:

Below scheme is recommended for assessment of mini project–

Hardware Based		Software Based	
1. Selection of the project and pre circuit testing,	20%	1.Algorithm design, UI / UX, Database Design	20%
2.Circuit design, simulation, PCB and assembly	30%	2. Software Low Level Design, UML, ER diagrams	30%
3.Results/Output from final assembly	10%	3. Results/Output from final Demonstration	10%
4.Miniproject presentation seminar	20%	4. Mini Project presentation seminar	20%
5.Project Report	20%	5.Project Report	20%