PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018

(AUTONOMOUS)

B.E - CSE (INTERNET OF THINGS)

REGULATIONS - 2019

CHOICE BASED CREDIT SYSTEM

CURRICULUM

(For the students admitted in the academic year 2022-2023)

SEMESTER III

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	HS	GE20301	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	1
2.	BS	MA20303	Discrete Mathematics	3	1	0	4
3.	ES	EC20308	Digital Principles and System Design	3	0	0	3
4.	PC	CI20301	Object Oriented Programming	3	0	0	3
5.	PC	CI20302	Embedded Systems in IOT	3	0	0	3
6.	PC	CI20303	Computer Architecture	3	0	0	3
7.	MC	MC20301	Value Education	2	0	0	0
Practical							
8.	ES	EC20309	Digital Laboratory	0	0	4	2
9.	PC	CI20304	Object Oriented Programming Laboratory	0	0	2	1
10.	PC	CI20305	Embedded Systems Laboratory	0	0	4	2
11.	EE	EN20301	English Proficiency Course Laboratory	0	0	2	1
			TOTAL	**17**	**1**	**12**	**23**

SEMESTER IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	BS	MA20403	Probability and Statistics	3	1	0	4
2.	ES	CI20401	Computer Networks	3	0	0	3
3.	PC	CI20402	Introduction to Internet of Things	3	0	0	3
4.	PC	CI20403	Software Engineering	3	0	0	3
5.	PC	CI20404	Python Programming	3	0	0	3
6.	ES	EC20407	Microprocessors and Microcontrollers	3	0	0	3
Practical							
7.	PC	CI20405	Computer Networks Laboratory	0	0	2	1
8.	PC	CI20406	Python Programming Laboratory	0	0	2	1
			TOTAL	**18**	**1**	**04**	**21**

PAAVAI ENGINEERING COLLEGE, NAMAKKAL BOARD OF STUDIES B.E. CSE (IOT) 10/7/23 AUTONOMOUS

GE20301

தமிழரும் தொழில்நுட்பமும்

L	T	P	C
1	0	0	1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்

அலகு II வடுவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் &சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை வடிவமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை

அலகு III உற்பத்தி தொழில் நுட்பம் 3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பு உருக்குதல், எஃகு - வரலாற்றுச் சின்னங்களாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் -எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம் 3

அணை - ஏரிகுளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு -அறிவுசார் சமூகம்

அலகு V *அறிவியல் தமிழ் மற்றும் கணித்தமிழ்* 3

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்

TOTAL PERIODS: 15

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை. (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subramanian, Dr.K.D.Thirunavukkarasu)
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by International institute of Tamil Studies)
9. Keeladi – 'Sangam City Civilzation on the vanks of river vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by the author)
11. Porunai Civilization (Jointly Published by Department of Arcaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to vaigai (R.Balakrishnan) (Published by RMRL) – Reference Book

GE20301	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

TOTAL PERIODS: 15

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை. (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).

5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International institute of Tamil Studies.
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8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by International institute of Tamil Studies)
9. Keeladi – 'Sangam City Civilzation on the vanks of river vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by the author)
11. Porunai Civilization (Jointly Published by Department of Arcaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to vaigai (R.Balakrishnan) (Published by RMRL) – Reference Book

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
10/7/23
AUTONOMOUS

MA20303 **DISCRETE MATHEMATICS** **3 1 0 4**

Common to CSE, CSE(IOT), CSE(AIML), Cyber

OBJECTIVES

To enable the students to

- interpret the introductory concepts of Logic, which will enable them to model and analyze Physical phenomena involving arguments.
- implement the definitions of relevant vocabulary from quantifiers and inference and be able to perform related calculations.
- summarize and apply the methodologies involved in solving problems related to fundamental principles of sets and Implement the mathematical ideas for relations.
- solve problems using recurrence relations and recursion to analyze algorithms
- acquire knowledge and understand the concepts of lattices.

UNIT I PROPOSITIONAL CALCULUS **12**

Propositions - Logical connectives , Compound propositions , Conditional and biconditional propositions, Truth tables; Tautologies and contradictions; Contrapositive; Logical equivalences and implications – De Morgan's Laws, Normal forms, Principal conjunctive and disjunctive normal forms; Rules of inference; Arguments - Validity of arguments.

UNIT II PREDICATE CALCULUS **12**

Predicates - Statement function, Variables, Free and bound variables; Quantifiers; Universe of discourse ; Logical equivalences and implications for quantified statements ; Theory of inference - The rules of universal specification and generalization ; Validity of arguments.

UNIT III SET THEORY **12**

Basic concepts - Notations, Subset, Algebra of sets, The power set; Ordered pairs and Cartesian product; Relations on sets - Types of relations and their properties, Relational matrix and the graph of relation; Partitions; Equivalence relations.

UNIT IV FUNCTIONS **12**

Definitions of functions , Classification of functions, Type of functions, Examples, Composition of functions, Inverse functions; Binary and n-ary operations; Characteristic function of a set; Hashing functions; Recursive functions; Permutation functions.

UNIT V LATTICE THEORY **12**

Partial ordering - Posets, Lattices as Posets, Properties of lattices, Lattices as Algebraic systems, Sub lattices; Direct product and Homomorphism; Some Special lattices.

TOTAL PERIODS: 60

OUTCOMES

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

- interpret the concepts of direct proof, indirect proof and proof by contradiction and verify the validity of an argument using propositional and predicate logic.
- have substantial experience to comprehend formal logical arguments.
- understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- use effectively algebraic techniques to analyse basic discrete structures and algorithms.
- perform operations on discrete structures such as sets, functions, relations, and sequences

TEXT BOOKS

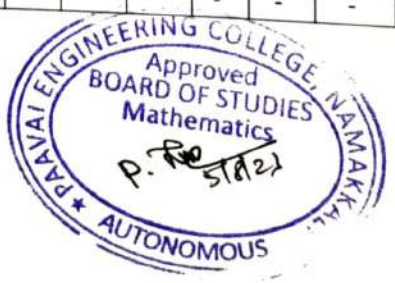
1. Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2010.
2. Kenneth H.Rosen, "Discrete Mathematics and its Applications (with Combinatorics and Graph Theory)", 6th Edition, Tata McGraw-Hill, 5th Reprint 2008.
3. Trembly J.P and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, 35th Reprint 2008.

REFERENCE BOOKS

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction ", 4th Edition, Pearson Education, 2002.
2. A. Tamilarasi, A. M. Natarajan, "Discrete Mathematics and its Applications", 3rd Edition, Khanna Publishers, 2008.
3. T. Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw – Hill, 2007.

CO/PO Mapping:

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium,1-Weak														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO2	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	2	2	3	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	3	-	-



EC20308 DIGITAL PRINCIPLES AND SYSTEM DESIGN 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the fundamentals and simplification of digital logic.
- design the various combinational logic circuits using logic gates.
- know the design procedures for synchronous sequential circuits.
- implement the asynchronous sequential circuits.
- acquire basic knowledge about memory devices and HDL programming.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Boolean laws and theorems - De-Morgan's Theorem- Boolean functions - Canonical and Standard Forms - Sum of products and product of sums, Simplifications of Boolean functions using Karnaugh map and Quine McClusky methods – Implementation of Boolean functions using logic gates - NAND -NOR implementations.

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure of Combinational circuits - Adders, Subtractors, Carry look ahead adder, BCD adder, Multiplexer, De-multiplexer, Decoder, Encoder, Priority encoder, 2-bit Magnitude comparator; Code converters, Parity Generator and Checker.

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip flops - SR, JK, D and T; Realization of flip flop using other flip flops; Asynchronous and Synchronous counters; Classification of sequential circuits - Moore and Mealy; Design of Synchronous counters - Modulo - N counter; Shift registers.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Design of fundamental mode circuits - Primitive flow table, Minimization of Primitive flow table, State assignment table, Excitation table; Cycles - Race Free State assignment; Hazards- Static, Dynamic, Essential Hazards, Hazards free elimination.

UNIT V MEMORY DEVICES AND INTRODUCTION TO HDL 9

Classification of memories - ROM organization, types; RAM - RAM organization, Write operation, Read operation, Static RAM Cell, Bipolar RAM cell, Dynamic RAM cell; Programmable Logic Devices - PLA, PAL; Introduction to HDL - HDL Models of Combinational circuits, HDL Models of Sequential Circuits.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concept of Boolean algebra, K map and tabulation method in digital circuits.
- design and implement combinational circuits for various real time applications.
- construct sequential logic circuits using flipflops.
- analyze the asynchronous sequential circuits.
- optimize the concepts of memory devices, PLDs and HDL programming.

TEXT BOOKS

1. M. Morris Mano, "Digital Design", 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi,2003.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson/ Brookscole, 2005. (Unit V).

REFERENCES

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 3rd Edition, Vikas Publishing House Pvt.Ltd, New Delhi. 2007.
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
3. Charles H.Roth, "Fundamentals of Logic Design", Thomson Publication Company, 2003.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th edition, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2003.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
Cos	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	2	-	-	3	3	3

CI20301	OBJECT ORIENTED PROGRAMMING	3	0	0	3

COURSE OBJECTIVES

To enable the students to

- understand the Object-Oriented Programming concepts.
- study the concept of constructor and operator overloading.
- learn the basic concepts of inheritance and utilization.
- know the concepts of Java using Packages and Arrays.
- study of Interface and I/O streams.

UNIT I INTRODUCTION 9

Object-Oriented Paradigm - Elements of Object Oriented Programming, Merits and Demerits of OO Methodology; C++ fundamentals - Classes and Objects, Function, Function overloading, Static data and member functions, inline function.

UNIT II CONSTRUCTOR AND OPERATOR OVERLOADING 9

Constructor - Copy Constructors, and Default Arguments; Array of Objects - Pointer to Object member; Friend Function; Operator Overloading - binary and Unary operator overloading.

UNIT III TEMPLATE AND INHERITENCE 9

Templates - Function Template, Class Template; Inheritance - Derived class, Abstract class, Types of Inheritance; Virtual Functions; Exception Handling.

UNIT IV INTRODUCTION TO JAVA 9

Introduction to JAVA - bytecode, virtual machines, objects, classes, Javadoc, packages, Arrays, Strings.

UNIT V INHERITANCE, THREADING AND I/O 9

Inheritance; interfaces and inner classes; exception handling; threads; Streams and I/O.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- utilize the principles of Object-Oriented Programming in program.
- develop a program using Constructor.
- utilize the inheritance and polymorphism concepts for solutions to a given problems.
- develop simple Java program using class, methods and objects.
- implement the concepts of concurrent programming.

TEXT BOOKS

1. Herbert Schildt "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003.
2. Herbert Schildt, "JAVA, The Complete Reference" Tata Mcgraw Hill, 8th edition, 2011.

REFERENCES

1. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley, 2014.
2. K.R. Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2009.
3. Bruce Eckel, "Thinking in JAVA", Prentice Hall,2006 6. Kathy Sierra, Bert Bates," Head First JAVA",O"Rielly,2005.
4. Kathy Sierra, Bert Bates," Head First JAVA",O"Rielly,2005.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
Cos	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	-	2	1	2	2
CO2	3	2	2	1	-	-	-	-	1	1	2	1	2	2
CO3	3	2	2	1	-	-	-	-	1	1	-	1	2	2
CO4	3	2	2	1	1	-	-	-	1	1	-	1	2	2
CO5	3	2	2	1	1	-	-	-	1	1	2	1	2	2

CI20302	EMBEDDED SYSTEMS IN IOT	3	0	0	3

COURSE OBJECTIVES

To enable the students to

- know the basic concept and components of embedded systems.
- understand the design of embedded systems.
- recognize the functions of real-time operating systems.
- gain knowledge about devices in embedded systems.
- develop familiarity with embedded system applications in IoT environment.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction - Classification of an embedded system -Major application areas of embedded systems - Purpose of Embedded Systems - General purpose computers vs embedded system - Typical embedded system - Core of the Embedded System - Memory - Communication interface - Embedded firmware - Other system components - PCB and passive components.

UNIT II DESIGN OF EMBEDDED SYSTEMS 9

Sensors and actuators - models of sensors and actuators, common sensors; Embedded processors-Types of processors, parallelism; Memory architecture - Memory technologies, memory hierarchy, memory models; Input and output hardware - Sequential software in a concurrent world.

UNIT III PILLARS OF EMBEDDED SYSTEMS 9

Fundamentals of Real Time Operating System(RTOS) - Types of operating systems - Multiprocessing and Multitasking -Task scheduling -Task communication -Task synchronization - Device drivers - How to choose an RTOS.

UNIT IV EMBEDDED IOT AND PHYSICAL DEVICES 9

Introduction to four pillars of IoT - M2M: The Internet of Devices – WSN: The internet of transducers – SCADA: The internet of controllers - Device: Things That Talk - Wired networks - Wireless networks; IoT Physical device and end points - Raspberry Pi - Raspberry Pi Model B, Raspberry Pi operating systems - Raspberry Pi interfaces – Sensors; Introduction to IoT security - Vulnerabilities of IoT, Security requirements, Challenges for secure IoT.

UNIT V APPLICATIONS OF EMBEDDED SYSTEMS WITH IOT 9

Trends in the embedded industry - Embedded OS trends -Development language trends - Open standards, Frameworks and alliances - Bottlenecks faced by the embedded industry - Development platform trends - Cloud, Internet of Things (IoT) and embedded systems; Applications: Washing machine - Application-Specific Embedded System , Automotive–domain specific examples of embedded system, home intrusion detection, weather monitoring system, air pollution monitoring, smart irrigation industry.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- recognize the components and classification of embedded systems.
- describe about design of embedded systems.
- Identify embedded systems using the concepts of RTOS.
- summarize the embedded IoT and physical devices.
- investigate various applications of embedded systems with IoT..

TEXT BOOKS

1. Shibu K.V , "Introduction to Embedded Systems" , Second Edition, Mc Graw Hill, 2017.
2. E. A. Lee and S.A. Seshia, "Introduction to Embedded Systems-A Cyber Physical Systems Approach", 2nd Edition, MIT Press, 2017.

REFERENCES

1. Steve Ferbur, "ARM System on Chip", Pearson, 2nd Edition, 2017.
2. Embedded Systems - Raj Kamal, Tata McGraw Hill, 4th Edition, 2020.
3. Rajkamal, "Embedded System: Architecture, Programming and Design", Tata McGraw Hill, 3rd Edition, 2017.
4. Dr. OvidiuVermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publisher, 2013.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	2	1	-	1	2	1	3	2
CO2	3	2	1	-	-	-	2	-	-	-	2	1	3	2
CO3	3	2	2	-	2	-	2	-	-	-	2	2	3	2
CO4	3	2	3	-	2	2	2	-	1	-	1	2	3	2
CO5	3	2	3	-	2	2	2	1	1	-	1	2	3	2

CI20303 **COMPUTER ARCHITECTURE** 3 0 0 3

COURSE OBJECTIVES

To enable students to

- learn the basic structure and operations of a computer.
- study the students with arithmetic and logic unit and implementation of fixed point and floating - point arithmetic unit.
- acquire knowledge about pipelining and parallel processing.
- understand the concept of virtual and cache memory.
- know the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTER SYSTEM 9

Functional Units, Basic Operational Concepts, Bus Structure, Performance, Instructions, Language of the Computer - Operations, Operands; Instruction representation, Logical operations, Execution of complete instruction, Addressing Modes.

UNIT II ARITHMETIC AND LOGIC UNIT 9

Addition and Subtraction; Multiplication; Division; Floating Point Representation - Floating Point Operations.

UNIT III PIPELINING AND PARALLEL PROCESSING 9

Pipelining Basic concepts - Data hazards, Instruction hazards, Structural Hazards; Influence on instruction sets; Data path and control considerations; Performance considerations; Exception handling; Parallel Processing Challenges; Flynn's classification - SISD, MIMD, SIMD, SPMD; Hardware multithreading.

UNIT IV MEMORY SYSTEM 9

Basic concepts - Semiconductor RAM, ROM; Cache memories - measuring and improving cache Performance; Virtual memory; Memory management requirements; Secondary storage devices.

UNIT V I/O ORGANIZATION 9

Accessing I/O devices - Programmed Input/ Output; Interrupts; Direct Memory Access; Buses; Interface circuits - Standard I/O Interfaces (PCI, SCSI, and USB); I/O devices and processors.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the basics structure and operation of a digital computer.
- utilize the operations of the arithmetic unit including the algorithms.
- implement the technique of pipelining and parallel processing.

- analyze the memory sub-systems of typical computer.
- develop the different ways of communication with I/O devices and standard I/O interfaces.

TEXT BOOKS

1. David A. Petterson and John L. Hennessey, "Computer organization and design', Morgan Kauffman / Elsevier, Fifth edition, 2014.

REFERENCES

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2012.
4. Heuring V.P. and Jordan H.F., —Computer Systems Design and Architecturel, 2nd Edition, Pearson Education, New Delhi, 2004.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	3	2	-	-	-	-	-	-	2	2	2
CO3	3	2	1	2	2	-	-	-	-	2	-	2	-	2
CO4	3	3	2	3	2	-	-	-	-	2	-	3	-	2
CO5	2	3	2	3	2	-	-	-	-	2	-	3	2	2

MC20301 **VALUE EDUCATION** 2 0 0 0

COURSE OBJECTIVES

To enable the students to

- develop the individual multi-dimensionally in physical, intellectual, emotional and spiritual dimensions.
- facilitate individuals think about and reflect on different values.
- understand their responsibility in making choices and the practical implications of expressing them.
- instigate to choose their personal, social, moral and spiritual values.
- design and chisel the overall personality of an individual.

UNIT I PERSONAL VALUES 6

Value Education - Definition, Types of values; Human values - Respect, Acceptance, Consideration, Appreciation, Listening, Openness, Affection, Patience, Honesty, Forgiveness, Sacrifice, Authenticity, Self Control, Altruism, Tolerance and Understanding, Wisdom, Decision making, Self –actualization, Character formation towards positive Personality, Contentment; -Religious Values -Humility, Sympathy and Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II SOCIAL VALUES 6

Social Values - Pity and probity - Self control - Respect to - Age, Experience, Maturity, Family members, Neighbors - Universal Brotherhood - Flexibility -Peer pressure - Sensitization towards Gender Equality, Physically challenged, Intellectually challenged - Reliability - Unity - Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition- Positive and Negative thoughts- Arrogance, Anger and Selfishness.

UNIT III ENGINEERING ETHICS 6

Professional Values - Knowledge thirst - Sincerity in profession- Regularity, Responsibility, Job Satisfaction, Punctuality and Faith - Perseverance - Courage - Competence - Co-operation - Curbing unethical practices - Integrity, Social Consciousness and Responsibility. Global Values – Ethical values of earth centric - Computer Ethics - Moral Leadership - Code of Conduct - Corporate Social Responsibility.

UNIT IV SPIRITUAL VALUES 6

Developing Spirituality - Thinking process, Moralization of Desires – Reduction of wants and freedom from greed; - Health benefits- Physical exercises - Mental peace - Meditation - Objectives, Types, Effects on body, mind and soul- Yoga - Objectives, Types, Asanas. Family values - family's structure, function, roles, beliefs, attitudes and ideals, Family Work Ethic, Family Time, Family Traditions.

UNIT V HUMAN RIGHTS 6

Classification of Human Rights - Right to Life, Liberty and Dignity- Right to Equality - Right against Exploitation - Cultural and Educational Rights- Physical assault and Sexual harassment - Domestic violence.

TOTAL PERIODS 30

COURSE OUTCOMES

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

- cultivate the values needed for peaceful living in the existing society.
- comprehend humanistic values to develop peace in the world.
- foster ethics in profession and usage of Technology.
- orient with the importance of value education towards personal, group and spiritual attributes.
- nurture physical, mental, spiritual growth to face the competitive world.

TEXT BOOKS

1. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.

REFERENCES

1. Little, William, An introduction of Ethics. Allied publisher, Indian Reprint 1955.
2. Values (Collection of Essays)". Sri Ramakrishna Math. Chennai. 1996.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	-	-	2	-	2
CO2	-	-	-	2	-	2	-	1	3	2	1	3	-	2
CO3	-	-	3	2	2	3	2	3	3	1	3	3	2	3
CO4	-	-	3	1	-	2	-	-	1	-	-	3	2	-
CO5	-	-	-	-	-	1	-	-	-	-	-	3	-	-

EC20309 **DIGITAL LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- understand the concept of Boolean theorems.
- know the concept of combinational circuits using digital logic gates.
- design and implement the combinational and sequential logic circuits using MSI devices.
- acquire knowledge about simulation of digital circuits with Verilog HDL.

LIST OF EXPERIMENTS

1 Verification of Boolean theorems using digital logic gates.

2 Design and implementation of Full and Half adders and Full and Half subtractors using logic gates.

3 Design and implementation of code converter: Binary to Gray code and Gray code to Binary code.

4 Design and implementation of 2-bit magnitude comparator.

5 Design and implementation of 4-bit binary adder / subtractor using IC7483.

6 Design and implementation of encoder and decoder using basic gates.

7 Design and implementation of multiplexers and Demultiplexers using basic gates.

8 Design and implementation of Shift registers.

9 Design and implementation of 3-bit synchronous up (or) down counter.

10 Design and Simulation of Full and Half Adders, Full and Half Sub tractors

TOTAL PERIODS 60

COURSE OUTCOMES

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

- design adders and subtractors using basic logic gates and Karnaugh map.
- create code converters using basic logic gates.
- implement the combinational logic circuits like MUX,DEMUX, Encoder, Decoder etc.
- design various counters and shift registers and simulate digital circuits using Verilog HDL.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes
(3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3

CI20304	OBJECT ORIENTED PROGRAMMING LABORATORY	0	0	2	1

COURSE OBJECTIVES

To enable students to

- understand Object Oriented Programming concepts.
- learn the various features of OOP in C++.
- acquire knowledge in concepts of reusability, platform independence in JAVA.
- study the thread-based concepts in JAVA.

LIST OF EXPERIMENTS

1 Creation of classes and use of different types of functions.

2 Programs using Constructor and Destructor

3 Count the number of objects created for a class using static member function.

4 Write programs using function overloading and operator overloading.

5 Programs using virtual function and friend functions.

6 Implementation of user defined function using exception handling mechanism.

7 Programs using function templates and class templates.

8 Develop Simple program in Java using class, objects and methods.

9 Programs for Method Overloading and Method Overriding.

10 Programs using inheritance.

11 Program to implement Inheritance, Interfaces and Packages

12 Create a thread in java using Thread and Runnable Interface.

TOTAL PERIODS 30

COURSE OUTCOMES

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

- apply class components that protect data integrity and produce classes that are re-usable and maintainable.
- analyze the C++ programs for errors and exceptions.
- develop the applications using object-oriented concepts.
- design simple Java program using class, methods and objects.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE: Turbo C++, Jdk

HARDWARE: Standalone desktops 60 Nos.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	-	2	2	-	-	-	-	-	-	-	3	3
CO2	2	1	-	2	2	-	-	-	-	-	-	-	1	3
CO3	3	2	-	2	3	-	-	-	-	-	-	-	-	3
CO4	3	-	-	2	-	-	-	-	-	-	-	-	-	3

CI20305	EMBEDDED SYSTEMS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable students to

- learn the interfacing of basic component.
- understand the Building Blocks of Embedded Systems
- acquire knowledge about interface memory and I/O with processor
- know the characteristics of Real Time Operating Systems

LIST OF EXPERIMENTS

1. Interface a simple Switch.
2. Interfacing Keyboard, LED and LCD.
3. Interrupts.
4. Temperature sensor Interfacing.
5. Stepper Motor Interfacing.
6. Interfacing ADC.
7. Interfacing DAC.
8. Interfacing Seven Segment Display.
9. Real Time Clock Interfacing.
10. Study of a type of Real Time Operating Systems (RTOS) with ARM.

TOTAL PERIODS 60

COURSE OUTCOMES

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

- recognize building blocks of embedded systems.
- understand peripheral interface with embedded system.
- illustrate the code for constructing a system.
- attain knowledge on Real Time Operating Systems using ARM.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	1	-	-	-	-	-	-	2	2	2
CO2	2	1	1	-	1	-	-	-	-	-	-	2	2	2
CO3	2	2	2	-	1	-	-	-	-	-	-	2	2	-
CO4	2	1	1	-	1	-	-	-	-	-	-	2	2	-

EN20301 **ENGLISH PROFICIENCY COURSE LABORATORY** **0 0 2 1**

COURSE OBJECTIVES

To enable students to

- familiarize with the reading skills such as skimming and scanning.
- practice writing tasks to the level expected.
- develop listening strategies such as listening for key words, making inferences and identifying main ideas.
- speak well without inhibition and to assist the students in improving their vocabulary, pronunciation and comprehension of grammar.
- enrich their LSRW skills so as to crack on-line proficiency tests and to bring their career aspirations true.

EXERCISES FOR PRACTICE

1. Listening Exercises from TOEFL
    a. Conversations, Lectures
2. Listening Exercises from IELTS
    a. Places and directions
    b. Actions and processes
3. Reading Exercises from PTE
    a. Re-order paragraphs
4. Reading Exercises from IELTS
    a. Opinions and attitudes
    b. Locating and matching information
    c. Identifying information
5. Reading Exercises from BEC Vantage & BEC Higher
    a. Error identification
    b. Gap filling
6. Writing Exercises from PTE
    a. Summarize written text
7. Writing Exercises from IELTS
    a. Describing maps
    b. Describing diagrams
8. Speaking IELTS format
    a. Talking about familiar topics
    b. Giving a talk
    c. Discussion on a Topic

TOTAL PERIODS 30

COURSE OUTCOMES

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

- skim, scan and infer the given texts and attend the tasks successfully.
- write coherently using appropriate vocabulary and grammar.
- listen to speeches and conversations and answer the questions.
- communicate fluently and effectively on any given topics.
- appear with confidence for on-line tests.

REFERENCES

1. Cambridge University Press India Pvt. Ltd, New Delhi.2016.
2. PTE Academic Test builder. Macmillan Education. London. 2012.
3. Cambridge IELTS 12 Academic Student's Book with Answers: Authentic Examination Papers (IELTS... by Cambridge University Press. New Delhi.2016
4. TOEFL iBT Prep Plus 2018-2019 4 Practice Tests) Kaplan Publishing. Newyork.2017.

WEB LINKS

1. https://magoosh.com/toefl/2018/best-toefl-books/
2. https://ptetutorials.com/
3. http://ieltsliz.com/recent-ielts-questions-and-topics/

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	2	3	-	-	-	3	2	-	-	-	2
CO2	-	-	2	2	-	-	1	1	3	2	-	2	-	2
CO3	-	-	-	-	-	3	1	2	3	2	2	3	2	-
CO4	-	-	-	-	-	2	2	3	3	2	2	-	2	-
CO5	-	-	2	-	-	1	2	-	3	3	-	1	2	3

MA20403 **PROBABILITY AND STATISTICS** **3 1 0 4**

(Common to Agri, BME, Bio-Tech, Cyber, CSE, CSE(IOT), CSE(AI&ML), IT, Food, Pharma)

OBJECTIVES

To enable the students to

- analyse the concept of Random variables and probability distribution in designing processes.
- know and differentiate the discrete and continuous two dimensional random variables.
- determine the concepts of hypotheses testing, its need and applications.
- equip with statistical techniques for designing experiments, analyzing, interpreting and presenting research data.
- emphasize the aspects of statistical tools in engineering problems.

UNIT I RANDOM VARIABLES **12**

Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of random variables.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Linear regression - Transformation of random variables –Applications of Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS **12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test for single mean and difference of means -Small samples: Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS **12**

ANOVA - One way and Two way classifications - Completely randomized design - Randomized block design - Latin square design - 2^2 factorial designs.

UNIT V STATISTICAL QUALITY CONTROL **12**

Control charts for measurements (X and R charts) - Control charts for attributes (P, C and NP charts) - Tolerance limits - Acceptance sampling.

TOTAL PERIODS: 60

OUTCOMES

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

- demonstrate the fundamental concepts of probability and probability distributions of random variables in designing process
- identify the differences in two dimensional random variables
- implement the statistical techniques to hypotheses testing of engineering and management problems
- be aware of the principles to be adopted for designing the experiments.
- compare statistical date using control chart in quality control

TEXT BOOKS

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4thEdition, 2007.
2. Johnson. R.A. and Gupta. C.B., Miller and Freund's Probability and Statistics for Engineers", PearsonEducation, Asia, 7thEdition, 2007.
3. Papoulis. A and Unnikrishnapillai. S., "Probability, Random Variables and Stochastic Processes" Mc Graw Hill Education India, 4thEdition, New Delhi, 2010.

REFERENCE BOOKS

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8thEdition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8thEdition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum"s Outline of Theory and Problems ofProbability and Statistics", Tata McGraw Hill Edition, 2004.

CO/PO Mapping:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3- Strong, 2-Medium, 1-Weak														
COs	Programmes Outcomes(POs)													
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CO2	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	3	-	-

CI20401 **COMPUTER NETWORKS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the protocol layering and physical level communication.
- analyze the performance of a network.
- understand the various components required to build different networks.
- learn the functions of network layer and the various routing protocols.
- familiarize the functions and protocols of the transport layer.

UNIT I INTRODUCTION AND PHYSICAL LAYER **9**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA-LINK LAYER & MEDIA ACCESS **9**

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices

UNIT III NETWORK LAYER **9**

Introduction-forwarding and routing-network services models– IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services –multiplexing and demultiplexing– Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS –Peer to peer applications– SNMP.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- identify the components required to build different types of networks.
- choose the required functionality at each layer for given application.
- identify solution for each functionality at each layer.
- trace the flow of information from one node to another node in the network.
- Analyze the capabilities of application layer utilities and replicate the same for new applications.

TEXTBOOKS

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2012.

REFERENCES

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw – Hill, 2013.
2. Nader. F. Mir, "Computer and Communication Networks", Second Edition, Pearson Prentice Hall Publishers, 2014.
3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2013.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
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CO2	1	2	3	1	1	-	-	-	-	-	2	-	3	2
CO3	3	2	3	-	-	-	-	-	-	-	2	-	3	2
CO4	1	3	2	2	-	-	-	-	-	-	2	-	3	2
CO5	3	2	-	-	-	-	-	-	-	-	1	-	3	3

CI20402 **INTRODUCTION TO INTERNET OF THINGS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the fundamentals of IoT.
- know the various communication protocols of IoT.
- recognize the IoT Reference Architecture.
- gain experience in Raspberry PI and Cloud Services.
- build a small, low cost IoT application and connect to the cloud.

UNIT I INTRODUCTION **9**

Definitions and functional requirements –IoT conceptual framework – IoT architectural view – Technology behind IoT - Components of Internet of Things: Control units – Sensors – Communication modules – Power sources - Communication technologies: RFID – Bluetooth – ZigBee – Wifi – RF Links – Mobile Internet – Wired Communication – M2M communication – Examples of IoT.

UNIT II IOT COMMUNICATION TECHNOLOGIES AND PROTOCOLS **9**

Sensor technology – Actuator - Participatory sensing, Industrial IoT and automotive IoT – Data acquiring and storage – Organizing the data – Analytics – Knowledge acquiring, Managing and Storing processes - Sensor data communication protocols - Functions of CoAP, MQTT, OAuth2, XMPP, CoAP vs HTTP, CoAP Structure Model, Security Protocol and Application for CoAP.

UNIT III IOT PLATFORMS **9**

Arduino Platform - Programming Arduino for the Internet of Things - Reading from Sensors - Communication: Connecting Arduino with a mobile device - Communicating using Bluetooth - Communicating using USB - Connection with the Internet using Wifi / Ethernet.

UNIT IV RASPBERRY PI AND CLOUD SERVICES **9**

Basic building blocks of an IoT Device - Raspberry Pi - Linux on Raspberry Pi – Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Cloud Storage Models and Communication APIs - WAMP - AutoBahn for IoT - Xively Cloud for IoT.

UNIT V CASE STUDIES **9**

Design Layers, Design Complexity and Designing using Cloud PaaS - IoT Applications in the Premises, Supply-Chain and Customer Monitoring – Connected Car Applications and Services – IoT Applications for Smart Homes, Cities, Environment Monitoring and Agriculture – Case Study: Smart City Streetlights Control and Monitoring - Google Assistant based I/O Control.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze various protocols for IoT.
- develop web services to access/control IoT devices.
- design a portable IoT using Raspberry Pi.
- deploy an IoT application and connect to the cloud.
- analyze applications of IoT in real time scenario.

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things, A Hands -on Approach", University Press, 1st Edition, 2015.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", McGraw-Hill Education Pvt. Ltd.,1st Edition, 2018.

REFERENCES:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press, 1st Edition, 2014.
2. Charalampos Doukas, "Building Internet of Things with the Arduino", Create Space, 2nd Edition, 2013.
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From parallel processing to the Internet of Things", Morgan Kaufmann Publishers, 1st Edition, 2012.
4. Marco Schwatrz, "Internet of Things with Arduino Cookbook", Packt Publications, 1st Edition, 2016.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2	2	2	2	2	-	2	-	3
CO2	2	3	3	3	2	2	3	2	2	2	-	2	-	3
CO3	2	3	3	3	2	2	3	3	2	3	2	2	2	3
CO4	2	3	3	3	2	3	3	3	2	3	2	2	2	3
CO5	2	3	3	3	2	3	3	3	2	3	2	2	2	3

CI20403 **SOFTWARE ENGINEERING** 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn the software life cycle models and system engineering process for developing a system from scratch.
- understand fundamental concepts of requirement engineering.
- acquire knowledge about Design levels of software engineering.
- learn the various software testing methods.
- study the software project management concepts.

UNIT I SOFTWARE PROCESS 9

The Evolving role of Software, Software, The changing Nature of Software, Legacy Software, A generic view of process, A layered Technology, A Process Framework, The Capability Maturity Model Integration (CMMI), Process Assessment, Personal and Team Process Models, Product and Process; Process Models -The Waterfall Model, Incremental Process Models, Incremental Model, The RAD Model, Evolutionary Process Models, Prototyping, The Spiral Model, The Concurrent Development Model, Specialized Process Models; the Unified Process.

UNIT II SOFTWARE REQUIREMENTS AND ANALYSIS 9

Requirements Engineering, Requirements Engineering tasks, Initiating the requirements Engineering Process, Eliciting Requirements, Developing Use cases, Building the Analysis Models, Elements of the Analysis Model, Analysis pattern, Negotiating Requirements, Validating Requirements; Requirements Analysis - Analysis Modeling approaches, data modeling concepts, Object oriented Analysis, Scenario based modeling, Flow oriented Modeling, Class based modeling, creating a behavior model.

UNIT III SOFTWARE DESIGN 9

Design Engineering, Design process, Design Quality, Design model, Agile Methods, Extreme Programming, Rapid Application development, Software Prototyping, Software Reuse, Application Frameworks, Application System Reuse, Software Evolution Program Evolution Dynamics, Software Maintenance; Evolution Processes - Legacy system evolution Planning; Verification and Validation ; Software Inspections; Automated Static analysis; Verification and Formal -Methods.

UNIT IV SOFTWARE TESTING AND IMPLEMENTATION 9

Software testing fundamentals - Internal and external views of Testing, white box testing, basis path testing, control structure testing, black box testing, Regression Testing, Unit Testing, Integration Testing, Validation Testing, System Testing and Debugging.

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Software Cost Estimation – Productivity, Estimation Techniques, Algorithmic Cost Modeling, Project Duration and Staffing; Process and Product Quality - Quality Assurance and Standards, Planning, Control,

Software Measurement and Metrics; Process Improvement - Process Classification, Measurement, Analysis and Modeling, Change; Configuration Management - Planning Change Management, Version and Release Management, System Building.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze the different process models.
- apply the Requirement engineering process with emphasis on elicitation analysis and modelling for any given software requirement.
- implement the different methods for the design of a software system.
- utilize the software testing methods.
- create and maintain documentation for software engineering process.

TEXT BOOKS

1. Roger S.Pressman, "Software Engineering: A Practitioner's Approach", Mc-Graw Hill International, Eighth edition, 2015. (UNIT-I, II, IV).
2. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education,2011. (UNIT-III, V).

REFERENCES:

1. Richard E. Fairley, "Principles of Software Engineering", IEEE computer society press, 2010
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Shari P fleeger, Joanne Atlee, "Software Engineering: Theory and Practice", Fourth Edition, Pearson Education, 2010.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	1	-	-	-	3	2	-	2	2	1
CO2	3	2	3	-	1	-	-	-	2	2	-	3	1	2
CO3	2	3	3	-	3	-	-	-	1	-	1	2	2	1
CO4	2	3	3	-	3	-	-	-	1	-	2	2	2	1
CO5	3	3	-	-	-	-	-	-	3	3	2	3	1	3

CI20404 **PYTHON PROGRAMMING** 3 0 0 3

COURSE OBJECTIVES

To enable students to

- know the basics of algorithmic problem solving.
- study the python program logics.
- acquire knowledge in writing programs with condition and loops.
- understand the concepts of lists, tuple and dictionaries.
- acquire knowledge about file and modules.

UNIT I ALGORITHMS AND PROBLEM SOLVING 9

Algorithms - building blocks of algorithms (statements, state, control flow, functions); notation (pseudo code, flow chart, programming language); algorithmic problem solving- simple strategies for developing algorithms (iteration, recursion).

UNIT II EXPRESSION AND STATEMENTS 9

Python interpreter and interactive mode - values and types, int, float, boolean, string and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions - function definition and use, flow of execution, parameters and arguments.

UNIT III CONTROL AND FLOW FUNCTIONS 9

Conditional - Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration - state, while, for, break, continue, pass; Fruitful functions - return values, parameters, local and global scope, function composition, recursion; Strings - string slices, immutability, string functions and methods, string module; Lists as array.

UNIT IV LISTS, TUPLES AND DICTIONARIES 9

Lists - list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples - tuple assignment, tuple as return value; Dictionaries - operations and methods; advanced list processing - list comprehension; Illustrative programs - selection sort, insertion sort, merge sort, histogram.

UNIT V FILES AND PACKAGES 9

Files and exception - text files, reading and writing files, format operator; command line arguments - errors and exceptions; handling exceptions; modules; packages; Illustrative programs - word count, copy file.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- develop algorithmic solutions to simple computational problems.
- develop simple Python programs.

- create simple Python programs with different logics.
- implement the compound data using Python lists, tuples, dictionaries.
- evaluate a Python program into files and Packages.

TEXT BOOKS

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/).
2. Martin C. Brown, —PYTHON: The Complete Reference, McGraw-Hill, 2001.

REFERENCES

1. John V Guttag, —" Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	1	-	-	-	-	-	1	2	-
CO2	3	2	1	-	2	1	-	-	-	-	-	1	2	-
CO3	3	2	1	-	2	1	-	-	-	-	-	1	2	-
CO4	3	2	1	-	2	1	-	-	-	-	-	1	2	-
CO5	3	2	1	1	2	1	-	-	-	-	-	1	2	-

EC20407 MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the architecture and programming of 8085 and 8086 microprocessors.
- have a knowledge about signals and bus architecture of 8086 microprocessor.
- learn the design aspects of I/O and memory interfacing circuits.
- acquire knowledge about the architecture of 8051 and PIC microcontroller.
- be familiar with the concepts of ARM and Pentium processors.

UNIT I MICROPROCESSORS **9**

8085 Microprocessor - Architecture, Addressing modes, Instruction set; 8086 Microprocessor - Architecture, Addressing modes, Instruction set, assembler directives; Simple programs - 8085,8086; Stacks, Macros, Interrupts and interrupt service routines.

UNIT II 8086 BUS ARCHITECTURE **9**

8086 signals, Basic configurations, System bus timing, System design using 8086, I/O programming; Introduction to Multiprogramming - System Bus Structure, Multiprocessor configurations, Coprocessor, Closely coupled and loosely coupled configurations.

UNIT III 8086 I/O INTERFACING **9**

Programmable Peripheral Interface; I/O interfacing - Serial communication interface, D/A and A/D Interface, Keyboard /display controller, Interrupt controller; Memory Interfacing - DMA controller.

UNIT IV MICROCONTROLLERS **9**

8051 - Architecture, Signals, Special Function Registers (SFRs), I/O Ports, Memory, Interrupts, Addressing Modes, Instruction set, Assembly language programming; Introduction to PIC microcontroller.

UNIT V SYSTEM DESIGN USING MICROCONTROLLER **9**

Case studies - Traffic light control, Washing machine control, Stepper Motor, Keyboard Interfacing, Sensor Interfacing; Overview of Pentium Processors - ARM Processors, Introduction to ARM Architecture.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- infer the operations of microprocessors architecture.
- explain the multiprocessor configurations.
- design various I/O interfacing circuits.
- write programs using 8051 and PIC microcontrollers.
- devise various applications of microcontrollers.

TEXT BOOKS

1. Ramesh S.Gaonkar, "Microprocessor Architecture ,Programming and Applications with 8085",Penram International Publishing reprint,6th edition,2017.
2. Krishna Kant, "Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.

REFERENCES

1. DoughlasV.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH,2012.
2. A.K.Ray& K.M Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata McGraw Hill, 2006.
3. Barry B Brey, "Intel Microprocessors: 8086/8088, 80286, 80386, 80486, Pentium, Pentium Pro Processors, Pentium II, Pentium III and Pentium 4: Architecture, Programming and Interfacing", Pearson Education, New Delhi, 2009.
4. Steve Furber "ARM System-On-chip Architecture", Pearson Education Limited,USA,2010.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO3	3	2	2	2	2	2	2	-	-	-	-	-	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO5	3	2	2	2	2	2	2	-	-	-	-	-	3	3

CI20405 **COMPUTER NETWORKS LABORATORY** **0 0 2 1**

COURSE OBJECTIVES

To enable students to

- understand the basics and working Networking Protocols using Cisco Packet Tracer
- Implement the various mechanism of supporting protocols of each layer through Packet Tracer.
- Familiar with the various routing algorithms.
- Learn and use simulation tools.

LIST OF EXPERIMENTS

1. There are 20PC's in your network. Five PC's are connected to one Ethernet hub, and five PC's are connected to another hub. Each hub is connected to separate switch and both the switches are connected to a separate router. The routers are connected via an Ethernet bridge. The remaining 10 PC's are connected directly to one of the two switches. How many Ethernet segments are there? Implement this scenario using cisco packet tracer.
2. Write a code to implement bit stuffing and byte stuffing.
3. In CRC error correction scheme, choose pattern 1101 and data 100100. Write a code to encode the given data.
4. In an IPv4 packet the value of header length is 1000 in binary. Write a code to find, how many bytes of Options are being carried by this packet?
5. Write a code to implement distance vector routing algorithm.
6. Write a code to implement HTTP web client program to download a web page using TCP sockets.
7. Write a code to implement border gateway protocol (BGP).
8. Configure a Web server, DHCP server and a DNS server all together in a single simulation through which IP have to be allocated for the host through DHCP server, Conversion of Canonical Name to IP address to be done by DNS server and Access to the webpage has to give by web server using Cisco Packet Tracer.
9. Study of Packet Analyzer using Wireshark Tool.

TOTAL PERIODS **30**

COURSE OUTCOMES

At the end this course, students will be able to

- demonstrate and Configure Networking Protocols using Cisco Packet Tracer.
- analyze the various working mechanism of supporting protocols of each layer through Packet Tracer.
- implement transport and application layer protocols in data networks.
- use simulation tools to analyze the performance of various network protocols.

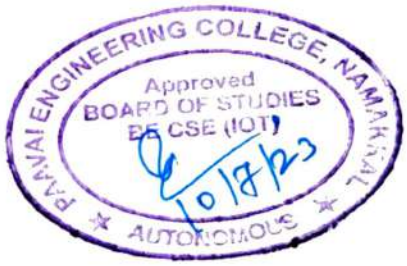
LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE: C / C++ / Cisco Packet Tracer

HARDWARE: Standalone desktops 30 Nos.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	-	-	-	-	-	-	1	-	3	3
CO2	3	1	2	2	-	-	-	-	-	-	-	-	2	2
CO3	3	3	2	1	-	-	-	-	-	-	2	-	3	3
CO4	2	3	1	3	-	-	-	-	-	-	-	-	2	1



CI20406	PYTHON PROGRAMMING LABORATORY	0	0	2	1

COURSE OBJECTIVES

To enable the students to

- acquire programming skills in core python concepts.
- study about object oriented skills in python.
- create the skill of designing graphical user interfaces in python.
- study the database applications in python.

LIST OF EXPERIMENTS

1. Programs that take command line arguments (word count)
2. Find the most frequent words in a text read from a file
3. Simulate elliptical orbits in Pygam
4. Simulate bouncing ball using Pygame
5. Compute the GCD of two numbers
6. Find the square root of a number (Newtons method)
7. Exponentiation (power of a number)
8. Find the maximum of a list of numbers
9. Linear Search
10. Binary Search
11. Selection Sort
12. Merge Sort
13. Insertion Sort
14. First n prime numbers
15. Multiply matrices

TOTAL PERIODS 30

COURSE OUTCOMES

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

- develop solutions to simple computational problems using Python programs.
- solve problems using conditionals and loops in Python.
- create Python programs by defining functions and calling them.
- use Python lists, tuples and dictionaries for representing compound data.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE: Python 3 interpreter for Windows/Linux.

HARDWARE: Standalone desktops 60 Nos.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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CO2	2	3	-	-	3	-	-	-	1	-	-	-	-	2
CO3	2	3	-	-	3	-	-	-	1	-	-	-	-	-
CO4	3	3	3	-	3	-	-	-	3	-	3	-	-	3