

IV B.Tech. II Sem.

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(A0441198) SATELLITE COMMUNICATION

Course Composition	Professional Core course (PC)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. To introduce the basic principles of Satellite Communication systems, orbital mechanics, launchers.
2. To know the different subsystems of satellites.
3. To introduce the basic concepts and designing of Satellite links.
4. To introduce the basic concepts of earth station transceiver.
5. To know the basics of direct broadcast satellite television
6. To know the basic concepts of various multiple access techniques and GPS systems.

COURSE OUTCOMES:

1. To introduce the basic principles of satellite communication system, orbital mechanics and launchers.
2. To understand the concepts of satellite subsystems and designing of satellite uplink and downlinks
3. To analyze the concepts of various multiple access techniques
4. To introduce the basic concepts of direct broadcast satellite television and radio.
5. To know the concepts of global positioning system and its operation.

Mapping COs with POs & PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO2	-	-	3	-	-	-	-	-	-	2	1	-	2	-	-
CO3	-	2	-	1	-	-	-	-	-	3	-	-	2	-	2
CO4	-	-	-	-	3	1	-	-	-	2	-	-	-	1	-
CO5	-	-	-	-	-	-	1	-	-	3	-	2	-	-	1

UNIT-I INTRODUCTION

Background, a brief history of satellite communications, overview of satellite communications, frequency allocations of satellite services, design considerations of satellite communications, advantages & disadvantages of satellite communications. Orbital mechanics and launchers: orbital mechanics, developing the equations of the orbit, kepler's three laws of planetary motion, describing the orbit of a satellite, locating the satellite in the orbit, locating the satellite with respect to the earth, orbital elements. Look angle determination, the sub satellite point, elevation angle calculation, azimuth angle calculation, specialization to geostationary satellites, orbital perturbations, longitudinal and inclination changes. Orbit determination, launches and launch vehicles, expandable launch vehicles, placing satellites into geostationary orbit. Orbital effects in communications systems performance, orbit considerations, coverage and frequency considerations.

UNIT-II SATELLITE SUBSYSTEMS

Attitude and orbit control system (aocs), telemetry, tracking, command and monitoring (ttc&m), power system, communication subsystems, description of the communications systems, transponders, satellite antennas basic antenna types and relationships, equipment reliability and space qualification, redundancy.

UNIT-III SATELLITE LINK DESIGN

Introduction, basic transmission theory, system noise temperature and gain to temperature (g/t) ratio: noise temperature, calculation of system noise temperature, noise figure and noise temperature, g/t ratio for earth stations. Uplink design, design of satellite links for specified carrier to noise (c/n) combining c/n and c/i value in satellite links: overall (c/n) with uplink and downlink attenuation, uplink and downlink attenuation in rain, uplink attenuation and (c/n) up, down link attenuation and (c/n) dn. Interference effects on complete link design. System design for specific performance, satellite communication link design procedure. Design of down links: link budgets, link budget example. Uplink design, design of satellite links for specified carrier to noise (c/n) combining c/n and c/i value in satellite links: overall (c/n) with uplink and downlink attenuation, uplink and downlink attenuation in rain, uplink attenuation and (c/n) up, down link attenuation and (c/n) dn. Interference effects on complete link design. System design for specific performance, satellite communication link design procedure.

UNIT-IV MULTIPLE ACCESSES

Introduction, frequency division multiple access (fdma): intermodulation, calculation of c/n with inter modulation. Time division multiple access (tdma): bits, symbols, and channels, frame structure. Reference burst and preamble, guard times, synchronization in tdma networks, transmitter power in tdma networks, satellite switched tdma, onboard processing: baseband processing transponders, satellite switched tdma with onboard processing. Demand access multiple access (dama), code division multiple access (cdma), spread spectrum transmission and reception.

UNIT-V DIRECT BROADCAST SATELLITE TELEVISION AND RADIO

C band and ku band home satellite tv, digital dbs tv, dbs-tv system design, dbs-tv link budget, master control station and uplink, installation of dbs tv antennas, satellite radio broadcasting.

UNIT-VI SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM

Introduction, radio and satellite navigation, gps position location principles: position location in gps, gps time. Gps receivers and codes: the c/a code. Satellite signal acquisition, gps navigation message, gps signal levels, timing accuracy, gps c/a code accuracy, differential gps, selective availability.

TEXT BOOKS:

1. Satellite Communications - Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE Wiley Publications, 2nd Edition, 2006.
2. Satellite Communications - Dennis Roddy, McGraw Hill, 3rd Edition, 2001.

REFERENCE BOOKS:

1. Satellite Communications: Design Principles - M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication -Dr.D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications - K.N. Raja Rao, PHI, 2004
4. Satellite communications Robert M.Gagliardi, CBS publications, first edition 1987.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/117105131>

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(A0446198) REAL TIME OPERATING SYSTEMS

Course Composition	Professional Elective (PE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. To learn real time scheduling and schedule ability analysis
2. To understand formal specification and verification of timing constraints and properties
3. To enable students to design real time systems
4. To development and implement new techniques to advance real time systems research

COURSE OUTCOMES:

1. The basic knowledge on real time operating system used in the embedded real time systems.
2. Study and analysis of various real time scheduling algorithms.
3. The skill to learn basic shell programming in Linux and RT Linux.
4. Ability to design real time embedded system.
5. Knowledge on the design of fault tolerant embedded real time system.

Mapping COs with POs & PSOs:

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CO2	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	1	-	1	3
CO4	-	2	3	-	1	-	-	-	-	-	-	-	1	2	1
CO5	-	2	2	-	-	-	-	-	-	-	-	-	1	-	2

UNIT-I REAL TIME OPERATING SYSTEMS CONCEPTS

Architecture of kernel, tasks and task scheduler, task states, context switching, scheduling algorithms, rate monotonic analysis, task management call functions, interrupt services routines, semaphores, mutex, mailboxes, message queues, event register, pipes, signals, timers, memory management, priority inversion problem, priority inheritance, path finder problem revisited.

UNIT-II HARD and SOFT REAL TIME SYSTEMS

Jobs and processors, release times, deadlines, and timing constraints. Hard and soft timing constraints. Hard real time systems, soft real time systems reference model of realtime systems: processors and resources, temporal parameters of real time work load, periodic task model, precedence constraint and data dependency, precedence graph and task graph.

UNIT-III REAL TIME SCHEDULING APPROACHES

Clock driven, weighted round robin, priority driven, dynamic vs static systems, effective release times and deadlines. Real time operating system: qnx neutrino, vx works, microc/osii, rt linux

UNIT-IV INTRODUCTION TO LINUX

Overview of unix/linux, features, commands, file manipulation commands, editors, directory commands, input/output redirection, pipes and filters, file protection, process commands, about the shell.

UNIT-V REAL TIME APPLICATIONS

Digital control, selection of sampling period, multirate systems, example of software controlled systems, timing characteristics, complex control law computations, kalman filter, high level controls, control hierarchy, guidance and control, timing requirements, real time command and control, signal processing, radar systems, multimedia applications.

UNIT-VI FAULT TOLERANCE TECHNIQUES

Introduction, fault causes, types, detection, fault and error containment, hardware, software and timing redundancy

TEXT BOOKS:

1. Embedded Real Time Systems Blackbook, Dr.K.V.K.K.Prasad, 2005 edition, Dreamtech press.
2. Jane W.S.Liu, "Real Time Systems", Pearson education, 2007.
3. C.M.Krishna, KANGG. Shin" Real Time Systems", McGraw Hill, 1997.

REFERENCE BOOKS:

1. www.kernel.org.
2. Vxworks Programming Guide.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc21_cs98/preview

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(A0532198) CAMPUS TO CORPORATE (SDC)

Course Composition	Skill Oriented Course
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. To make the students aware of the GD session in selection process
2. To learn the art of presentation and organizing meetings
3. To learn about the benefits of team work at the work place
4. To learn the process of interviews an also extempore sessions
5. To motivate the students with the help of popular motivational stories

COURSE OUTCOMES:

1. The students can develop leadership skills, communication skills, interpersonal skill, analytical and lateral thinking
2. To apply the principles of a good presentation and develop the art of presenting effectively.
3. The student can be a good team player by learning about the advantages of team building
4. The student would be able to perform well in interviews and extempore sessions.
5. The student also learns the importance of leadership themes by successful stories.

Mapping COs with POs & PSOs:

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CO1	1	-	2	1	-	1	-	1	-	3	1	-	-	3	1
CO2	-	-	-	-	-	-	1	-	1	2	-	2	-	1	-
CO3	-	-	-	1	2	-	-	2	-	-	1	-	-	-	-
CO4	-	-	2	-	1	1	-	-	-	2	-	-	-	-	2
CO5	-	-	-	-	-	2	-	1	3	-	-	1	-	1	-

UNIT-I Group Discussion

Introduction - concept of gd, types of gd's, importance of gd in selection, do's and don'ts in gd -gd tips- difference between gd and debate - mock gd's and debate - practical session on gd.

UNIT-II Presentation Skills

Presentation & evaluation - just a minute speeches - creating a power point presentation - body language - conclusions -planning a meeting-analyzing a meeting-analyzing agendas-round table discussions-small group presentation-shaking hands-logging silences-talent search-to speak or not to speak-relation ships

UNIT-III Team Work Skills

Dimensions of team building-components of team building-purpose of teams-building blocks for team-types of team-team leader skills

UNIT-IV Interview Skills

Introduction - concept - types of interviews - characteristics of interviewer -characteristics of interviewee - recruitment interview - appraisal interview - research interview

UNIT-V Extempore

Introduction to extempore - common extempore topics - swot analysis

UNIT-VI Leadership Content Themes

Leader - characteristics - leader vs. Manager - leadership styles - entrepreneur leadership style - role of women as leaders - success stories of leadership.

TEXT BOOKS:

1. Principles of Management, Koontz, Weihrich and Aryasri, Tata McGraw Hill, 2004
2. Leadership wisdom by Robin Sharma

REFERENCE BOOKS:

1. Master the Group Discussion & Personal Interview by Sheetal Desarda, Notion Pr
2. Organizational Behavior, Stephen P. Robbins, Pearson Education

e-Resources and Digital Material:

1. https://archive.nptel.ac.in/CSR/training_csr.html

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(A0423198) ARDUINO & MSP 430 PROGRAMMING (SDC)

Course Composition	Professional Core course (PC)
Course Category	Employability, Skill Development
Developmental Needs	Global

COURSE OBJECTIVES:

1. To understand the basic concepts of embedded system using various micro controllers and its architectures.
2. To Learn the Arduino programming language and IDE.
3. To learn how to prototype circuits with Arduino UNO.
4. To learn how to Program the Arduino board to make the circuits work for any given application

COURSE OUTCOMES:

1. Understand the concepts of various micro controllers used in embedded systems.
2. Understand basics of arduino & MSP 430 programming and various types of functions libraries.
3. Understand how to interface Arduinio & MSP 430 to various sensors and actuators.
4. Gains Knowledge of interfacing various sensors and actuators.
5. Able to Integrate hardware and software for embedded system for any given application

Mapping COs with POs & PSOs:

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CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-I Embedded System design

Basics, introduction to embedded systems, components of embedded system, advantages and applications of embedded systems, examples of real time embedded systems. Learning arduino platform: arduino overview, introduction to arduino, arduino history and family, features, board types, arduino uno board description, input vs output, arduino program structure, data types, variables & constants, operators, control statements , loops, functions, strings , time, arrays, arduino function libraries

UNIT-II Learning Arduino Platform

Blinking led, fading led, switches, push buttons, reading analog voltage, relays (ac appliance control), pwm generation: dc motor, stepper motor, servo.

UNIT-III Working with Displays

Led bar graph, seven segment display, multi segment displays, i2c display, lcd. Working with sound and sensors: piezo buzzer, audio signal, arduino piano keyboard, lm393 digital sound sensor

UNIT-IV The basic sensors and actuators using Arduino

Introduction to sensors and actuators; how to connect and work with different sensors, such as ir sensor, ultrasonic sensor, humidity, pir sensor, water detector sensor, accelerometer, sound, light distance, pressure etc. , to arduino board, reading various sensor data on serial monitor and lcd display. Home automation, robot control etc.

UNIT-V RISC - MSP 430

Low power risc msp430 - block diagram, features and architecture, variants of the msp430 family viz. Msp430x2x, msp430x4x, msp430x5x and their targeted applications, msp430x5x series block diagram, addressing modes, instruction set, memory address space, on-chip peripherals (analog and digital), and register sets. Sample embedded system on msp430 microcontroller.

UNIT-VI I/O ports pull up/down resistors concepts

Interrupts and interrupt programming. Watchdog timer. System clocks. Low power aspects of msp430: low power modes, active vs standby current consumption, fram vs flash for low power & reliability. Timer & real time clock (rtc), pwm control, timing generation and measurements. Analog interfacing and data acquisition: adc and comparator in msp430

TEXT BOOKS:

1. Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.

REFERENCE BOOKS:

1. John H. Davies, MSP430 microcontroller basics, 1st Ed., Newnes, Elsevier, 2008.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/108102169>

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(A0445198) BIOMEDICAL INSTRUMENTATION

Course Composition	Open Elective (OE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. Introduction biomedical instrumentation system and bio electrodes
2. Cardiac, neuro an respiratory instrumentation
3. Medical imaging principles

COURSE OUTCOMES:

1. Analyze the problems encountered in human body and their measurement by using various Instruments
2. Differentiate the different types of Electrodes suitable for measurement of different parameters of human body.
3. Can able to analyze the functioning of Heart, eventually able to determine the characteristics of P, Q, R, S, T ECG waveform
4. Analyze the working of different types of Pacemakers, Defibrillators etc.,
5. Get to know about the Neuronal Communication system, Brain working and Measurement of EMG and EEG by Electrodes
6. Get to know the functioning of Spirometers Body Plethysmograph Respiratory Therapy Equipment: Inhalators, Ventilators/Respirators

Mapping COs with POs & PSOs:

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CO2	2	2	-	-	2	-	-	-	-	-	-	2	-	2	-
CO3	2	3	2	2	1	-	-	-	-	-	-	2	1	-	-
CO4	1	3	2	2	-	-	-	-	-	-	-	1	2	-	-
CO5	3	1	2	-	1	-	-	-	-	-	-	2	-	-	1
CO6	3	2	2	-	2	-	-	-	-	-	-	3	-	2	-

UNIT-I INTRODUCTION

Components of medical instrumentation system problems, encountered with measurements from human beings levels of structural organization of the human body physiological systems of the body organization of cell resting membrane potential generation of action potential and conduction through nerve cell.

UNIT-II BIO ELECTRODES

Electrode theory electrode characteristics bio potential electrodes: micro, skin surface and needle electrodes biochemical electrodes: reference electrodes, ph electrode, blood gas electrodes.

UNIT-III CARDIAC INSTRUMENTATION I

Cardiovascular system electrical conduction system of the heart cardiac cycle the ecg: einthoven triangle, standard 12lead configurations interpretation of ecg waveforms with respect to electromechanical activity of the heart ecg recorder principles

UNIT-IV CARDIAC INSTRUMENTATION II

Blood flow measurements blood pressure measurements pace maker defibrillators hemo dialysis.

UNIT-V NEURO MUSCULAR INSTRUMENTATION

Nervous system: anatomy, structure, functions, organization neuronal communication brain: anatomy, organization eeg: electrode placement, recorder principles, interpretation of waveforms neuromuscular junction and emg.

UNIT-VI RESPIRATORY INSTRUMENTATION

The physiology of the respiratory system lung volumes and capacities spirometers body plethysmograph respiratory therapy equipment: inhalators, ventilators/respirators, humidifiers, nebulizers, aspirators.

TEXT BOOKS:

1. Biomedical Instrumentation and Measurements - by Leslie Cromwell, F.J.Weibell, E.A. Pfeiffer, PHI.

REFERENCE BOOKS:

1. Human Physiology: from cells to system by Lauralee Sherwood, 6 th edition, Thomson Brooks/Cole.
2. Medical Instrumentation, Application and Design - by John G. Webster, John Wiley.
3. Principles of Applied Biomedical Instrumentation - by L.A. Geoddes and L.E.Baker, John Wiley and Sons.
4. Introduction to Biomedical Equipment Technology, Joseph J Carr, John M.Brown, 4th Edition Pearson Education.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/108105101>

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(A0539198) CYBER SECURITY

Course Composition	Open Elective (OE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. This course provides insight knowledge about cyber crime and it portrays preventive measures the security policies and procedures that must be adapted to prevent the end user from cyber threats. It also conveys a basic knowledge on the how to analyze the cyber incidents through cyber forensic methods.

COURSE OUTCOMES:

1. Students will be able to gain the knowledge on cyber crime and the challenges and threats in cyber security
2. Students will have knowledge on External and Internal reconnaissance through various tools.
3. Students will have better understanding upon how the system is compromised and user identity is compromised.
4. Students will have an effective knowledge on web and mobile security
5. Students will be aware on the ethics and policy guidelines that must be followed
6. Students will be given a fundamental knowledge on Cyber Forensics

Mapping COs with POs & PSOs:

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CO2	2	2	2	2	3	-	-	-	-	-	-	-	3	3	2
CO3	1	2	2	1	-	-	1-	-	-	-	-	2	2	2	2
CO4	2	1	3	-	-	-	2	-	-	-	-	1	2	2	2
CO5	2	2	3	1	2	2	1	3	-	2	-	-	-	1	1
CO6	3	2	3	2	-	2	1	1	-	-	-	2	2	2	1

UNIT-I Introduction to cyber crime

Classification of cyber crime - reasons for commission of cyber crime - malware and its types - kinds of cyber crime security posture: the current threat landscape- cyber security challenges- enhancing your security posture- the red and blue team.

UNIT-II Understanding the Cyber security Kill Chain

External reconnaissance - internal reconnaissance - access and privilege escalation - sustainment - assault -obfuscation - threat life cycle management

UNIT-III Compromising the System

Analyzing current trends - phishing-exploiting a vulnerability-zero-day-performing the steps to compromise a system. Chasing a user's identity: identity is the new perimeter-strategies for compromising a user's identity -hacking a user's identity

UNIT-IV Web & Mobile security

Fundamental concepts and approaches- appification - webification - sandboxing - permission dialog based access control - web pki and https - cookies - password and alternatives - frequent software updates- client side vulnerabilities and mitigation: phishing & clickjacking - client side storage- physical attacks. Server side vulnerabilities and mitigation.

UNIT-V Security Policy

Reviewing your security policy - educating the end user-policy enforcement - monitoring for compliance legal issues and ethics: protecting programs and data - information and law-rights of employees and employers- computer crime- ethical issues in computer security.

UNIT-VI Computer Forensics

What is computer forensics? , use of computer forensics in law enforcement, computer forensics assistance to human recourses/employment proceedings, computer forensics services, benefits of professional forensics methodology, steps taken by computer forensics specialists. Types of computer forensics technology

TEXT BOOKS:

1. The Cyber Security Body of Knowledge, version 1.0 by Awais Rashid, The National Cyber Security Centre 2019.
2. Introduction to cyber crime, by Jeetendra Pande, Uttarakhand Open University, Haldwani
3. Security in computing by Charles p pflieger, Pearson Education; Fifth edition
4. Computer Forensics, Computer Crime Investigation by John R,Vacca, Firewall Media, New Delhi

REFERENCE BOOKS:

1. Information Security and Auditing in the Digital Age: A Practical Managerial Perspective Amjad Umar
2. Cybersecurity: Attack and Defense Strategies: Infrastructure security with Red by Erdal Ozkaya and Yuri Diogenes
3. Cyber Security Audit A Complete Guide - 2020 by Gerardus Blokdyk
4. Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software By Michael Sikorski, Andrew Honig
5. Information Technology Control and Audit" by Angel R. Otero

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

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(A0522198) DATA WAREHOUSING & MINING

Course Composition	Open Elective (OE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. With the basic data warehousing and data mining concepts
2. To learn mining rules in large databases
3. To get idea on clustering analysis
4. Applications that can enable them to set up and manage an industrial data warehousing and data mining system.
5. To learn about OLTP and OLAP systems

COURSE OUTCOMES:

1. Ability to do Conceptual, Logical, and Physical design of Data Warehouses
2. Familiarity with Requirements Engineering for Data Warehouses
3. OLAP applications and OLAP deployment
4. Have a good knowledge of the fundamental concepts that provide the foundation of data mining.
5. Learn broad classes of data mining technologies
6. Understand how these concepts are engineered to use some of the basic data mining tools.

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CO3	2	1	-	-	-	1	-	-	-	-	-	2	-	-	2
CO4	1	-	-	1	-	-	-	2	-	-	-	-	2	-	-
CO5	1	-	2	-	-	-	-	-	-	-	-	-	-	3	-
CO6	2	-	2	-	1	-	-	1	-	-	-	-	-	-	1

UNIT-I Introduction

What motivated data mining? Why is it important? ; what is data mining? ; data mining- on what kind of data? ; data mining functionalities: what kinds of data can be mined? ; are all of patterns interesting? ; classification of data mining systems; data mining task primitives; data warehouse and olap technology: what is a data warehouse? ; a multidimensional data model: from tables and spreadsheet to data cubes, stars, snowflakes and fact constellation schemas for multidimensional databases, measures: their categorization and computation, concept hierarchies, olap operations in the multidimensional data model; data warehouse architecture: steps for the design and construction of data warehouses, a three-tier architecture.

UNIT-II Data Pre-processing

Why pre-process the data; descriptive data summarization: measuring the central tendency, measuring the dispersion of data, graphic displays of basic descriptive data summaries; data cleaning: missing values, noisy data cleaning as a process; data integration and transformation: data integration, data transformation, data reduction: data cube aggregation, attribute subset selection; dimensionality reduction, numerosity reduction;

UNIT-III Mining Frequent patterns, Associations, and Correlations

Basic concepts; efficient and scalable frequent itemset mining methods: the apriori algorithm, generating association rules from frequent itemsets, improving efficiency of apriori, mining frequent itemsets without candidate generation; mining various kinds of association rules: mining multilevel & multi-dimensional association rules; from association mining to correlation analysis: strong rules are not necessarily interesting, from association analysis to correlation analysis;

UNIT-IV Classification

Overview of classification and prediction: what is classification, what is prediction? ; issues regarding classification and prediction: preparing data for classification and prediction, comparing classification and prediction methods; bayesian classification: bayes' theorem, naïve bayesian classification; classification by decision tree induction: decision tree induction, attribute selection measures, tree pruning, scalability and decision tree induction; rule-based classification: using if-then rules for classification, rule extraction from decision tree, rule induction using a sequential covering algorithm; classification by back propagation: a multilayer feed-forward neural network, defining network topology, back propagation;

UNIT-V Classification II and Prediction

Support vector machines: the case when the data are linearly separable, the case when the data are linearly inseparable; lazy learners: k-nearest-neighbour classifiers, case-based reasoning; prediction: linear regression, nonlinear regression; accuracy and error measures: classifier accuracy measures, predictor error measures; evaluating the accuracy of a classifier or predictor: holdout method and random sub sampling, cross validation, bootstrap;

UNIT-VI Cluster Analysis

Overview of cluster analysis; types of data in cluster analysis: interval-scaled variables, binary variables, categorical, ordinal, and ratio-scaled variables, variables of mixed types; a categorization of major clustering methods; partitioning methods: classical partitioning methods: k-means and k-medoids, partitioning methods in large databases: from k-medoids to clarans; hierarchical methods: agglomerative and divisive hierarchical clustering, birch, rock; density-based methods: dbscan; grid-based methods: sting; model-based clustering methods: expectation-maximization;

TEXT BOOKS:

1. Data Mining - Concepts and Techniques - Jiawei Han & Micheline Kamber
Harcourt India, second Edition.

REFERENCE BOOKS:

1. Data Mining Introductory and advanced topics-Margaret H Dunham, Pearson Education
2. Data Mining Techniques - Arun K Pujari, University Press
3. Data Warehousing in the Real World - Sam Anahory & Dennis Murray. Pearson Edn Asia.
4. Data Warehousing Fundamentals - Paulraj Ponnaiah Wiley Student Edition
5. The Data Warehouse Life cycle Tool kit - Ralph Kimball Wiley Student Edition.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

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L	T	P	C
2	1	0	3

(A0531198) INTERNET OF THINGS

Course Composition	Professional Elective (PE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. To study the fundamentals about IoT
2. To study about IoT Access technologies
3. To study the design methodology and different IoT hardware platforms
4. To study the basics of IoT Data Analytics and supporting services.
5. To study about various IoT case studies and industrial applications.

COURSE OUTCOMES:

1. After completion of the course, the student should be able to
2. Understand the use of Devices, Gateways and Data Management in IoT
3. Analyze various protocols for IoT
4. Familiarize various IoT Development frameworks
5. Develop and understand various applications in IoT
6. Understand the need of Security and Vulnerabilities in IoT

Mapping COs with POs & PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	1	2	-	1	-	1	1	2	-	1
CO2	2	1	2-	2	-	1	-	1	-	1	-	1	2	-	2
CO3	2	2	1	1	1	-	1-	-	1-	1	1	1	2	1	2
CO4	2	2	2-	1	1	1	1	1	2	-	1	1	2	-	1
CO5	1	2	2	1	2	1	1	1	2	1	1	1	1	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-I FUNDAMENTALS OF IoT

Evolution of internet of things - enabling technologies - iot architectures: onem2m, iot world forum (iotwf) and alternative iot models - simplified iot architecture and core iot functional stack -- fog, edge and cloud in iot - functional blocks of an iot ecosystem - sensors, actuators, smart objects and connecting smart objects

UNIT-II IoT PROTOCOLS

IoT access technologies: physical and mac layers, topology and security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN - network layer: IP versions, constrained nodes and constrained networks - optimizing IP for IoT: from 6LoWPAN to 6Lo, routing over low power and lossy networks - application transport methods: supervisory control and data acquisition - application layer protocols: CoAP and MQTT

UNIT-III DESIGN AND DEVELOPMENT

Design methodology - embedded computing logic - microcontroller, system on chips - IoT system building blocks - Arduino - board details, IDE programming - Raspberry Pi - interfaces and Raspberry Pi with Python programming

UNIT-IV DATA ANALYTICS AND SUPPORTING SERVICES

Data analytics and supporting services: structured vs unstructured data and data in motion vs data in rest - role of machine learning - NoSQL databases - Hadoop ecosystem - Apache Kafka, Apache Spark - edge streaming analytics and network analytics - Xively Cloud for IoT, Python web application framework - Django - AWS for IoT - system management with Netconf-Yang

UNIT-V INDUSTRIAL APPLICATIONS

Cisco IoT system - IBM Watson IoT platform - manufacturing - converged plantwide Ethernet model (CPWE) - power utility industry - GridBlocks reference model - smart and connected cities: layered architecture, smart lighting, smart parking architecture and smart traffic control.

UNIT-VI DEVELOPING IoT SOLUTIONS & VULNERABILITIES, ATTACKS AND COUNTERMEASURES IN IoT

Introduction to different IoT tools- introduction to Arduino and Raspberry Pi- implementation of IoT with Arduino and Raspberry Pi - primer on threats, vulnerability, and risks (TVR): the classic pillars of information assurance, threats, vulnerability and risks. Primer on attacks and countermeasures: common IoT attack types, attack trees, fault trees and CPS, privacy and security issues in IoT.

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Russell Brian and Drew Van Duren, Practical Internet of Things Security, 1st Edition, Packt Publication, 2016.

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things - A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things - Key applications and Protocols, Wiley, 2012 (for Unit 2).

3. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

IV B.Tech. II Sem.

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2	1	0	3

(A0443198) FPGA ARCHITECTURE AND APPLICATIONS

Course Composition	Professional Elective (PE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. Study of PLDs, Classification of PLDs.
2. To study CPLDS and FPGAs.
3. To study and design with PLDs and FPGAS
4. Study of Altera, Xilinx, Actel industry FPGAs.
5. Study of Programming Technologies and Technology mapping for FPGAs
6. Study of FSM and realization of FSM

COURSE OUTCOMES:

1. Acquire Knowledge about various architectures and device technologies of PLD's and various FPGAs.
2. Comprehend FPGA Architectures from different vendors.
3. Describe FSM and different FSM techniques like petrinets& different case studies
4. Analyze System level Design and their application for Combinational and Sequential Circuits.
5. Study the different case studies using one hot design methods.

Mapping COs with POs & PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1		3										2	1		
CO2		2										1	2	1	
CO3	3				2									1	
CO4	2		3										2		
CO5				3											2

UNIT-I PROGRAMMABLE LOGIC

Rom, pla, pal, pld, fpga - features, complex programmable logic devices: altera max 7000 cpld, speed performance

UNIT-II FPGA

Xilinx logic cell array, clb,i/o block programmable interconnect, technology mapping for fpga: library based, lut based, multiplexer based technology mapping.

UNIT-III CASE STUDIES

Programming technologies, xilinx xc3000, xc4000, actel fpgas, alteras fpgas, plus logic fpga, amd fpga, quick logic fpga, algotronix fpga, cross point solutions fpga, fpga design flow.

UNIT-IV FINITE STATE MACHINES (FSM)

Finite state machine- state transition table, state assignments for fpgas. Problem of the initial state assignment for one hot encoding.

UNIT-V REALIZATION OF STATE MACHINE

Derivation of sm charts. Realization of state machine chart, alternative realization of state machine chart using microprogramming. Linked state machines. One-hot state machine, petri nets for state machines - basic concepts, properties.

UNIT-VI FSM ARCHITECTURES

Architectures centered around nonregistered plds. State machine designs centered around a shift register. Using xilinx ise eda tool guidelines front front end design for fpgas

TEXT BOOKS:

1. P.K.Chan& S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte), 1994.
2. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995

REFERENCE BOOKS:

1. Fundamentals of logic Design, 5/e, Charles H Roth.Jr.
2. S. Brown, R. Francis, J. Rose, Z. Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
3. Engineering Digital Design, 2/e, Richard F Tinder Unit VI.

e-Resources and Digital Material:

1. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/lab-workshop-fpga-architecture-and-programming-using-verilog-hdl/>

IV B.Tech. II Sem.

L	T	P	C
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(A0442198) DSP PROCESSORS ARCHITECTURES AND APPLICATIONS

Course Composition	Professional Elective (PE)
Course Category	Employability
Developmental Needs	Global

COURSE OBJECTIVES:

1. To understand the concept of DSP Architecture & comparison of this with that of microprocessors
2. To understand addressing modes, instruction sets, pipelining and application programs in TMS320C54XX processor
3. To understand the architectural issues of programmable DSP devices and their relationship to the algorithmic requirements, architectures of commercially popular programmable devices and the use of such devices for software development and system design
4. To highlight the suitability of programmable DSP devices for various application areas and motivate to design systems around these devices.

COURSE OUTCOMES:

1. To become familiar with fundamentals of DSP processors and architectures
2. To become familiar with computational accuracy in DSP implementations.
3. To understand architectures of programmable DSP devices and processors
4. Students can able to implement basic DSP algorithms.
5. To understand interfacing and applications of programmable DSP devices.

Mapping COs with POs & PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	2	3	-	1	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	1	-	-	-	-	-	-	3	2	-	-	-	1
CO3	-	3	-	1	-	-	-	-	-	2	-	-	2	-	2
CO4	-	-	-	-	3	2	-	-	-	1	-	-	-	2	-
CO5	-	-	-	-	-	-	2	-	-	3	-	-	-	-	2

UNIT-I ARCHITECTURE OF DSP PROCESSOR (TMS320C5X)

Introduction, bus structure, central arithmetic logic unit(calu),auxiliary register alu (arau),index register(indx),auxiliary register compare register(arcrcr),block move address register(bmar)block repeat registers(rptc,brcr, pasr,paer), parallel logic unit(plu),memory mapped registers, program controller, some flags in the status registers

UNIT-II COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS

Number formats for signals and coefficients in dsp systems, dynamic range and precision, sources of error in dsp implementations, a/d conversion errors, dsp computational errors, d/a conversion errors, compensating filter.

UNIT-III ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES

Basic architectural features, dsp computational building blocks, bus architecture and memory, data addressing capabilities, address generation unit, programmability and program execution, speed issues, features for external interfacing.

UNIT-IV PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial digital signal processing devices, data addressing modes of tms320c54xx dsps, data addressing modes of tms320c54xx processors, memory space of tms320c54xx processors, program control, tms320c54xx instructions and programming, onchip peripherals, interrupts of tms320c54xx processors, pipeline operation of tms320c54xx processors. Commercial digital signal processing devices, data addressing modes of tms320c54xx dsps, data addressing modes of tms320c54xx processors, memory space of tms320c54xx processors, program control, tms320c54xx instructions and programming, onchip peripherals, interrupts of tms320c54xx processors, pipeline operation of tms320c54xx processors.

UNIT-V IMPLEMENTATIONS OF BASIC DSP ALGORITHMS

The quotation, fir filters, iir filters, interpolation filters, decimation filters, implementation of fft algorithms: an fft algorithm for dft computation, a butterfly computation, overflow and scaling, bit reversed index generation, an 8point fft implementation on the tms320c54xx, computation of the signal spectrum.

UNIT-VI INTERFACING &APPLICATIONS OF PROGRAMMABLE DSP DEVICES

Dsp based biotelemetry receiver, a speech processing system, an image processing system, memory interfacing, synchronous serial interface, mcbsp, a codec interface circuit.

TEXT BOOKS:

1. Digital Signal Processing - Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. Digital Signal Processors, Architecture, Programming and Applications - B. Venkata Ramani and M. Bhaskar, TMH, 2004.

REFERENCE BOOKS:

1. Digital Signal Processing - Jonathan Stein, John Wiley, 2005.

2. DSP Processor Fundamentals, Architectures & Features - Lapsley et al. S. Chand & Co, 2000.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/108106149>