JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

B.TECH. - COMPUTER SCIENCE & ENGINEERING (INTERNET OF THINGS)
Course Structure (R20) – III & IV Year

Semester–V						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A05501T	Computer Networks	3	0	0	3
2.	20A35501	Embedded Systems	3	0	0	3
3.	20A35502T	Internet Programming and Web Technologies	3	0	0	3
4.	 20A35503a 20A35503b 20A35503c	**Professional Elective Course – I** Commutation Protocols for IoT Adhoc and Wireless Sensor Networks Data Dissemination Techniques	3	0	0	3
5.		**Open Elective Course – I**	3	0	0	3
6.	20A05501P	Computer Networks Lab	0	0	3	1.5
7.	20A35502P	Internet Programming and Web Technologies Lab	0	0	3	1.5
8.	 20A35504	**Skill oriented course – III** Working with Embedded C	1	0	2	2
9.	20A35505	Evaluation of Community Service Project				1.5
Total						**21.5**

Open Elective-I

S.No.	CourseCode	Course Name	Offered by the Dept.
1	20A01505	Building Technology	CE
2	20A02505	Electric Vehicles	EEE
3	20A03505	3D Printing Technology	ME
4	20A04507	MATLAB Programming for Engineers	ECE/EEE
5	20A04508	Introduction to Control Systems	ECE/EEE
6	20A27505	Computer Applications in Food Processing	FT
7	20A54501	Optimization Techniques	Mathematics
8	20A56501	Materials Characterization Techniques	Physics
9	20A51501	Chemistry of Energy Materials	Chemistry

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

Semester–VI						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A35601T	Mobile Application Development for IOT	3	0	0	3
2.	20A35602T	IoT Application Development on Cloud Platforms	3	0	0	3
3.	20A35603T	Cyber Physical Systems	3	0	0	3
4.	20A05602T 20A05701a 20A05502T	**Professional Elective Course– II** Machine Learning Cloud Computing Artificial Intelligence	3	0	0	3
5.		**Open Elective Course – II**	3	0	0	3
6.	20A35601P	Mobile Application Development for IOT Lab	0	0	3	1.5
7.	20A35602P	IoT Application Development using Cloud Lab	0	0	3	1.5
8.	20A35603P	Cyber Physical Systems Lab	0	0	3	1.5
9.	20A52401	**Skill oriented course - IV** Soft Skills	1	0	2	2
10.	20A99601	**Mandatory Non-credit Course** Intellectual Property Rights & Patents	2	0	0	0
Total						**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation						

Open Elective-II

S.No.	CourseCode	Course Name	Offered by the Dept.
1	20A01605	Environmental Economics	CE
2	20A02605	Smart Electric Grid	EEE
3	20A03605	Introduction to Robotics	ME
4	20A04605	Signal Processing	ECE
5	20A04606	Basic VLSI Design	ECE
6	20A27605	Food Refrigeration and Cold Chain Management	FT
7	20A54701	Wavelet Transforms & its applications	Mathematics
8	20A56701	Physics Of Electronic Materials and Devices	Physics
9	20A51701	Chemistry of Polymers and its Applications	Chemistry

Semester-VII						
S.No.	**Course Code**	**Course Name**	**L**	T	**P**	**Credits**
1.	20A35701a 20A35701b 20A32601T	**Professional Elective Course– III** Big Data Analytics for IoT Business Analytics Data Visualization	3	0	0	3
2.	20A05703b 20A05705a 20A35702a	**Professional Elective Course– IV** Blockchain Technologiesand Applications Cyber Security Privacy and Security in IoT	3	0	0	3
3.	20A35703a 20A35703b 20A35703c	**Professional Elective Course– V** Fog and Edge Computing Industrial and Medical IoT Wearable Computing	3	0	0	3
4.	20A52701a 20A52701b 20A52701c	**Humanities Elective – II** Entrepreneurship and Incubation Management Science Enterprise Resource Planning	3	0	0	3
5.		**Open Elective Course – III**	3	0	0	3
6.		**Open Elective Course – IV**	3	0	0	3
7.	20A30503	**Skill oriented course – V** Web Application Design	1	0	2	2
8.	20A35704	Evaluation of Industry Internship				3
				Total		**23**

Open Elective-III

S.No.	Course Code	Course Name	Offered by the Dept.
1	20A01704	Cost Effective Housing Techniques	CE
2	20A02704	IOT Applications in Electrical Engineering	EEE
3	20A03704	Product Design & Development	ME
4	20A04704	Electronic Sensors	ECE
5	20A04506	Principles of Communication Systems	ECE
6	20A27704	Human Nutrition	FT
7	20A54702	Numerical Methods for Engineers	Mathematics
8	20A56702	Sensors And Actuators for Engineering	Physics
9	20A51702	Chemistry of Nanomaterials and Applications	Chemistry

Open Elective-IV

S.No.	Course Code	Course Name	Offered by the Dept.
1	20A01705	Health, Safety & Environmental management	CE
2	20A02705	Renewable Energy Systems	EEE
3	20A03705	Introduction to Composite Materials	ME
4	20A04706	Principles of Cellular & Mobile Communications	ECE
5	20A27705	Waste and Effluent Management	FT
6	20A54703	Number theory & its Applications	Mathematics
7	20A56703	Smart Materials and Devices	Physics
8	20A51703	Green Chemistry and Catalysis for Sustainable	Chemistry

Semester-VIII							
S.No.	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
1.	20A35801	Full Internship & Project work	PR				12
						Total	**12**

COURSES OFFERED FOR HONOURS DEGREE IN CSE (IOT)

S.No.	Code	Course Name	Contact Hours per week		Credits
			L	T	
1	20A35H01	IOT Infrastructure	3	1	4
2	20A35H02	Introduction to UAV	3	1	4
3	20A32H01	Software Project Management using Agile	3	1	4
4	20A35H03	IOT Applications	3	1	4
5	20A35H04	MOOC – I			2
6	20A35H05	MOOC - II			2

MOOC Courses for a Total of 2 credits	IOT Programming and Big Data	5 weeks	https://www.edx.org/course/iot-programming-and-big-data?source=aw&awc=6798_1657521563_1ebf77fb8386e109feb06a181dbae7ac&utm_source=aw&utm_medium=affiliate_partner&utm_content=text-link&utm_term=422873_Edflex
	Drones for Agriculture: Prepare and Design your Drone (UAV) mission	3 weeks	https://www.edx.org/course/drones-for-agriculture-prepare-and-design-your-dro?source=aw&awc=6798_1657521578_de80476c5e88bb1417127738e5f93335&utm_source=aw&utm_medium=affiliate_partner&utm_content=text-link&utm_term=422873_Edflex
MOOC Courses for a Total of 2 credits	AWS IoT: Developing and Deploying an Internet of Things	4 weeks	https://www.edx.org/course/aws-iot-developing-and-deploying-an-internet-of-th
	IoT System Architecture: Design and Evaluation	3 weeks	https://www.edx.org/course/iot-system-architecture-design-and-evaluation-2
MOOC Courses for a Total of 2 credits	Cyber Security and Privacy in the IoT	5 weeks	https://www.edx.org/course/cybersecurity-and-privacy-in-the-iot
	Microsoft Future Ready: Fundamentals of Internet of Things (IoT)	3 weeks	https://www.classcentral.com/course/gettingstartedwiththeiot-92704
MOOC Course for 2 credits	Embedded System Design with ARM	8 weeks	https://onlinecourses.nptel.ac.in/noc22_cs93/preview

LIST OF MINORS OFFERED TO CSE (IOT_

S.No.	Minor Title	Department offering the Minor
1.	Construction Technology	Civil Engineering
2.	Environmental Geotechnology	Civil Engineering
3.	Energy Systems	EEE
4.	3D Printing	ME
5.	Industrial Engineering	ME
6.	Food Science	Food Technology

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B.Tech CSE(IoT)– III-I Sem

L	T	P	C
3	0	0	3

(20A05501T) COMPUTER NETWORKS

Common to CSE,IT,CSD,CSE(AI),CSE(AI&ML),AI&DS,CSE(IOT)

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop new routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

UNIT I **Computer Networks and the Internet** Lecture 8Hrs

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1)

UNIT II **The Data Link Layer, Access Networks, and LANs** Lecture 10Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks

Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

UNIT III **The Network Layer** Lecture 8Hrs

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

UNIT IV **The Transport Layer** Lecture 9Hrs

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)

UNIT V **Principles of Network Applications** Lecture 8Hrs

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2)

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Online Learning Resources:
https://nptel.ac.in/courses/106105183/25
http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3

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B.Tech CSE(IoT)– III-II Sem

L	T	P	C
3	0	0	3

(20A35501) EMBEDDED SYSTEMS

Pre-requisite Computer Organization, Fundamentals of Programming

Course Objectives:

- Understand the concept of embedded systems
- Demonstrate the architecture of MSP430
- Discuss embedded systems programming
- Illustrate design of embedded systems

Course Outcomes (CO):

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

- Analyse MSP430 Architecture, Instruction Set, addressing modes to develop Programs for various control applications using Assembly and Embedded C.
- Solve Problems by analysing MSP430 On Chip Resources such as Timer, Clock System, Low Power Modes/ techniques and Interrupt Structure.
- Realize Mixed Signal Processing and Networking Applications, by analysing on-Chip Resources such as Comparator, ADC, Temperature Sensor, PWM and Communication Peripherals.
- Analyze Language, IDE Support, Processor IC & Design Technologies, and System Modelling Techniques to capture behaviour of Embedded Prototype using suitable model.

UNIT - I Architecture of Msp430 Lecture 9 Hrs

Embedded Systems – Introduction, MSP430 - Anatomy of microcontroller, Memory, Software, Pin out (MSP430G2553), Functional Block diagram, Memory, CPU, and Memory mapped input and output, Clock generator; Exceptions- Interrupts and Resets.

UNIT - II Programming Msp430 Lecture 9 Hrs

Development Environment, Aspects of C for Embedded Systems, Assembly Language, Register Organization, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Example programs- Light LEDs, read input from a switch; Automatic Control-Flashing light by delay, use of subroutines and Functions; Basic Clock System, Interrupts and Low Power Modes.

UNIT - III Timers and Mixed Signal Systems Lecture 9 Hrs

Timers - Watchdog Timer, RTC, Timer A, Measurement in capture mode, PWM generation; Mixed Signal Systems- Comparator A, ADC10 SAADC –Architecture, operation- Single Conversion, Temperature Sensor on ADC10, DTC in ADC10; ADC12 – Comparison with ADC10.

UNIT - IV COMMUNICATION PERIPHERALS & PROTOCOLS Lecture 8 Hrs

MSP430 Communication Interfaces- USART, USCI, USI; Communication Protocols- SPI, Inter-integrated Circuit Bus, USB, CAN

UNIT - V EMBEDDED SYSTEM DESIGN Lecture 8 Hrs

Processor Technology, IC Technology, Design Technology, Trade-offs.

Model VS. Language, System Modelling – Data Flow Model, FSM, FSMD, HCFSM, PSM, Concurrent Process Model & implementation.

Textbooks:

1. John H. Davies, MSP430 Microcontroller Basics, Newnes Publications, 1stEdition, 2008.
2. Santanu Chattopadyay, Embedded System Design, PHI, 2010.
3. Frank Vahid, Tony D. Givargis, Embedded System Design – A Unified Hardware/Software Introduction, John Wiley, January 2006.

Reference Books:

1. Chris Nagy, Embedded Systems Design using the TI MSP30 Series, Newnes Publications, 2003.

2. Jorgeon Staunstrup, Wayne Wolf, Hardware/Software Co-design Principles and Practice, Springer 2009.
3. Patrick R Schamont, A Practical Introduction to Hardware/Software Co-design, Springerpublications, January 2010.

Online Learning Resources:

Embedded Systems Design - Course (nptel.ac.in)

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B.Tech CSE(IoT)– III-II Sem

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(20A35502T) INTERNET PROGRAMMING AND WEB TECHNOLOGIES

Course Objectives:

- Explain how the client-server model of Internet programming works.
- Design and develop interactive, client-side, executable web applications.
- Demonstrate how Internet programming tasks are accomplished.
- Build tools that assist in automating data transfer over the Internet.
- Compare the advantages and disadvantages of the core Internet protocols.

Course Outcomes:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client-side programming).
- Create XML documents and Schemas.
- Build interactive web applications using AJAX.

UNIT I Internet Overview Lecture 8 Hrs

Internet Overview- Networks – WWW –Web Protocols — Web Organization and Addressing – Internet Service Providers, DNS Servers, Connection Types, Internet Addresses - Web Browsers and Web Servers -Security and Vulnerability-Web System Architecture – URL - Domain Name – Web Content Authoring - Webserver Administration – Search Engines

UNIT II HTML5 – Text tags Lecture 8 Hrs

HTML5 – Text tags; Graphics, Form elements, HTML 5 Input types, HTML 5 Input types, semantic tags, CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Cascading and inheritance of style properties - Normal Flow Box Layout-Beyond the Normal Flow – Introduction to responsive design – bootstrap

UNIT III JavaScript Lecture 9 Hrs

JavaScript -Variables and Data Types - Statements – Operators- Literals- Functions Objects-Arrays- Built-in Objects, DOM – BOM - Regular Expression Exceptions, Event handling, Validation – jQuery

UNIT IV Ajax-Enabled Rich Internet Applications Lecture 9 Hrs

Ajax-Enabled Rich Internet Applications: Introduction, Traditional Web Applications vs. Ajax Applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax, Raw Ajax Example using the XMLHttp Request Object, using XML and the DOM, Creating a full-Scale Ajax-Enabled Application, Dojo Toolkit, Wrap-up, Web Resources.

UNIT V Using MongoDB, Advanced Features Lecture 8 Hrs

Using MongoDB: MongoDB Basics, Schema Initialization, MongoDB Node.js Driver, Reading from MongoDB, Writing to MongoDB.

Advanced Features: MongoDB Aggregate, Search Bar, Google Sign-in.

Textbooks:

1. Paul J. Deitel, Harvey Deitel, Internet and World Wide Web How to Program, 6th Edition, Pearson, 2020.

2. Vasan Subramanian, Pro MERN Stack - Full stack web app development, 2nd Edition, 2019.

Reference Books:

1. Jessica Minnick, Responsive Web Design with HTML 5 & CSS, Cengage Learning, 2020.
2. Frank Zammetti, Modern Full-Stack Development: TypeScript, React, Node.js, 1st Edition, Apress,2020

Online Learning Resources:

1. IBM Full stack software developer, https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer

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B.Tech CSE(IoT)– III-II Sem **L T P C**

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(20A35503a) COMMUTATION PROTOCOLS FOR IOT
(Professional Elective Course-I)

Course Objectives:

- Discuss the characteristics, technologies, and protocols related to IoT
- Study the architecture of Arduino, and Raspberry Pi
- Demonstrate applications of IoT
- Understand business models associated with IoT

Course Outcomes:

- Identify the main components of Internet of Things
- Program the sensors and controller as part of IoT
- Assess different Internet of Things technologies and their applications.
- To learn basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world
- To understand various challenges in designing IoT devices
- Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.

UNIT I **IoT Fundamentals** Lecture 8 Hrs

Definition & Characteristics of IoT - Challenges and Issues - Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security. IoT Reference Architecture, Software Design Control Units – Communication modules – Bluetooth – Zigbee – WIFI – GPS- IOT Protocols (IPv6, 6LoWPAN, RPL, CoAP etc..), MQTT, Wired Communication, Power Sources

UNIT II **Technologies behind IoT** Lecture 8 Hrs

Technologies behind IoT, four pillars of IOT paradigm, - RFID, Wireless Sensor Networks, SCADA (Supervisory Control and Data Acquisition), M2M - IOT Enabling Technologies - Big Data Analytics, Cloud Computing, Embedded Systems, Programming the microcontroller for IoT

UNIT III **Communication Protocols for IoT** Lecture 9 Hrs

Working principles of sensors – IOT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, WIFI and USB - Contiki OS- Cooja Simulator.

UNIT IV **Resource management in IoT** Lecture 9 Hrs

Resource management in IoT: Clustering, Clustering for Scalability, Clustering for routing, Clustering Protocols for IOT, From the internet of things to the web of things, The Future Web of Things – Set up cloud environment –Cloud access from sensors– Data Analytics for IOT- Rest Architectures- The web of Things, Resource Identification and Identifier, Richardson Maturity Model.

UNIT V **Applications of IoT** Lecture 8 Hrs

Applications of IoT, Business models for IoT, Green energy buildings and infrastructure, Smart farming, Smart retailing and Smart fleet management, Recent trends.

Textbooks:

1. Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri. Internet of Things: Architectures, Protocols and Standards, 1st edition, Wiley Publications, 2019.
2. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A hands-on approach, 1st edition,

University press, 2014.

Reference Books:

1. Vermesan, Ovidiu, and Peter Friess, eds. Internet of things-from research and innovation to market deployment, 1st edition, Aalborg: River publishers, 2014.
2. Tsiatsis, Vlasios, Tsiatsis, Vlasios, Stamatis Karnouskos, Jan Holler, David Boyle, and Catherine Mulligan, Internet of Things: technologies and applications for a new age of intelligence, 2nd edition, Academic Press, 2018.

Online Learning Resources:

1. M2M and IoT interface design and protocols for Embedded Systems on Coursera

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3	0	0	3

(20A35503b) ADHOC AND WIRELESS SENSOR NETWORKS
Professional Elective Course-I

Course Objectives:
- Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems.
- Understand the medium access control protocols
- Learn transport layer protocols for wireless sensor networks, and design requirements.
- Understand the sensor network middleware, operating systems.

Course Outcomes:
- Explain the basic principles of Wireless Sensor Networks
- Critically analyze transport protocols of WSNs
- Explore the routing strategies of WSNs
- Use operating systems related to WSNs

UNIT I **Introduction** Lecture 8 Hrs

Introduction and overview of Wireless Sensor Networks: Introduction, Basic overview of the technology, Basic wireless sensor technology, Wireless transmission technology and systems.

UNIT II **Wireless Sensor Networks** Lecture 9 Hrs

Medium Access control protocol for Wireless Sensor Networks:
Introduction, Fundamentals of MAC Protocols, Sensor-MAC, IEEE 802.15.4 LR-WPANs standard case study.

Routing protocol for wireless sensor networks: Introduction, Data dissemination and gathering, Routing challenges and design issues in wireless, Routing strategies in wireless sensor networks.

UNIT III Title Lecture 8 Hrs

Transport control protocols for Wireless Sensor Networks: Traditional TCP, Transport protocol design issues, Examples of Existing TCP, Performance of TCP

Middleware for Wireless Sensor Networks: Introduction, WSN middleware principles, Middleware Architecture, Existing middleware.

UNIT IV Title Lecture 9 Hrs

Network Management for Wireless Sensor Networks: Introduction, Network management Requirements, Traditional network management models, and Network management design issues, Examples of management architecture: MANNA, Other issues related to network management.

UNIT V Title Lecture 8 Hrs

Unit V:Operating systems for Wireless Sensor Networks: Introduction, Operating system design issues, Examples of Operating systems.

Performance and Traffic Management: Introduction, WSN Design issues, Performance modelling of WSN's, Case study: Simple Computation of the system life span.

Textbooks:
1. Kazem sohraby, Daniel Minoli, Taiebznati, "Wireless Sensor Networks", Technology, Protocols and Applications. WILEY Publication-2007

Reference Books:
1. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
2. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005

Online Learning Resources:
1. NPTEL: Computer Science and Engineering - NOC: Wireless Ad Hoc and Sensor Networks

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B.Tech CSE(IoT)– III-II Sem **L T P C**

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(20A35503c) DATA DISSEMINATION TECHNIQUES

(Professional Elective Course-I)

Course Objectives:

- Discuss the need for data dissemination
- Illustrate different data dissemination techniques

Course Outcomes:

- Understand the various mobile communication systems.
- Design data dissemination techniques
- Explore the issues in data dissemination
- Compare push and pull strategies

UNIT I Introduction, Models For Information Dissemination, Data Broadcast Scheduling **Lecture 9 Hrs**

INTRODUCTION: Reference Architecture of Wireless Computing Environments, Characteristics of V Computing Environments, Potential, Benefits and Applications, Design Issues in Wireless Data Dissemi MODELS FOR INFORMATION DISSEMINATION: Taxonomy of Data Delivery Mechanisms, Perfo Metrics.

DATA BROADCAST SCHEDULING: Organization of Broadcast for Push-based Broadcast Scheduling Strategies for Pull-based Broadcast System.

UNIT II INDEXING ON AIR **Lecture 9 Hrs**

Data Organization for Selective Tuning, Flat Broadcast Programs withIndexes, Selective Tuning for Data Access, Non-flat Broadcast Programs with Indexes, Selective Tuning Mechanisms for Pull-Based Model.

UNIT III Fault-Tolerant Broadcast Organization, Cache Invalidation Mechanisms Lecture 9 Hrs

FAULT-TOLERANT BROADCAST ORGANIZATION: Fault on Air, Characteristics of Fault Tolerant Index, Inter-Index Schemes, Intra-Index Schemes.

CACHE INVALIDATION MECHANISMS: A Taxonomy of Cache Invalidation Schemes,Cache Invalidation Schemes.

UNIT IV Balancing Push and Pull & Supporting Relational Operations Lecture 8 Hrs

BALANCING PUSH AND PULL: Architecture of Integrated Model, The Case for Dynamism, Adaptive Integrated Models.

SUPPORTING RELATIONAL OPERATIONS: Cache Coherency Strategies in Pull-based Syster Processing in Push-based System.

UNIT V DATA DISSEMINATION IN MS NETS **Lecture 8 Hrs**

Data Dissemination in MS Nets: Introduction, Overview, Trace-based Analysis on Mobile Social Networks, User Mobility Model, Designing Algorithms for the Super use route, Performance Evaluation, Discussions.

Textbooks:

1. Data Dissemination in Wireless Computing Environments Kluwer International Series on Advances in Systems, Tan, Kian-Lee., Ooi, Beng Chin, publisher: Kluwer Academic Publishers
2. Data Dissemination and Query in Mobile Social Networks Front Cover Jiming Chen, Jialu Fan, You content,2012

Reference Books:

Data Dissemination: Complete Self-Assessment Guide, Gerardus Blokdyk, 2018

Online Learning Resources:

Data Dissemination - an overview | ScienceDirect Topics

Data Dissemination Techniques in Mobile Computing Environment | International Journal of Scientific Res Science and Technology IJSRST - Academia.edu

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B.Tech CSE(IoT)– III-I Sem

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0	0	3	1.5

(20A05501P) COMPUTER NETWORKS LAB
Common to CSE,IT,CSD,CSE(IOT)

Course Objectives:

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system
- To impart knowledge of Network simulator 2/3
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools**.**

Course Outcomes (CO):

After completion of the course, students will be able to

- Design scripts for Wired network simulation
- Design scripts of static and mobile wireless networks simulation
- Analyze the data traffic using tools
- Design JAVA programs for client-server communication
- Construct a wired and wireless network using the real hardware

List of Experiments:

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.
    - Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
    - Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.
2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup
3. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.
4. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
5. Use Packet tracer software to build network topology and configure using Link State routing protocol.
6. Using JAVA RMI Write a program to implement Basic Calculator
7. Implement a Chatting application using JAVA TCP and UDP sockets.
8. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbour. Implement Hello and Echo commands using JAVA.
9. Using Wireshark perform the following operations:
    - Inspect HTTP Traffic
    - .Inspect HTTP Traffic from a Given IP Address,
    - Inspect HTTP Traffic to a Given IP Address,
    - Reject Packets to Given IP Address,
    - Monitor Apache and MySQL Network Traffic.
10. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
11. Create a static wireless network. Attach agents, generate both FTP and CBR traffic,

and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

12. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

References:

1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials A Lab-Based Approach", Cambridge University Press, 2004.
2. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
3. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.

Online Learning Resources/Virtual Labs:

- https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
- Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
- https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
- https://nptel.ac.in/courses/106105183/25
- http://www.nptelvideos.in/2012/11/computer-networks.html
- https://nptel.ac.in/courses/106105183/3
- http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE(IoT)– III-I Sem

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(20A35502P) INTERNET PROGRAMMING AND WEB TECHNOLOGIES LAB

Course Objectives:

- To be exposed to creating applications with AJAX
- To be familiar with Web page design using HTML/XML and style sheets
- To develop an ability to design and implement static and dynamic website
- Choose best technologies for solving web client/server problems
- Understand, analyze and create XML documents and XML Schema

Course Outcomes:

- Construct Web pages using HTML/XML and style sheets.
- Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- Develop dynamic web pages using server-side scripting.
- Construct web applications using AJAX and web services.
- Understand, analyze and apply the role of languages like HTML, CSS, XML, JavaScript, PHP and protocols in the workings of the web and web applications

List of Experiments:

1. Work with different HTML tags. Design your own sample applications
2. Add CSS sheets to the web pages you create
3. Create a web page with multiple types of style sheet used in a single page.
4. Write a CGI sample program to send output back to the user.
5. Write a Java Script program by using variables.
6. Write a java script program to multiply two numbers and display the result in separate text box.
7. Write a java script program on Form Validations.
8. Write an AJAX program checking the presence of XMLHttpRequest object.
9. Write a program to create sales report for our books by using AJAX.
10. Create an XML document template to describe the result of students in an examination.
11. The description should include the student's roll number, name, three subject names and marks, total marks, percentage and results.
12. Write an XSLT code to only retrieve the book titles and their prices.
13. Assuming any product, design product landing page.
14. Design your personal website which is SEO friendly
15. Design a Blog considering all the activities you have done till now and skills you acquired. Assume you are marketing yourself

References:

1. Achyut Godbole, Atul Kahate"WebTechnologies:TCP/IP,Web/Java Programming, and Cloud Computing", Third Edition,McGraw Hill Education, 2002.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
3. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

Online Learning Resources/Virtual Labs:

1. Internet and Web programming - GeeksforGeeks

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE(IoT)– III-I Sem **L T P C**

1 0 22

(20A35504) WORKING WITH EMBEDDED C

Course Objectives:

- Aim to impart technical skills to the students right from the basics to advanced level, such that, by the end of the Program the student is developed as the finished product, ready to join the industry.
- Describes what an embedded system is, what makes them different, and what embedded systems designers need to know to develop embedded systems
- Provides the student with a life cycle view for designing multi-objective, multi-discipline embedded systems
- Imparts a solid understanding of the role of embedded systems and embedded systems design and development in modern day's technology-enabled society
- Understand the role of embedded systems in the context of complex engineering systems.

Course Outcomes:

- Transfer the executable code to the embedded hardware and test the system.
- To show how simple C programs can be developed and tested using the software tools.
- The Keil hardware simulator will allow you to simulate suitable hardware for use with the program.
- Describe how to use an object-oriented style of programming with C programs.

UNIT I **Programming embedded systems in C** Lecture 9 Hrs

Programming embedded systems in C: Introduction, what is an embedded system? Which processor should you use? Which programming language should you use? Which operating system should you use?, How do you develop embedded software?.

Hello, embedded world: Introduction, Installing the Keil software and loading the project, Configuring the simulator, Building the target, Running the simulation, Dissecting the program, aside: Building the hardware.

UNIT II **Reading switches** Lecture 8 Hrs

Reading switches: Introduction Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats.

UNIT III **Adding structure to your code** Lecture 9 Hrs

Adding structure to your code: Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' Example: Restructuring the goat-counting example, Further examples.

UNIT IV Meeting real-time constraints &multi-state systems and Lecture 9 Hrs
Function sequences

Meeting real-time constraints: The need for 'timeout' mechanisms, creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, creating hardware timeouts, Example: Testing a hardware timeout.

Multi-state systems and function sequences: Introduction, implementing a Multi-State (Timed) system, Example: Traffic light sequencing, Example: Animatronic dinosaur, Implementing a Multi-State (Input/Timed) system, Example: Controller for a washing machine.

UNIT V **Using the serial interface** Lecture 9 Hrs

Using the serial interface: Introduction, what is RS-232? Does RS-232 still matter? The basic RS-232 protocol, Asynchronous data transmission and baud rates, Flow control, the software architecture, Using the on-chip UART for RS-232 communications, Memory requirements, Example: Displaying elapsed time on a PC, The Serial-Menu architecture, Example: Data acquisition, Example: Remote-control robot.

List of Experiments

1. Program to transmit message from microcontroller to PC serially using RS232
2. Program to interface Elevator.
3. Program to interface keypad. Whenever a key is pressed, it should be displayed on LCD
4. Program to receive a message from PC to microcontroller serially using RS232
5. Program to interface a switch and a buzzer to two different pins of a port such that the buzzer should sound as long as the switch is pressed.
6. Interrupt programming through GPIOs
7. PWM generation using Timer on MSP430 GPIO
8. Interfacing potentiometer with MSP430
9. a) Interfacing DC motor. b) Interfacing Relay. c) Interfacing Servo d) Interfacing Stepper motor.
10. Write a random number generation function using assembly language. Call this function from a C program to produce a series of random numbers and save them in the memory
11. Design a Water level controller using Microcontroller
12. Design a Bio metric Attendance System
13. Design a Fingerprint based Security system

Textbooks:

1. Embedded Systems, Michael J. Pont, Pearson Education,2015

Reference Books:

1. Embedded C Programming: Techniques and Applications of C and PIC MCUS, Mark Siegesmund,2014.
2. Embedded C Programming and the Atmel AVR, Richard H. Barnett, Sarah Cox, Larry O'Cull, 2006.

Online Learning Resources:

1. Embedded System C Programming - javatpoint
2. Embedded Systems Programming on ARM Cortex-M3/M4 Processor | Udemy

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE(IoT)– III-II Sem

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(20A35601T) MOBILE APPLICATION DEVELOPMENT FOR IOT

Course Objectives:

- Discuss the fundamentals of IoT
- Understand the architecture of Arduino
- Demonstrate the interfacing of sensors with Arduino

Course Outcomes:

- Describe various development technologies in each IoT layer.
- Develop IoT applications using standardized hardware and software platforms.
- Create prototype using low power communication technologies.
- Explain IoT solution development from Product management perspective

UNIT I Lecture 10Hrs

Setting up Your Workspace: Hardware and Software requirements, installing Java Developer Kit, Installing Android Studio, setting up the Android Software Development Kit, Hardware configuration, learning to use aREST library, Creating your first Android project

Wi-Fi Remote Security Camera: Hardware and software requirements, Android phone Sensor

UNIT II Lecture 8 Hrs

Wi-Fi Smart Power Plug: Hardware and Software requirements, Writing the Arduino sketch

Control an Arduino Board via NFC: Hardware and Software requirements, Writing the Arduino sketch

UNIT III Lecture 7 Hrs

Bluetooth Weather Station: Hardware and Software requirements, Writing the Arduino sketch, Enhancing the user interface

Pulse Rate Sensor: Hardware and Software requirements, Writing the Arduino sketch

UNIT IV Lecture 9 Hrs

Controlling an Android Board via Bluetooth: Hardware and Software requirements, Writing the Arduino sketch

Android Phone Sensor: Hardware and Software requirements, Writing the Arduino sketch**.**

UNIT V Lecture 10 Hrs

Voice-activated Arduino: Hardware and Software requirements, Writing the Arduino sketch

Bluetooth Low Energy Mobile Robot: Hardware and Software requirements, Writing the Arduino sketch, Enhancing the interface further.

Textbooks:

1. Arduino Android Blueprints, Marco Schwartz, Stefan Buttigieg, PACKT Publishing, 2014.

Reference Books:

1. Internet of Things A to Z Technologies and Applications, Qusay F. Hassan, IEEE Press, Wiley.

Online Learning Resources:

1. Mobile Development Courses & Tutorials | Codecademy
2. The Complete React Native + Hooks Course | Udemy

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE(IoT)– III-II Sem **L T P C**

3 0 03

(20A35602T) IOT APPLICATION DEVELOPMENT ON CLOUD PLATFORMS

Course Objectives:

- Provide knowledge on Sensor Principles.
- Familiarize with different sensors and their application in real life.
- Understand Basics of IoT and enabling technologies.
- Demonstrate the design of IoT applications using Arduino and Raspberry pi.

Course Outcomes:

- Perform Data Acquisition and analysis using Cloud and Tkinter.
- Understand the vision of IoT from a global context.
- Determine the Market perspective of IoT.
- Use of Devices, Gateways and Data Management in IoT.
- Building state of the art architecture in IoT.

UNIT I Lecture 8 Hrs

Four Pillars of IoT: The Horizontal, verticals and Four Pillars, M2M: The Internet of Devices, RFID: The Internet of Objects, WSN: The Internet of Transducers, SCADA: The Internet of Controllers.

UNIT II Lecture 8 Hrs

The DNA of IoT: DCM: Device, Connect and Manage, Device: Things That Talk, Connect: Via Pervasive Networks, Manage: To Create New Business Value.

UNIT III Lecture 8 Hrs

Middleware and IoT: An Overview of Middleware, Communication Middleware for IoT, LBS and Surveillance Middleware.

UNIT IV Lecture 9 Hrs

Cloud Computing: What is Cloud Computing? Grid/SOA and Cloud Computing, Cloud Middleware, NIST's SPI Architecture and Cloud Standards, Cloud Providers and Systems.

UNIT V Lecture 9 Hrs

The Cloud of Things: The Internetof Things and Cloud Computing, Mobile Cloud Computing, MAI Versus XaaS: The Long Tail and the Big Switch, The Cloud of Things Architecture.

Textbooks:

1. The Internet of Things in the Cloud, A Middleware Perspective, Honbo Shou, CRC Press.

Reference Books:

1. The Convergence of Internet of Things and Cloud for Smart Computing, Parishit N. Mahalle, Nancy Ambritta P., Gitanjali Rahul Shinde and Arvind Vinayak Deshpande, CRC Press.

Online Learning Resources:

1. IoT Cloud Application | IoT Cloud Service Providers (embitel.com)

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B.Tech CSE(IoT)– III-II Sem

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(20A35603T) CYBER PHYSICAL SYSTEMS

Course Objectives:

- Introduce modeling of CPS
- Introduce ability to analyze and simulate CPS systems

Course Outcomes:

After completion of the course, students will be able to

- Apply modeling and associated tools for Hybrid system
- Analyze CPS by with holistic models of cyber and physical components
- Understand CPS design, modeling, and analysis
- Compare architectural design trade-offs in CPS
- Understand methods for verification and validation of CPS such as simulation, testing, model checking, etc.

UNIT I Lecture 9 Hrs

Medical Cyber-physical Systems – Introduction and Motivation, System Description and Operational Scenarios, Key Design and Quality Attributes, Practitioner's Implications.

Energy Cyber-Physical Systems - Introduction and Motivation, System Description and Operational Scenarios, Key Design and Quality Attributes, Cyber Paradigm for Sustainable SEES, Practitioner's Implications.

UNIT II Lecture 8 Hrs

Cyber-Physical Systems Built on Wireless Sensor Networks – Introduction and motivation, **System Description and Operational Scenarios:** MAC, Routing, Node Localization, Clock Synchronization, and Power Management. **Key Design and Quality Attributes:** Physically Aware, Real-Time Aware, Runtime validation aware, Security aware

UNIT III Lecture 8 Hrs

Logical Correctness for Hybrid Systems – Introduction and motivation, **Basic techniques**: Discrete Verification. **Advanced techniques:** Real-Time Verification, Hybrid verification.

Security of Cyber-Physical Systems - Introduction and motivation, **Basic techniques**: Cyber security requirements, Attack model, Counter measures. **Advanced techniques:** System theoretic approaches

UNIT IV Lecture 9 Hrs

Synchronization in Distributed Cyber-Physical Systems - Introduction and motivation, **Basic techniques:** Formal software engineering, distributes consensus algorithms, Synchronous lockstep executions, Time-triggered architecture. **Advanced techniques:** Physically asynchronous, Logically synchronous systems.

Real-Time Scheduling for Cyber-Physical Systems - Introduction and motivation, **Basic techniques –** Scheduling with fixed Timing Parameters, Memory Effects. **Advanced techniques –** Multiprocessor / Multicore scheduling, Accommodating variability and uncertainty.

UNIT V Lecture 9 Hrs

Model Integration in Cyber-Physical Systems - Introduction and Motivation, **Basic Techniques:** Causality, Semantic domains for time, Interaction models for computational processes, Semantic of CPS DSMLs. **Advanced Techniques:** For Spec, The syntax of CyPhyML, Formalization of semantics, Formalization of Language Integration.

Textbooks:

1. Raj Rajkumar, Dionisio de Niz, Mark Klein ,"Cyber Physical Systems", 2017

Reference Books:

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", 2011

Online Learning Resources:

1. Introduction to Cyber-Physical Systems (CPS): An Overview (acodez.in)

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B.Tech CSE(IoT)– III-II Sem

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(20A05602T) MACHINE LEARNING

Common to CSE, IT,CSD,CSE(AI),CSE(AI&ML),CSE(DS),AI&DS,CSE(IOT)

PROFESSIONAL ELECTIVE - II

Course Objectives:

The course is introduced for students to

- Understand basic concepts of Machine Learning
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Design application using machine learning techniques

UNIT – I **Introduction to Machine Learning &Preparing to Model** Lecture 9Hrs

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning

Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT – II **Modelling and Evaluation &Basics of Feature Engineering** Lecture 9Hrs

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model

Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

UNIT – III **Bayesian Concept Learning & Supervised Learning: Classification** Lecture 10Hrs

Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network

Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*-Nearest Neighbour(*k*NN), Decision tree, Random forest model, Support vector machines

UNIT – IV **Supervised Learning: Regression** Lecture 10Hrs

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT – V **Unsupervised Learning** Lecture 9Hrs

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods,

K-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN

Finding Pattern using Association Rule- Definition of common terms, Association rule, The apriori algorithm for association rule learning, Build the apriori principle rules

Textbooks:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
1. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.

Online Learning Resources:

- Andrew Ng, “Machine Learning Yearning”
- https://www.deeplearning.ai/machine-learning- yearning/
- Shai Shalev-Shwartz , Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms” , Cambridge University Press https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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B.Tech CSE(IoT)– III-II Sem

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(20A05701a) CLOUD COMPUTING
Common to CSE,IT, CSD, CSE(AI), CSE(AI&ML), CSE(DS), AI&DS
PROFESSIONAL ELECTIVE - II

Course Objectives:
- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes (CO):
After completion of the course, students will be able to
- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT - I **Basics of Cloud computing** Lecture 8Hrs

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT - II **Hadoop and Python** Lecture 9Hrs

Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT - III **Python for Cloud computing** Lecture 8Hrs

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT - IV **Big data, multimedia and Tuning** Lecture 8Hrs

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT - V **Applications and Issues in Cloud** Lecture 9 Hrs

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud

computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven–step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Textbooks:

1. Cloud computing A hands-on Approach| By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O 'Reilly, SPD, rp2011.
6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

Online Learning Resources:

Cloud computing - Course (nptel.ac.in)

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B.Tech CSE(IoT)– III-II Sem

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(20A05502T) ARTIFICIAL INTELLIGENCE
COMMON TO CSE,IT,CSD, CSE (DS), CSE(IOT)
PROFESSIONAL ELCTIVE - II

Course Objectives:
This course is designed to:
- Introduce Artificial Intelligence
- Teach about the machine learning environment
- Present the searching Technique for Problem Solving
- Introduce Natural Language Processing and Robotics

Course Outcomes:
After completion of the course, students will be able to
- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

UNIT I **Introduction** Lecture 9Hrs

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II **Solving Problems by searching** Lecture 9 Hrs

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT III **Reinforcement Learning & Natural Language Processing** Lecture 8Hrs

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT IV **Natural Language for Communication** Lecture 8 Hrs

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition
Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT V **Robotics** Lecture 10Hrs

Robotics: Introduction, Robot Hardware, Robotic Perception, planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:
1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html
http://nptel.ac.in/courses/106106139/
https://nptel.ac.in/courses/106/105/106105152/

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B.Tech CSE(IoT)– III-II Sem

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(20A35601P) MOBILE APPLICATION DEVELOPMENT FOR IOT Lab

Course Objectives:

- Learn the configuration of Android Studio, SDK Manager, and AVD Emulators
- Understand Android UI Components and make use of Material Design for Android
- Learn the usage of Libraries, APIs and handle messages
- Explore various Hybrid App Development Platforms
- Acquire the knowledge of app releases and publishing and app to the play store

Course Outcomes:

After completion of the course, students will be able to

- Demonstrate the configuration of Android Software Development tools
- Design and develop Mobile Applications using Android and Kotlin
- Develop a complex android application by using APIs, Libraries, and message handling techniques
- Construct the mobile application using a hybrid framework or SDK release and publish an application on Google Play Store

List of Experiments:

1. Install Android Studio and Configure Latest Android SDKs and Android Virtual Devices
2. Build and Run Hello World Application on the virtual Device and also test the app on your mobile phone
3. Explore all the UI Controls and design a student registration Activity
4. Design the Student Registration Activity using Material Design for Android Components
5. Design a complete Student Management Application using Android and provide effective navigation between various Activities
6. Design a mobile IoT APP for a smart home
7. Design a mobile IoT App for Agriculture motor control from a remote location
8. Design a mobile IoT APP for home protection which monitors for intruders and sends a message to your phone immediately and also sends an email.
9. Design a Green leaf disease detection using Rasberry Pi
10. Design a Weed Removal vehicle controlled by a mobile
11. Design a Garbage based IoT monitoring system
12. Develop an Android Application that stores Student Details into the hosting server and retrieve student details from the server
13. Prepare and Publish Your Android Apps in Google Play Store

References:

1. Smyth, Neil. Android Studio 4.2 Development Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 4.2, Kotlin, and Android Jetpack, Payload Media, Incorporated, 2021.
2. Cheng, Fu. Build Mobile Apps with Ionic 4 and Firebase: Hybrid Mobile AppDevelopment. Germany, Apress, 2018.
3. Derks, Roy, and Boduch, Adam. React and React Native: A Complete Hands-on Guide to Modern Web and Mobile Development with React.js, 3rd Edition. United Kingdom, Packt Publishing, 2020.

Online Learning Resources/Virtual Labs:

1. https://developer.android.com/
2. https://material.io/
3. https://kotlinlang.org/
4. https://google-developer-training.github.io/android-developer-fundamentals-course-concepts/
5. https://developers.google.com/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE(IoT)– III-II Sem

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(20A35602P) IOT APPLICATION DEVELOPMENT USING CLOUD LAB

Course Objectives:

The man objective is to develop IoT applications for the Cloud platform

Course Outcomes:

- Subscribe the cloud services
- Explore the cloud services
- Deploy applications on cloud

List of Experiments:

1. Create any cloud platform account, explore IoT services and register a thing on the platform.
2. Push sensor data to cloud.
3. Control an actuator through cloud.
4. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
5. Control any two actuators connected to the development board using Bluetooth.
6. Read data from sensor and send it to a requesting client. (Using socket communication)
7. Design a Carbon Footprint monitoring system
8. Design a system which transfers accelerometer readings over WiFi
9. Design a IoT Cloud Enabled Alarm Clock
10. Design a Controller of your TV using Alexa and Arduino IoT Cloud
11. Design an Arduino cloud-based system to interact with a simple webpage
12. Design a Diabetes detection system which uses the chemical decomposition analysis of organic compounds in the breath
13. Design a system which connects your door to the cloud and open it from anywhere.
14. Design an Arduino system which guesses the secret number (GAME)

Textbooks:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011.

References:

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
2. The Internet of Things, enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Online Learning Resources/Virtual Labs:

1. IoT Virtual Lab | IoTIFY - cloud based IoT simulator and IoT testing platform

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B.Tech CSE(IoT)– III-II Sem

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(20A35603P) CYBER PHYSICAL SYSTEMS LAB

Course Objectives:

- Understand the components that make a cyber physical system
- Demonstrate cyber physical systems

Course Outcomes:

- Design various cyber physical systems

List of Experiments:

2. Develop a wearable assisted continuous authentication framework where a wearable device like smartwatch is used to authenticate a computer user continuously utilizing the motion sensors of the smartwatch
3. Design a compromised device detection system in a grid
4. Design a Covid patient tracking system. The information about the Covid patients shall be maintained in a website. The patients are to be tracked using mobile numbers. The system shall keep track of the movement of the Covid patients based on their mobile numbers.
5. Design a prototype of the parking system which keeps track of empty parking spots and informs the drivers entering a parking spot.
6. Design a milk quality checker system. Do a survey and identify the different adulterates that may be added to the milk.
7. Design an automated seeding robot
8. Design an environmental monitoring system and informs the people particularly farmers
9. Design a medical alert system which alerts the elderly patients whenever it is time to take medicines. Particular medicines and other value-added information may also be provided.
10. Design an intelligent stream lighting system
11. Design a PID based cyber physical system model for controlling room temperature
12. Build a line follower robot using Raspberry pi
13. Build an IoT Communication model for connecting devices

Textbooks:

1. Walid M. Taha, Abd-Elhamid M. Taha, Johan Thunberg, Cyber-Physical System: A Model-Based Approach

References:

1. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011.
2. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.

Online Learning Resources/Virtual Labs:

1. Cyber-Physical Systems Lab (ucdenver.edu)

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(20A52401) SOFT SKILLS

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes (CO):

By the end of the program students should be able to

- Memorize various elements of effective communicative skills
- Interpret people at the emotional level through emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Judge the situation and take necessary decisions as a leader
- Develop social and work-life skills as well as personal and emotional well-being

UNIT – I **Soft Skills & Communication Skills** **10 Hrs**

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II **Critical Thinking** **10 Hrs**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT – III **Problem Solving & Decision Making** **10 Hrs**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

UNIT – IV **Emotional Intelligence & Stress Management** **10 Hrs**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V **Leadership Skills** **10 Hrs**

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities:
Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

NOTE-:
1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:
1. Personality Development and Soft Skills (English, Paperback, Mitra BarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:
1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

Online Learning Resources:
1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

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B.Tech CSE(IoT)– III-II Sem

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(20A99601) INTELLECTUAL PROPERTY RIGHTS AND PATENTS
(Mandatory Non-Credit Course)

Course Objectives:

This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws, Cyber Laws, Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations

Course Outcomes:

- Understand IPR law & Cyber law
- Discuss registration process, maintenance and litigations associated with trademarks
- Illustrate the copy right law
- Enumerate the trade secret law.

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Textbooks:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal &Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections

References:

1. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub.

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B.Tech CSE(IoT)– IV-I Sem

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(20A35701a) BIG DATA ANALYTICS FOR IOT (PROFESSIONAL ELECTIVE COURSE-III)

Course Objectives:

- Understand the Big Data Platform and its Use cases.
- Demonstrate analytics on Structured, Unstructured Data.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- To learn big data concepts and its uses.

Course Outcomes:

- Analyse the big data analytic techniques for business applications.
- Manage big data using different tools and frameworks.
- Design efficient algorithms for mining the data from large volumes.
- Implement the HADOOP and MapReduce technologies associated with big data analytics

UNIT I Lecture 9 Hrs

Big Data Analytics for the Internet of Things: An Overview, Data, Analytics and Interoperability Between Systems (IoT)- Context, Models in the Background, Problem Space, Solutions Approach, The Illusion of Data, Delusion of Big Data, and the Absence of Intelligence in AI, Data Science in Service of Society: Knowledge and Performance from PEAS, Machine Learning Techniques for IoT Data Analytics- Introduction, Taxonomy of Machine Learning Techniques

UNIT II Lecture 9 Hrs

I**oT Data Analytics Using Cloud Computing**- Introduction, IoT Data Analytics Cloud Computing for IoT, Cloud-Based IoT Data Analytics Platform, Machine Learning for IoT Analytics in Cloud, Challenges for Analytics Using Cloud, Deep Learning Architectures for IoT Data Analytics- Introduction, DL Architectures

UNIT III Lecture 8 Hrs

Adding Personal Touches to IoT: A User-Centric IoT Architecture- Introduction, Enabling Technologies for BDA of IoT Systems, Personalizing the IoT, Related Work, User Sensitized IoT Architecture, The Tweaked Data Layer, The Personalization Layer, Concerns and Future Directions, Smart Cities and the Internet of Things, A Roadmap for Application of IoT-Generated Big Data in Environmental Sustainability

UNIT IV Lecture 8 Hrs

Intelligent Enterprise-Level Big Data Analytics for Modelling and Management in Smart Internet of Roads, Predictive Analysis of Intelligent Sensing and Cloud-Based Integrated Water Management System, Data Security in the Internet of Things: Challenges and Opportunities.

UNIT V Lecture 9 Hrs

DDoS Attacks: Tools, Mitigation Approaches, and Probable Impact on Private Cloud Environment, Securing the defence Data for Making Better Decisions Using Data Fusion, New Age Journalism and Big Data

Textbooks:

1. "Big Data Analytics for Internet of Things", Tausifa Jan Saleem (Editor), Mohammad Ahsan Chishti (Editor), Wiley

Reference Books:

1. Big Data Analytics for Cloud, IoT and Cognitive Computing, Kai Hwang and Min Chen, 2017.
2. Big Data Analytics, Venkat Ankam, 2016.

Online Learning Resources:

1. https://www.wiley.com/en-us/Big+Data+Analytics+for+Internet+of+Things-p-9781119740759

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(20A35701b) BUSINESS ANALYTICS
(PROFESSIONAL ELECTIVE COURSE-III)

Course Objectives:

- Introduce the Business intelligence concepts, techniques and models
- Understand the modelling process behind business analytics
- To analyse different data analysis tools and techniques
- Understand the fundamental of Business Intelligence and to design a customized solution.

Course Outcomes:

- Familiarize on the concepts, techniques and reporting methods of descriptive analytics and predictive analytics
- Explore the methods used to analyse speech and text and implement optimized search engines
- Design and implement Decision Support systems
- Familiarize on the processes needed to develop, report, and analyse business data

UNIT I Lecture 9 Hrs

Introduction to Business Intelligence: Designing Business Intelligence Application Requirements Gathering, Establishing the Technical Architecture, designing a Business Intelligence Solution, Designing Dimensional Models, Designing the Physical Databases.

UNIT II Lecture 9 Hrs

Descriptive Analytics: Data Warehousing- Definitions and Concepts -- Data Warehousing Architectures - Data Integration and the Extraction, Transformation, and Load (ETL) Processes - Transaction processing- Data Warehouse Development Approaches - Data Warehousing Implementation Issues - Data Warehouse Administration, Security Issues, and Future Trends- Business Reporting, Visual Analytics, and Business Performance Management.

UNIT III Lecture 8 Hrs

Predictive Analytics: Data Mining Concepts- Definitions, Characteristics, and Benefits - How Data Mining Works - Data Mining Versus Statistics Data Mining Process - Data Mining Methods - Data Mining and Privacy Issues - Regression – Classification –Association Rules – clustering -Techniques for Predictive Modeling – ANN- SVM.

UNIT IV Lecture 8 Hrs

Text Analytics, Text Mining, And Sentiment Analysis: Natural Language Processing - Text Mining Process- tools - Sentiment Analysis -Overview, Process, Applications - Speech Analytics – Rule based, Multi, Layer, Hybrid Sentimental analysis – Machine Learning in Sentimental analysis.

Web Analytics and Web Mining: Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools.

UNIT V Lecture 10 Hrs

Prescriptive Analytics: Decision Support Systems Modelling - Mathematical Models for Decision Support - Certainty, Uncertainty, and Risk- Decision Modelling with Spreadsheets - Mathematical Programming Optimization - Decision Analysis with Decision Tables and Decision Trees - Problem-Solving Search Methods - Problem-Solving Search Methods

Knowledge Management and Big Data Analytics: Knowledge Management –Concepts, Definitions, Approaches, tools and techniques - Big Data and Analytics- Fundamentals of Big Data Analytics – Technologies - Data Scientist - Big Data and Data Warehousing - Automated Decision Systems and Expert Systems - Business Analytics: Emerging Trends and Future Impacts.

Textbooks:

1. Efraim Turban, Ramesh Sharda, Dursun Delen, “Business Intelligence and Analytics”, 10th Edition, Pearson, 2015.

Reference Books:

1 S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis & Decision Making, 6th Edition, CENGAGE INDIA, 2017
2 Dinabandhu Bag, Business Analytics, Routledge, 1st edition, 2016.
3 Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics, Morgan Kaufmann, 1st edition 2014.

Online Learning Resources:

1. What is Business Analytics? | Oracle India

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B.Tech CSE(DS)– III-II Sem

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(20A32601T) DATA VISUALIZATION
(Professional Elective-III)

Course Objectives:

- Discuss the importance of Data Visualization
- Demonstrate story telling
- Explain the environment of Tableau

Course Outcomes:

After completion of the course, students will be able to

- Effectively present the data
- Draw insights from the data
- Use Tableau

UNIT I Lecture 9 Hrs

Introduction, The importance of Context, Choosing and effective visual

UNIT II Lecture 9 Hrs

Clutter is your enemy, Focus your audience's attention, Lessons in Storytelling

UNIT III Lecture 10 Hrs

Communicating data: A step in the process, a model of communication, Three types of communication problems, six principles of communicating data.
Introduction to Tableau: Using Tableau, Tableau products, Connecting to data.
How much and How many: Communicating how much, communicating how many
Ratios and Rates: Ratios, Rates

UNIT IV Lecture 10 Hrs

Proportions and Percentages: Part to whole, current to historical, actual to target.
Mean and Median
Variation and Uncertainty: Respecting variation, Variation over time-Control charts, Understanding uncertainty

UNIT V Lecture 8 Hrs

Multiple Quantities: Scatterplots, Stacked Bars, Regression and Trend Lines, The Quadrant Chart
Changes over time: The origin of time charts, the line chart, the dual axis line chart, the connected scatterplot, the date filed type and seasonality, the timeline, the slopegraph
Maps and Location: One special map, circle maps, filled maps, dual encoded maps.

Textbooks:

1. Cole NussbaumerKnaflic, Storytelling with data, Wiley
2. Ben Jones, Communicating Data with Tableau, O'Reilly

Reference Books:

1. A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Reilly.
2. Andy Kirk, Data Visualization: A Successful Design Process, PAKT.
3. Scott Murray, Interactive Data Visualization for Web, O'Reilly.

Online Learning Resources:

1. Data Analysis and Visualization Foundations | Coursera
2. Data Visualization | Coursera

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B.Tech CSE(IoT)– IV-I Sem **L T P C**

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(20A05703b) BLOCKCHAIN TECHNOLOGY AND APPLICATIONS

(Professional Elective Course– IV)

Course Objectives:

- Understand how blockchain systems (mainly Bitcoin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from blockchain technology into their own projects.

Course Outcomes:

After completion of the course, students will be able to

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Blockchain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets.
- Examine how to profit from trading cryptocurrencies.

UNIT I Introduction Lecture 8Hrs

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT II Block chain Concepts Lecture 9Hrs

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT III Architecting Block chain solutions Lecture 9Hrs

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

UNIT IV Ethereum Block chain Implementation Lecture 8Hrs

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts

UNIT V Hyper ledger Block chain Implementation Lecture 8Hrs

Hyper ledger Block chain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, Fab Car Use Case Implementation, Invoking

Chaincode Functions Using Client Application.
Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

Textbooks:

1. Ambadas, Arshad SarfarzAriff, Sham "Blockchain for Enterprise Application Developers", Wiley
1. Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

Reference Books:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Online Learning Resources:

1. https://github.com/blockchainedindia/resources
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0 401.htm
4. https://nptel.ac.in/courses/106105184
5. https://onlinecourses.nptel.ac.in/noc22_cs44/preview

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(20A05705a) CYBER SECURITY
Common to IT, CSE(DS),CSE(IOT)
PROFESSIONAL ELECTIVE - IV

Course Objectives:

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cyber crime.

Course Outcomes:

After completion of the course, students will be able to

- Classify the cyber crimes and understand the Indian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

UNIT I **Introduction to Cybercrime** Lecture 8Hrs

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II **Cyber Offenses: How Criminals Plan Them** Lecture 9Hrs

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT III **Cybercrime: Mobile and Wireless Devices** Lecture 9Hrs

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV **Tools and Methods Used in Cybercrime** Lecture 8Hrs

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT V **Cyber Security: Organizational Implications** Lecture 8Hrs

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group

Online Learning Resources:

http://nptel.ac.in/courses/106105031/40
http://nptel.ac.in/courses/106105031/39
http://nptel.ac.in/courses/106105031/38

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(20A35702a) PRIVACY AND SECURITY IN IOT
(PROFESSIONAL ELECTIVE COURSE-IV)

Course Objectives:

- To know the state-of-the-art methodologies in Cyber Physical systems.
- To impart knowledge on Model threat sand countermeasures.
- ToexplorethePrivacyPreservationandTrustModelsinInternetofThings(IoT)
- To apply the concept of Internet of Things Security in the real-world scenarios

Course Outcomes:

- Identify the areas of cyber security for the Internet of Things.
- Assess different Internet of Things technologies and their applications.
- Model IoT to business
- Customize real time data for IoT applications.
- Solve IoT security problems using lightweight cryptography

UNIT I Lecture 9 Hrs

Internet of Things (IoT) as Interconnection of Threats (IoT): Introduction, Phases of IoT System, Internet of Things as Interconnections of Threats (IoT vs. IoT)- Phase attacks, Attacks as per Architecture, Attacks Based on Components.

Attack, Defense and Network Robustness of Internet of Things: Introduction, Centrality Attacks, Network Resilience and Topological Defense Scheme, Game-Theoretic Analysis of Network Robustness and Fusion-Based Defense Scheme, Sequential Defense Scheme.

UNIT II Lecture 9 Hrs

Lightweight and Robust Schemes for Privacy Protection in Key Personal IoT Applications Mobile WBSN and Participatory Sensing: Introduction, Lightweight and Robust Schemes for Protecting Privacy in Mobile WBSN- Related Work, Problem Formulation, Proposed Schemes, A Lightweight and Robust Scheme for Privacy Protection in Participatory Sensing: Related Work, Problem Formulation, Proposed Scheme.

UNIT III Lecture 8 Hrs

Trust and Trust Models for the IoT: Introduction, Trust Model Concepts, PKI Architecture Components, Public Key Certificate Formats, Design Considerations for Digital Certificates, A Public Key Reference Infrastructure for the IoT.

UNIT IV Lecture 8 Hrs

Computational Security for the IoT and Beyond: Characterizing Complex Systems- Wireless, Biological, Social, Economic, Computer, Computational Tools for Complex Systems- Signal Processing, Network Science, Controllability and Observability, Tomography, Lessons from Communication Engineering, Perspective Research Directions.

UNIT V Lecture 10 Hrs

Privacy Preserving Time Series Data Aggregation for Internet of Things: Introduction, Models and Design Goals, Preliminaries, Proposed Time Series Data Aggregation Scheme, Security Analysis, Performance Evaluation.

Security Protocols for IoT Access Networks: Introduction to IoT, Related Works on Security protocols, Time-Based Secure Key Generation and Renewal, Cognitive Security.

Textbooks:

1. Hu, Fei. Security and privacy in Internet of things (IoTs): Models, Algorithms, and Implementations, 1st edition,CRCPress, 2016.

Reference Books:

1. Russell, Brian, and Drew Van Duren. Practical InternetofThingsSecurity,1st edition,PacktPublishingLtd,2016.
2. White house O. Security of things: Animplementers' guidetocyber- security forinternet of thingsdevicesand beyond,1st edition,NCC Group, 2014
3. DaCosta,Francis, andByron Henderson.Rethinkingthe InternetofThings:ascalable approachtoconnectingeverything,1st edition, Springer Nature, 2013.

Online Learning Resources:

1. (PDF) IoT Privacy and Security: Challenges and Solutions (researchgate.net)

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(20A35703a) FOG AND EDGE COMPUTING
PROFESSIONAL ELECTIVE COURSE-V

Course Objectives:

- To learn design concepts, frameworks, and applications in Edge Computing to the audience.
- To understand the other associated technologies like cloud and fog computing in the domain of IoT.
- To gain Knowledge about applications of fog and Edge Computing.
- To apply concepts of computing paradigms.

Course Outcomes:

- To understand various edge devices and their ecosystems, issues and challenges.
- To develop edge-based distributed computing platforms and applications.
- Understand the challenges of developing fog-based applications and middleware, and the possible solutions to deal with them.
- Able to measure and analyze the performance of a fog computing application.

UNIT I Lecture 9 Hrs

Internet of Things (IoT) and New Computing Paradigms: Introduction, Relevant Technologies, Fog and Edge Computing Completing the Cloud, Hierarchy of Fog and Edge Computing, Business Models.

Addressing the Challenges in Federating Edge Resources: The Networking Challenge, The Management Challenge, Miscellaneous Challenges.

UNIT II Lecture 9 Hrs

Integrating IoT + Fog + Cloud Infrastructures: System Modeling and Research Challenges: Introduction, Methodology, Integrated C2F2T Literature by Modeling Technique, Integrated C2F2T Literature by Modeling Scenarios, Integrated C2F2T Literature by Metrics.

Optimization Problems in Fog and Edge Computing: The Case for Optimization in Fog Computing, Formal Modeling Framework, Metrics, Optimization Opportunities along the Fog Architecture, Optimization Opportunities along the Service Life Cycle, Taxonomy of Optimization Problems, Optimization Techniques.

UNIT III Lecture 8 Hrs

Middleware for Fog and Edge Computing: Design Issues: Introduction, Need for Fog and Edge Computing Middleware, Design Goals, State-of-the-Art Middleware Infrastructures, System Model, Proposed Architecture, Case Study Example.

A Lightweight Container Middleware for Edge Cloud Architectures: Introduction, Background, Clusters for Lightweight Edge Clouds, Architecture Management-Storage and Orchestration, IoT Integration, Security Management for Edge Cloud Architectures.

UNIT IV Lecture 8 Hrs

Testing Perspectives of Fog-Based IoT Applications: Introduction, Background, Testing Perspectives- Smart Homes, Smart Health, Smart Transport, Future Research Directions- Smart Homes, Smart Health, Smart Transport.

UNIT V Lecture 9 Hrs

Exploiting Fog Computing in Health Monitoring: Introduction, An Architecture of a Health Monitoring IoT-Based System with Fog Computing, Fog Computing Services in Smart E-Health Gateways.

Aspects of Operating IoT Applications in the Fog: Introduction, Related Work, Classification of

Fog/Edge/IoT Applications, Restrictions of the GDPR Affecting Cloud, Fog and IoT Applications, Data Protection by Design Principles

Textbooks:

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.

Reference Books:

1. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE.
2. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packet Publishing, 2020, ISBN: 9781839214806
3. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.

Online Learning Resources:

1. Fog Computing - GeeksforGeeks

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B.Tech CSE (IoT)– IV-I Sem

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(20A35703b) NDUSTRIAL AND MEDICAL IOT
(PROFESSIONAL ELECTIVE COURSE-V)

Course Objectives:

- To develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
- To gain conceptual understanding of networking and wireless communication protocols used in IIoT deployments.
- To Understand the various Internet of Things (IoT) Protocols like COAP, MQTT.etc
- Introduce how IoT has become a game changer in the new economy where the customers are looking for integrated value.
- Bring the IoT perspective in thinking and building solutions.
- Introduce the tools and techniques that enable IoT solution and Security aspects.

Course Outcomes:

- Develop conceptual design of Medical and Industrial IoT architecture.
- Apply sensors and various protocols for industry standard solutions.
- Articulate privacy and security measures for industry standard solutions.
- Study about Internet of Medical Things (IoMT) and its applications in Healthcare industry.
- Design various applications using IoT in Healthcare Technologies.
- Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.

UNIT I Lecture 9 Hrs

Overview of Internet of Things: Introduction, IOT Architecture, Application –based IOT protocols, Cloud Computing, Fog Computing, Sensor Cloud, Big Data.

Overview of Industry 4.0 and Industrial Internet of Things: IIoT- Prerequisites of IIOT, Basics of CPS, CPS and IIOT, Applications of IIoT.

UNIT II Lecture 9 Hrs

Industrial Internet of Things: Introduction, Industrial Internet Systems, Industrial sensing, Industrial sensing, Industrial Processes.

Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IOT, Business models of IIOT.

UNIT III Lecture 8 Hrs

Key Technologies: Off-site Technologies- Introduction, Cloud Computing- Necessity, Cloud Computing and IIot, Industrial Cloud Platform Providers, SLA, Requirements of Industry 4.0, Fog Computing.

On-site Technologies- Introduction, Augmented Reality- History, Categorization, Applications, Virtual Reality- History, Categorization, Applications.

UNIT IV Healthcare Technologies Lecture 8 Hrs

Sensitivity Analysis of Micro Mass Optical MEMS Sensor for Biomedical IoT Devices: Introduction, Modeling and Simulation, Different Shapes of Cantilever, Rectangular-Shaped, Trapezoidal/Triangular-Shaped, Step Profile-Shaped, Results and Discussion.

Enhancing the Performance of Decision Tree Using NSUM Technique for Diabetes Patients: Introduction, Related Work, Mutual Information, Experimental Results and Discussion.

A Novel Framework for Healthcare Monitoring System through Cyber-Physical System: Introduction, Related Work, Framework, Internet of Medical Things (IoMT), Proposed Model, Result and Discussion.

UNIT V Lecture 10 Hrs

An IoT Model to Improve Cognitive Skills of Student Learning Experience Using Neurosensors: Introduction, Existing Methods, Proposed Method, Result and Discussion.

AdaBoost with Feature Selection Using IoT to Bring the Paths for Somatic Mutations Evaluation in Cancer: Introduction, Existing Models, Methodology.

A Computational Approach to Predict Diabetic Retinopathy Through Data Analytics: Introduction, Methodology, Performance Measures, Tools Used and Results Discussion.

Textbooks:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and* Industry 4.0. CRC Press.
2. P. Venkata Krishna, Sasikumar Gurumoorthy, Mohammad S. Obaidat, Internet of Things and Personalized Healthcare Systems.

Reference Books:

1. Pethuru Raj,Abhishek Kumar,Internet of Things Use Cases for the Healthcare Industry,2020.
2. Arun Kumarrana, SharadSharma, Internet of Things Energy, Industry and Healthcare 2021, 1st Edition, CRC Press.

Online Learning Resources:

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B.Tech CSE (IoT)– IV-I Sem

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(20A35703c)WEARABLE COMPUTING
(PROFESSIONAL ELECTIVE COURSE-V)

Course Objectives:

- To understand advanced and emerging technologies in wearable computing.
- To learn how to use software programs to perform varying and complex tasks.
- Expand upon the knowledge learned and apply it to solve real world problems.

Course Outcomes:

- Develop Android and Wear applications for Android phone and wearable device, including handling and making device data ready for Google Fi.
- Learn about software, hardware tools, protocols and components required for Wearable Computing.
- Enable to explore innovations with Wearable's.
- Learn about the requirements to design Frameworks for Wearable Computing.
- Exploring regulatory systems—their structures, constraints, and possibilities.
- Able to learn about I/O communication protocols

UNIT I Lecture 9 Hrs

Body Sensor Networks-Introduction, Typical m-Health System Architecture, Hardware Architecture of a Sensor Node, Communication Medium, Power Consumption Considerations, Communication Standards, Network Topologies, Commercial Sensor Node Platforms, Biophysiological Signals and Sensors, BSN Application Domains

BSN Programming Frameworks-Introduction, Developing BSN Applications, Programming Abstractions, Requirements for BSN Frameworks, BSN Programming Frameworks, Signal Processing In-Node Environment-Introduction, Background, Motivations and Challenges, The SPINE Framework

UNIT II Lecture 9 Hrs

Task-Oriented Programming in BSNs-Introduction, Motivations and Challenges, SPINE2 Overview, Task-Oriented Programming in SPINE2, SPINE2 Node-Side Middleware, SPINE2 Coordinator, SPINE2 Communication Protocol, Developing Application in SPINE

Autonomic Body Sensor Networks-Introduction, Motivations and Challenges, State-of-the-Art, SPINE: Task-Based Autonomic Architecture, Autonomic Physical Activity Recognition

Agent-Oriented Body Sensor Networks-Introduction, Agent-Oriented Computing and Wireless Sensor Networks, Mobile Agent Platform for Sun SPOT (MAPS), Motivations and Challenges, State-of-the-Art: Description and Comparison, Agent-Based Modellingand Implementation of BSNs, Engineering Agent-Based BSN Applications: A Case Study

UNIT III Lecture 8 Hrs

Collaborative Body Sensor Networks-Introduction, Motivations and Challenges, State-of-the-Art, Reference Architecture for Collaborative BSNs, C-SPINE: CBSN Architecture

Integration of Body Sensor Networks and Building Networks-Introduction, Building Sensor Networks and Systems, Building Management Framework, Motivations and Challenges, Integration Layers. State-of-the-Art: Description and Comparison, An Agent-Oriented Integration Gateway, Application Scenarios

Integration of Wearable and Cloud Computing-Introduction, Cloud Computing, Architectures for Sensor Stream Management, Motivations and Challenges, Reference Architecture for Cloud-Assisted BSNs, State-of-the-Art: Description and Comparison, Body Cloud: A Cloud-based Platform for Community BSN Applications, Engineering Body Cloud Applications

UNIT IV Lecture 9 Hrs

Development Methodology for BSN Systems- Introduction, Motivations and Challenges, SPINE-Based Design Methodology

SPINE-Based Body Sensor Network Applications- Introduction, Physical Activity Recognition, Step Counter, Emotion Recognition, Handshake Detection, Physical Rehabilitation

UNIT V Lecture 9 Hrs

Signal Processing In-Node Environment: Introduction, Background, Motivations and Challenges, SPINE Framework- Architecture, Programming Perspective, Optional SPINE Modules, High-Level Data Processing, Multiplatform Support.

SPINE at Work - Introduction, SPINE 1.x- How to Install SPINE 1.x, How to Use SPINE, How to Run a Simple Desktop Application using SPINE 1.3, SPINE Logging Capabilities, SPINE2- How to Install SPINE2, How to Use SPINE2, how to run a Simple Application using SPINE2.

Textbooks:

1. Wearbale Computing: From Modeling to Implementation of Wearable Systems Based on Body Sensor Networks, Giancarlo Fortino, Raffaele Gravina, Stefano Galzarano, Wiley, IEEE Press, 2018.

Reference Books:

1. Fundamentals of Wearable Computers and Augmented Reality, Second Edition by Woodrow Barfield 2015
2. Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design by OmeshTickoo, Ravi Iyer 2016.
3. Barfield, Woodrow, ed. Fundamentals of wearable computers and augmented reality, 1st edition, CRC press, 2015.

Online Learning Resources:

1. Wearable Computing – CodeReality.net

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(20A52701a) ENTREPRENEURSHIP & INCUBATION
(HUMANITIES ELECTIVE II)

Course Objectives:

To make the student understand about Entrepreneurship

- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:

- Understand the concept of Entrepreneurship and challenges in the world of competition.
- Apply the Knowledge in generating ideas for New Ventures.
- Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
- Evaluate the role of central government and state government in promoting Entrepreneurship.
- Create and design business plan structure through incubations.

UNIT I

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT II

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT III

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

UNIT IV

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

UNIT V

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship**"** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

References:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.
2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana‖ "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

E-Resources

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

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B.Tech (IoT)– IV-I Sem

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(20A52701b) MANAGEMENT SCIENCE
(HUMANITIES ELECTIVE-II)

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection,Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:

- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create Modern technology in management science.

UNITI INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Eltan Mayo's Human relations - Systems Theory - **Organisational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT II OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Deming's contribution to Quality. **Material Management** - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - **Marketing Management** - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job & Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

UNIT IV STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT V CONTEMPORARY ISSUES IN MANAGEMENT

The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking - Balanced Score Card - Knowledge Management.

Textbooks:

1. A.R Aryasri, “Management Science”, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

References:

1. Koontz &Weihrich, “Essentials of Management”, 6th edition, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, “Management Principles and Guidelines”, Biztantra.
3. Kanishka Bedi, “Production and Operations Management”, Oxford University Press, 2004.
4. Samuel C.Certo, “Modern Management”, 9th edition, PHI, 2005

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B.Tech (IoT)– IV-I Sem

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(20A52701c) ENTERPRISE RESOURCE PLANNING (HUMANITIES ELECTIVE-II)

Course Objectives:

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

- Understand the basic use of ERP Package and its role in integrating business functions.
- Explain the challenges of ERP system in the organization
- Apply the knowledge in implementing ERP system for business
- Evaluate the role of IT in taking decisions with MIS
- Create reengineered business processes with process redesign

UNITI

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

UNITII

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

UNITIII

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

UNITIV

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

UNITV

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Textbooks:

1. Pankaj Sharma. “Enterprise Resource Planning”. Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, “Enterprise Resource Planning”, IV Edition, Mc.Graw Hill, 2019

References:

1. Marianne Bradford “Modern ERP”, 3rd edition.
2. “ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

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B.Tech (IoT)– IV-I Sem

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(20A30503) WEB APPLICATION DESIGN
Skill Oriented Course - V

Course Objectives:

- Explore the programming aspects of Web
- Teach concepts related to client side and server-side programming
- Understand Full Stack Development

Course Outcomes:

After completion of the course, students will be able to

- Develop Client-side applications
- Develop Server-side applications
- Connect to Databases
- Design comprehensive web applications

Activities:

Module 1:

Introduction, MERN Components: React, Node.js, Express, MongoDB, Tools and Libraries, Why MERN? JavaScript Everywhere, JSON Everywhere , Node.js Performance, The npm Ecosystem Isomorphic, It's Not a Framework!

Hello World: Server-Less Hello World, Server Setup, Build-Time JSX Compilation

Task: Create a simple Hello world web page using node.js and express.

Module 2:

React Components, Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.

React State, Async State Initialization, Event Handling, communicating from child to parent, Stateless Components, Designing Components: State vs. Props, Component Hierarchy, Communication, Stateless Components.

Task: Create the Issue Tracker Application: -

1. The user should be able to view a list of issues, with an ability to filter the list by various parameters.
2. The user should be able to add new issues, by supplying the initial values of the issue's fields.
3. The user should be able to edit and update an issue by changing its field values.
4. The user should be able delete an issue.
5. An issue should have following attributes: A title that summarizes the issue (freeform long text),An owner to whom the issue is assigned (freeform short text), A status indicator (a list of possible status values),Creation date (a date, automatically assigned),Effort required to address the issue (number of days, a number),Estimated completion date or due date (a date, optional)

Module 3:

Express REST APIs, REST: Resource Based, HTTP Methods as Actions, JSON ,Express: Routing, Handler Function, Middleware, The List API: Automatic Server Restart ,Testing. The Create API , Using the List API, Using the Create API, Error Handling.

Task : Create a Issues API to

1. Show the list of Issues which are sorted according to creation date.
2. To create the new Issue.
3. To delete the existing Issue title.
4. To update the existing Issue.

Module 4:
MongoDB Basics: Documents, Collections, Databases, Query Language, Installation, The mongo Shell, Shell Scripting, Schema Initialization, MongoDB Node.js Driver, Reading from MongoDB, Writing to MongoDB.

Task : Develop the Student Management API to store the student data into Database :-
1. To add the new students.
2. To remove the existing student.
3. To update the existing student details.
4. To list all the students.
5. To list all the students based on Roll Number or any unique ID or Age.
6. The student should have the following attributes:- Name , Date of Birth , Branch , Year of Study , Address , Roll Number or any unique ID.

Module 5:
Modularization and Webpack: Server-Side Modules, Introduction to Webpack, Using Webpack Manually, Transform and Bundle, Libraries Bundle, Hot Module Replacement, HMR using Middleware, Debugging, Server-Side ES2015, ESLint.
Routing with React Router : Routing Techniques, Simple Routing, Route Parameters, Route Query String, Programmatic Navigation, Nested Routes, Browser History.
Task: Develop the Student Management System website for the College.
1. The admins should be able to Sign In, Sign out from the website.
2. The admin should be able to see the Dashboard after successful sign in.
3. The Dashboard should contain the Add Student, Delete Student, Update Student, List Student.
4. The admin should able filter the students based on branch or Roll Number or Date of Birth.

Module 6:
Forms: More Filters in the List API, Filter Form, The Get API, Edit Page, UI Components: Number Input , Data Input, Update API , Using the Update API, Delete API, Using the Delete API.
React-Bootstrap: Bootstrap Installation, Navigation, Table and Panel, Forms: Grid-Based Forms, Inline Forms, Horizontal Forms, Alerts: Validations, Results , Modals.

Task: Develop the Bookstore Library Website:
1. It should contain the 2 interfaces: User and Admin Interface.
2. User should be able do the following:
   - browse books from the library
   - filter them based on category, author, publications etc.
   - Rent them for a specific duration
   - Like/Review them
3. Admin should be able do the following:
   - List/manage books
   - Track rented books and their availability
4. Deploy the application in Netlify.

References:
1. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node Book by Vasan Subramanian

Online Learning Resources/Virtual Labs:

1. https://nodejs.org/en/
2. https://expressjs.com/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://www.netlify.com/

OPEN ELECTIVES

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A01505) BUILDING TECHNOLOGY
(Open Elective-I)

Course Objectives:

- To know different types of buildings, principles and planning of the buildings.
- To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
- To know the different modes of vertical transportation in buildings.
- To know the utilization of prefabricated structural elements in buildings.
- To know the importance of acoustics in planning and designing of buildings.

Course Outcomes (CO):

- Understand the principles in planning and design the buildings
- To get different types of buildings, principles and planning of the buildings
- To know the different methods of termite proofing in buildings.
- Know the different methods of vertical transportation in buildings.
- Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.
- Know the importance of acoustics in planning and designing of buildings.

UNIT I

Overview of the course, basic definitions, buildings-types-components-economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

UNIT II

Termite proofing: Inspection-control measures and precautions-lighting protectionof buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building.

UNIT III

Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators.

UNIT IV

Prefabrication systems in residential buildings-walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings.

UNIT V

Acoustics –effect of noise –properties of noise and its measurements, principles of acoustics of building. Sound insulation-importance and measures.

Textbooks:

1. Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015
2. Building construction by Punmia.B.C, Jain.A.K and Jain.A.K Laxmi Publications 11th edition 2016

Reference Books:

1. National Building Code of India, Bureau of Indian Standards
2. Building construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P.Arora and S.P.BrndraDhanpat Rai and Sons Publications, New Delh 2014 edition

https://nptel.ac.in/courses/105102206
https://nptel.ac.in/courses/105103206

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B.Tech III-I Sem

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(20A02505) ELECTRIC VEHICLES
(Open Elective-I)

Course Objectives:

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

Course Outcomes:

- Understand and differentiate between conventional and latest trends in Electric Vehicles
- Analyze various EV resources, EV dynamics and Battery charging
- Apply basic concepts of EV to design complete EV system
- Design EV system with various fundamental concepts

UNIT I INTRODUCTION TO EV SYSTEMS AND PARAMETERS

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT II EV AND ENERGY SOURCES

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT III EV PROPULSION AND DYNAMICS

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

UNIT IV FUEL CELLS

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.

Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

UNIT V BATTERY CHARGING AND CONTROL

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Control: Introduction, modelling of electromechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.

Online Learning Resources:1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

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B.Tech III-I Sem

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(20A03505) 3D PRINTING TECHNOLOGY
(Open Elective-I)

Course Objectives:

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

Course Outcomes:

- Use techniques for processing of CAD models for rapid prototyping.
- Understand and apply fundamentals of rapid prototyping techniques.
- Use appropriate tooling for rapid prototyping process.
- Use rapid prototyping techniques for reverse engineering.
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

UNIT I Introduction to 3D Printing

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II Solid and Liquid Based RP Systems

Working Principle, Materials, Advantages, Limitations and Applicationsof Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III Powder Based & Other RP Systems

Powder Based RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV Rapid Tooling & Reverse Engineering

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT V Errors in 3D Printing and Applications:

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.

Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Textbooks:

1. Chee Kai Chua and Kah Fai Leong, “3D Printing and Additive Manufacturing Principles and Applications” 5/e, World Scientific Publications, 2017.

2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

Reference Books:

1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, **"**Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

Online Learning Resources:

- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A04507) MATLAB PROGRAMMING FOR ENGINEERS

Course Objectives:
To provide fundamental knowledge of programming language for solving problems.
Course Outcomes: On completion of the course, students will be able to

- Generate arrays and matrices for numerical problems solving.
- Represent data and solution in graphical display.
- Write scripts and functions to easily execute series of tasks in problem solving.
- Use arrays, matrices and functions in Engineering applications
- Design GUI for basic mathematical applications.

UNIT I
Introduction: Basics of MATLAB, MATLAB windows, Advantages of MATLAB, on-line help, file types. MATLAB Basics: Variables and Constants –Vectors and Matrices- Arrays - manipulation-Built-in MATLAB Functions. Creating and printing simple plots, Creating, Saving and Executing a Script File, Creating and Executing a function file. Programming Basics: Data Types-Operators – Hierarchy of operations, Relational and logical operators, if-end structure, if-else-end structure, if-elseif-else-end structure, switch-case statement, for-end loop, while-end loop, break and continue commands.

UNIT II
Scripts and Functions Script Files, Function Files, Debugging methods in MATLAB. Graphics: Basic 2D plots: Printing labels- grid and axes box- Entering text in a box- Axis control-Style options Multiple plots-subplots-specialized 2D plots: stem-, bar, hist, pi, stairs, loglog, semilog,polar,comet 3D plots: Mesh,Contour,Surf,Stem3,ezplot.

UNIT III
Numerical Methods Using MATLAB Numerical Differentiation, Numerical integration- Newton-Cotes integration formulae, Multi-step application of Trapezoidal rule, Simpson's 1/3 Rule for Numerical Integration. MATLAB functions for integration. Linear Equations- Linear algebra in MATLAB, solving a linear system, Gauss Elimination, Finding eigen values and eigen vectors, Matrix factorizations, Advanced topics.

UNIT IV
Nonlinear Equations System of Non-linear equations, Solving System of Equations Using MATLAB function fsolve, Interpolation Lagrange Interpolation, Two dimensional Interpolation, Straight line fit using Least Square Method, Curve fitting using built-in functions ployval and polyfit, cubic fit using least square method. Finding roots of a polynomial - roots function, Newton-Raphson Method.

UNIT V
Solution of Ordinary differential Equations (ODEs)-The 4th order Runge-kutta Method, ODE Solvers in MATLAB, Solving First –order equations using ODE23 and ODE45. Structures and Graphical user interface (GUI): Advanced data Objects, how a GUI works, Creating and displaying a GUI. GUI components, Dialog Boxes.

Learning Resources:

1. Getting started with MATLAB "A quick introduction for scientist and engineers by Rudra Pratap, Oxford publications.
2. Advanced Guide to MATLAB-Practical Examples in Science and Engineering by S.N.Alam, S.Islam, S.K. Patel-I.K. International Publishing House Pvt. Ltd.

3. Stephen J. Chapman-"MATLAB Programming for Engineers"- 5th Edition- Cengage Learning- 2015. Getting started with MATLAB (Version 9) The Math works.
4. An Introduction to MATLAB® Programming and Numerical Methods for Engineers 1st Edition by Timmy Siauw Alexandre Bayen, Elsevier-18th April 2014.
5. https://nptel.ac.in/courses/103106118/2
6. https://www.udemy.com/numerical-methods

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A04508) INTRODUCTION TO CONTROL SYSTEMS

Course Objectives:

- To learn the concepts of linear Systems theory and its analysis.

Course Outcomes:

- Understand different system representation, block diagram reduction and Mason's rule.
- Determine Time response analysis of LTI systems and steady state error.
- Plot open loop and closed loop frequency responses of systems
- Understand Stability concept.
- Perform State variable analysis.

UNIT I MATHEMATICAL MODELS OF PHYSICAL SYSTEMS

Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction– Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS & ROOT LOCUS TECHNIQUE

Standard test signals – Steady state error & error constants – Time Response of I and II order system – Root locus – Rules for sketching root loci.

UNIT III FREQUENCY RESPONSE ANALYSIS

Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.

UNIT IV STABILITY CONCEPTS & ANALYSIS

Concept of stability – Necessary condition – RH criterion – Relative stability – Nyquist stability criterion – Stability from Bode plot – Relative stability from Nyquist & Bode – Closed loop frequency response.

UNIT V STATE VARIABLE ANALYSIS

Concept of state – State Variable & State Model – State models for linear & continuous time systems – Solution of state & output equation – controllability & observability.

Textbooks:

1. Benjamin C. Kuo, Automatic Control Systems, PHI Learning Private Ltd, 2010.
2. J. Nagrath and M. Gopal, Control Systems Engineering, Tata McGraw-Hill Education Private Limited, Reprint, 2010.

References:

1. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Pearson Education, Third Impression, 2009.
2. S. Palani, Control System Engineering, Tata McGraw-Hill Education Private Limited, First Reprint, 2010.

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B.Tech III-I Sem

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(20A27505) COMPUTER APPLICATIONS IN FOOD TECHNOLOGY
(Open Elective-1)

Course Objectives:

- To know different software and applications in food technology.
- To understand the Chemical kinetics in food processing, Microbial distraction in thermal processing of food.
- To acquire knowledge on computer aided manufacturing and control of food machinery, inventory control, process control.

Course Outcomes:

- Students will gain knowledge on software in food technology, data analysis, Chemical kinetics, microbial distortion in thermal process
- Use of linear regression in analyzing sensory data, application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants.

UNIT I

Introduction to various software and their applications in food technology. Application of MS Excel to solve the problems of Food Technology, SPSS and JMP for data analysis, Pro-Engineering for design, Lab VIEW and SCADA for process control .

UNIT II

Chemical kinetics in food processing: Determining rate constant of zero order reaction First order rate constant and half-life of reactions. Determining energy of activation of vitamin degradation during food storage Rates of Enzymes catalyzed reaction. Microbial distraction in thermal processing of food. Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food. Sampling to ensure that a lot is not contaminated with more than a given percentage Statistical quality control. Probability of occurrence in normal distribution. Using binomial distribution to determine probability of occurrence. Probability of defective items in a sample obtained from large lot

UNIT III

Sensory evaluation of food Statistical descriptors of a population estimated from sensory data obtained from a sample Analysis of variance**.** One factor, completely randomized design For two factor design without replication**.** Use of linear regression in analyzing sensory data. Mechanical transport of liquid food**.** Measuring viscosity of liquid food using a capillary tube viscometer . Solving simultaneous equations in designing multiple effect evaporator while using matrix algebra available in excel.

UNIT IV

Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product.

UNIT V

Basic Introduction to computer aided manufacturing. Application of computers, instrumentation and control of food machinery, inventory control, process control etc.

Recommended books:

1. Computer Applications in Food Technology: Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office.

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(20A54501) OPTIMIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:
This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.

Course Outcomes: Student will be able to

- formulate a linear programming problem and solve it by various methods.
- give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
- identify strategies in a game for optimal profit.
- implement project planning.

UNIT I
Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT II
Transportation problems- assignment problems-Game theory.

UNIT III
CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT IV
Sequencing Problems-Replacement problems-Capital equipment- Discounting costs- Group replacement.

UNIT V
Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.

Textbooks:

1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers

Reference Books:

1. Problems on Operations Research, Er. Prem kumar gupta, Dr.D.S. Hira, Chand publishers
2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumar yadav

Online Learning Resources:
https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf
https://slideplayer.com/slide/7790901/
https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

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B.Tech III-I Sem

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(20A56501) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:

- To provide an exposure to different characterization techniques.
- To enlighten the basic principles and analysis of different spectroscopic techniques.
- To explain the basic principle of Scanning electron microscope along with its limitations and applications.
- To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

Course Outcomes: At the end of the course the student will be able

- To explain the structural analysis by X-ray diffraction.
- To understand the morphology of different materials using SEM and TEM.
- To recognize basic principles of various spectroscopic techniques.
- To study the electric and magnetic properties of the materials.
- To make out which technique can be used to analyse a material

UNIT I

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT IV

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT V

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Handbook of Materials Characterization -by Sharma S. K. - Springer

References:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall, 2001
3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang Leng- John Wiley & Sons
4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley (Bp)

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B.Tech III-I Sem

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(20A51501) CHEMISTRY OF ENERGY MATERIALS
(Open Elective- I)

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

Course Outcomes:

- Ability to perform simultaneous material and energy balances.
- Student learn about various electrochemical and energy systems
- Knowledge of solid, liquid and gaseous fuels
- To know the energy demand of world, nation and available resources to fulfill the demand
- To know about the conventional energy resources and their effective utilization
- To acquire the knowledge of modern energy conversion technologies
- To be able to understand and perform the various characterization techniques of fuels
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

UNIT I: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batteries**.**

UNIT II: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,.

UNIT III: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

UNIT IV:Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

UNIT V: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

References:

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

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B.Tech IV-I Sem **L T P C**
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(20A01605) ENVIRONMENTAL ECONOMICS
(Open Elective Course - II)

Course Objectives:

- To impart knowledge on sustainable development and economics of energy
- To teach regarding environmental degradation and economic analysis of degradation
- To inculcate the knowledge of economics of pollution and their management
- To demonstrate the understanding of cost benefit analysis of environmental resources
- To make the students to understand principles of economics of biodiversity

Course Outcomes :

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

- The information on sustainable development and economics of energy
- The information regarding environmental degradation and economic analysis of degradation
- The identification of economics of pollution and their management
- The cost benefit analysis of environmental resources
- The principles of economics of biodiversity

UNIT I

Sustainable Development: Introduction to sustainable development - Economy-Environment inter-linkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy – Nonrenewable energy, scarcity, optimal resources, backstop technology, property research, externalities, and the conversion of uncertainty.

UNIT II

Environmental Degradation: Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.

UNIT - III

Economics of Pollution: Economics of Pollution - Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.

UNIT IV

Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.

UNIT V

Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate Change – stern Report

Textbooks:

1. An Introduction to Environmental Economics by N. Hanley, J. Shogren and B. White Oxford University Press.(2001)
2. Blueprint for a Green Economy by D.W. Pearce, A. Markandya and E.B. Barbier Earthscan, London.(1989)

Reference Books:

1. Environmental Economics: An Elementary Introduction by R.K. Turner, D.W. Pearce and I. Bateman Harvester Wheatsheaft, London. (1994),
2. Economics of Natural Resources and the Environment by D.W. Pearce and R.K. Turner Harvester Wheat sheaf, London. (1990),
3. Environmental and Resource Economics: An Introduction by Michael S. Common and Michael Stuart 2nd Edition, Harlow: Longman.(1996),

4. Natural Resource and Environmental Economics by Roger Perman, Michael Common, Yue Ma and James Mc Gilvray 3rdEdition, Pearson Education.(2003),

Online Learning Resources:
https://nptel.ac.in/courses/109107171

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B.Tech III-II Sem

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(20A02605) SMART ELECTRIC GRID
(Open Elective Course-II)

Course Objectives:

- Understand recent trends in grids, smart grid architecture and technologies
- Analyze smart substations
- Apply the concepts to design smart transmission systems
- Apply the concepts to design smart distribution systems

Course Outcomes:

- Understand trends in Smart grids, needs and roles of Smart substations
- Design and Analyze Smart Transmission systems
- Design and Analyze Smart Distribution systems
- Analyze SCADA and DSCADA systems in practical working environment

UNIT I INTRODUCTION TO SMART GRID

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

UNIT II SMART GRID TECHNOLOGIES

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

UNIT III SMART SUBSTATIONS

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

UNIT IV SMART TRANSMISSION SYSTEMS

Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid

UNIT V SMART DISTRIBUTION SYSTEMS

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Textbooks:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee82/preview

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B.Tech IV-I Sem

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(20A03605c) INTRODCUTION TO ROBOTICS
(Open Elective-II)

Course Objectives:

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system

Course Outcomes:

After completing the course, the student will be able to,

- Explain fundamentals of Robots
- Apply kinematics and differential motions and velocities
- Demonstrate control of manipulators
- Understand robot vision
- Develop robot cell design and programming

UNIT I Fundamentals of Robots

Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis.

UNIT II Kinematics, Differential motions and velocities of robot

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg(D-H) representation of forward kinematic equations of robots, the inverse kinematic of robots, degeneracy and dexterity, simple problems with D-H representation.

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian.

UNIT III Control of Manipulators

Open- and close-loop control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

UNIT IV Robot Vision

Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

UNIT V Robot Cell Design and Programming

Robot cell layouts-Robot centred cell, In-line robot cell, considerations in work cell design, work cell control, interlocks, error detection, work cell controller. methods of robot programming, WAIT, SIGNAL, and DELAY commands, Robotic languages, VAL system.

Textbooks:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — Mc Graw Hill, 1986.

2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.

References:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley- Interscience, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.

Online Learning Resources:

https://nptel.ac.in/courses/108105088
https://nptel.ac.in/courses/108105063
https://nptel.ac.in/courses/108105062
https://nptel.ac.in/courses/112104288

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A04605) SIGNAL PROCESSING
(Open Elective Course –II)

Course objectives:

- Understand, represent and classify continuous time and discrete time signals and systems, together with the representation of LTI systems.
- Ability to represent continuous time signals (both periodic and non-periodic) in the time domain, sdomain and the frequency domain
- Understand the properties of analog filters, and have the ability to design Butterworth filters
- Understand and apply sampling theorem and convert a signal from continuous time to discrete time or from discrete time to continuous time (without loss of information)
- Able to represent the discrete time signal in the frequency domain
- Able to design FIR and IIR filters to meet given specifications

Course Outcomes:

- Understand and explain continuous time and discrete time signals and systems, in time and frequency domain
- Apply the concepts of signals and systems to obtain the desired parameter/ representation
- Analyse the given system and classify the system/arrive at a suitable conclusion
- Design analog/digital filters to meet given specifications
- Design and implement the analog filter using components/ suitable simulation tools
- Design and implement the digital filter using suitable simulation tools, and record the input and output of the filter for the given audio signal

UNIT I

Signal Definition, Signal Classification, System definition, System classification, for both continuous time and discrete time. Definition of LTI systems

UNIT II

Introduction to Fourier Transform, Fourier Series, Relating the Laplace Transform to Fourier Transform, Frequency response of continuous time systems

UNIT III

Frequency response of ideal analog filters, Salient features of Butterworth filters Design and implementation of Analog Butterworth filters to meet given specifications

UNIT IV

Sampling Theorem- Statement and proof, converting the analog signal to a digital signal. Practical sampling. The Discrete Fourier Transform, Properties of DFT. Comparing the frequency response of analog and digital systems.

UNIT V

Definition of FIR and IIR filters. Frequency response of ideal digital filters

Transforming the Analog Butterworth filter to the Digital IIR Filter using suitable mapping techniques, to meet given specifications. Design of FIR Filters using the Window technique, and the frequency sampling technique to meet given specifications Comparing the designed filter with the desired filter frequency response

Textbooks:

1. ‘Signals and Systems’, by Simon Haykin and Barry Van Veen, Wiley.

References:

1. 'Theory and Application of Digital Signal Processing', Rabiner and Gold
2. ‘Signals and Systems’, Schaum’s Outline series
3. ‘Digital Signal Processing’, Schaum’s Outline series

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B.Tech III-II Sem

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(20A04606) BASIC VLSI DESIGN

Course Objectives:

- Understand the fundamental aspects of circuits in silicon
- Relate to VLSI design processes and design rules

Course Outcomes:

- Identify the CMOS layout levels, and the design layers used in the process sequence.
- Describe the general steps required for processing of CMOS integrated circuits.
- Design static CMOS combinational and sequential logic at the transistor level.
- Demonstrate different logic styles such as complementary CMOS logic, pass-transistor Logic, dynamic logic, etc.
- Interpret the need for testability and testing methods in VLSI.

UNIT I

Moore's law, speed power performance, nMOS fabrication, CMOS fabrication: n-well, pwell processes, BiCMOS, Comparison of bipolar and CMOS. Basic Electrical Properties of MOS And BiCMOS Circuits: Drain to source current versus voltage characteristics, threshold voltage, transconductance.

UNIT II

Basic Electrical Properties of MOS And BiCMOS Circuits: nMOS inverter, Determination of pull up to pull down ratio: nMOS inverter driven through one or more pass transistors, alternative forms of pull up, CMOS inverter, BiCMOS inverters, latch up. Basic Circuit Concepts: Sheet resistance, area capacitance calculation, Delay unit, inverter delay, estimation of CMOS inverter delay, super buffers, BiCMOS drivers.

UNIT III

MOS and BiCMOS Circuit Design Processes: MOS layers, stick diagrams, nMOS design style, CMOS design style Design rules and layout & Scaling of MOS Circuits: λ - based design rules, scaling factors for device parameters

UNIT IV

Subsystem Design and Layout-1: Switch logic pass transistor, Gate logic inverter, NAND gates, NOR gates, pseudo nMOS, Dynamic CMOS Examples of structured design: Parity generator, Bus arbitration, multiplexers, logic function block, code converter.

UNIT V

Subsystem Design and Layout-2: Clocked sequential circuits, dynamic shift registers, bus lines, General considerations, 4-bit arithmetic processes, 4-bit shifter, RegularityDefinition & Computation Practical aspects and testability: Some thoughts of performance, optimization and CAD tools for design and simulation.

Textbooks:

1. "Basic VLSI Design", Douglas A Pucknell, Kamran Eshraghian, 3 rd Edition, Prentice Hall of India publication, 2005.

References:

1. "CMOS Digital Integrated Circuits, Analysis And Design", Sung – Mo (Steve) Kang, Yusuf Leblebici, Tata McGraw Hill, 3 rd Edition, 2003.
2. "VLSI Technology", S.M. Sze, 2nd edition, Tata McGraw Hill, 2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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(20A27605) FOOD REFRIGERATION AND COLD CHAIN MANAGEMENT
OPEN ELECTIVE II

Course Objectives:

- To know the equipment available to store perishable items for a long time
- To understand to increase the storage life of food items

Course Outcomes

By the end of the course, the students will

- Understand various principles and theories involved in refrigeration systems
- Understand the different equipment useful to store the food items for a long period.
- Understand how to increase the storage life of food items

UNIT I

Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

UNIT II

Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry vs wet compression, throttling vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

UNIT III

Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquid sub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

UNIT IV

Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

UNIT V

Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convicted heat, internal heat sources, heat of respiration, peak load; etc.

Textbooks:

1. Arora, C. P. “Refrigeration and Air Conditioning”. Tata MC Graw Hill Publishing Co.Ltd., New Delhi. 1993.

References:

1. Adithan, M. and Laroiya, S. C. “Practical Refrigeration and Air Conditioning”. Wiley Estern Ltd., New Delhi 1991

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem **L T P C**

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(20A54701) WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective-II)

Course Objectives:

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes:

- Understand wavelets and wavelet expansion systems.
- Illustrate the multi resolution analysis ad scaling functions.
- Form fine scale to coarse scale analysis.
- Find the lattices and lifting.
- Perform numerical complexity of discrete wavelet transforms.
- Find the frames and tight frames using fourier series.

UNIT I Wavelets

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform the Discrete-Time and Continuous Wavelet Transforms.

UNIT II A Multiresolution Formulation of Wavelet Systems

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT III Filter Banks and the Discrete Wavelet Transform

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT IV Time-Frequency and Complexity

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT V Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”,Prentice Hall, (1997).
2. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999).

Reference Books:

1. Raghuveer Rao, “Wavelet Transforms”, Pearson Education, Asia.

Online Learning Resources:

https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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(20A56701) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

Course Objectives:

- To impart the fundamental knowledge on various materials, their properties and applications.
- To provide insight into various semiconducting materials, and their properties.
- To enlighten the characteristic behavior of various semiconductor devices.
- To provide the basics of dielectric and piezoelectric materials and their properties.
- To explain different categories of magnetic materials, mechanism and their advanced applications.

Course Outcome: At the end of the course the student will be able

- To understand the fundamentals of various materials.
- To exploit the physics of semiconducting materials
- To familiarize with the working principles of semiconductor-based devices.
- To understand the behaviour of dielectric and piezoelectric materials.
- To identify the magnetic materials and their advanced applications.

UNIT I Fundamentals of Materials Science

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

UNIT II Semiconductors

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III Physics of Semiconductor devices

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT IV Dielectric Materials and their applications:

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

UNIT V Magnetic Materials and their applications

Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Textbooks

1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, Dhanpat Rai and Co.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011
4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland, Chapman& Hall Pub.

NPTEL courses links

https://nptel.ac.in/courses/113/106/113106062/
https://onlinecourses.nptel.ac.in/noc20_mm02/preview, https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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(20A51701) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS

Course Objectives:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

Course Outcome

- At the end of the course, the student will be able to:
- Understand the state of art synthesis of Polymeric materials
- Understand the hydro gels preparation, properties and applications in drug delivery system.
- Characterize polymers materials using IR, NMR, XRD.
- Analyze surface phenomenon fo micelles and characterise using photoelectron spectroscopy, ESCA and Auger spectroscopy

UNIT I : Polymers-Basics and Characterization

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit II : Synthetic Polymers

Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization.

Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications.

Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD.

UNIT III : Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEAK.

Learning Outcomes:

UNIT IV: Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

UNIT V : Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

References :

1. A Text book of Polymer science, Billmayer
2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
3. Advanced Organic Chemistry, B.Miller, Prentice Hall
4. Polymer Chemistry – G.S.Mishra
5. Polymer Chemistry – Gowarikar
6. Physical Chemistry –Galston
7. Drug Delivery- Ashim K. Misra

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

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(20A01704) COST EFFECTIVE HOUSING TECHNIQUES
(Open Elective Course - III)

Course Objectives:

- To understand the requirements of structural safety for future construction.
- To know about the housing scenario, housing financial systems land use and physical
- planning for housing and housing the urban poor
- To know the traditional practices of rural housing
- To know the different innovative cost effective construction techniques
- To know the alternative building materials for low cost housing.

Course Outcomes :

- To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
- To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
- Apply the traditional practices of rural housing
- Understand the different innovative cost effective construction techniques
- Suggest the alternative building materials for low cost housing

UNIT I

a) **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
b) **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
c) **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
d) **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT II

Development and adoption of low cost housing technology

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT III

Alternative building materials for low cost housing

Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - alternative building maintenance

Low cost Infrastructure services:

Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT IV

Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

https://nptel.ac.in/courses/124107001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

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(20A02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING
(Open Elective Course – III)

Course Objectives:

- Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- Analyze motion less and motion detectors in IoT applications
- Understand about Analyze applications of IoT in smart grid
- Apply the concept of Internet of Energy for various applications

Course Outcomes:

- Understand the concept of IoT in Electrical Engineering
- Analyze various types of motionless sensors and various types of motion detectors
- Apply various applications of IoT in smart grid
- Design future working environment with Energy internet

UNIT I SENSORS

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT II OCCUPANCY AND MOTION DETECTORS

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT III MEMS

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

UNIT IV IoT FOR SMART GRID

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT V INTERNET of ENERGY (IoE)

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid

Textbooks:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Online Learning Resources:

1.https://onlinecourses.nptel.ac.in/noc22_cs96/preview
2. https://nptel.ac.in/courses/108108123
3. https://nptel.ac.in/courses/108108179

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A03704) PRODUCT DESIGN AND DEVELOPMENT
(Open Elective-III)

Course Objectives:

- To Design products creatively while applying engineering design principles.
- To Apply principles of human factors, ethics and environmental factorsin product design.
- To Work in groups or individually in their pursuit of innovative product design.
- To implement value design for optimum product cost.

Course Outcomes: After successful completion of the course, the student will be able to

- Apply knowledge of basic science and engineering fundamentals
- Undertake problem identification, formulation and solution
- Understanding of the principles of sustainable design and development
- Understanding of professional and ethical responsibilities and commitment to them

UNIT I Product Development Process

General problem-solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behaviour.

UNIT II Task Clarification

Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

UNIT III Conceptual Design

Steps in Conceptual Design. Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem. Formulation, Identifying the essential problems from the requirements list, establishing functions structures, Overall function, Breaking a function down into sub-functions. Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures. Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of working structures. Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

UNIT IV Embodiment Design

Steps of Embodiment Design, Checklist for Embodiment Design Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force Transformations, Principles of Division of Tasks, Principles of Self-Help, Principles of Stability and Bi-Stability, Principles of Fault-Free Design Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design to Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards. Evaluation of Embodiment Designs.

UNIT V Mechanical Connections, Mechatronics And Adaptronics:

Mechanical Connections - General functions and General Behaviour, Material connections, From Connections, Force connections, Applications. Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solution, Examples. Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples.

Textbooks:

1. G.Paul; W. Beitzetal, Engineering Design, Springer International Education, 2010.
2. Kevin Otto: K. Wood, Product Design And Development, Pearson Education, 2013.

References:

1. Kenith B. Kahu, Product Planning Essentials, Yes dee Publishing, 2011.
2. K.T. Ulrich, Product Design and Development, TMH Publishers, 2011.

Online Learning Resources:

- https://nptel.ac.in/courses/112107217
- https://nptel.ac.in/courses/112104230
- https://www.youtube.com/watch?v=mvaqZAFdL6U
- https://nptel.ac.in/courses/107103082
- https://quizxp.com/nptel-product-design-and-manufacturing-assignment-5/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A04704) ELECTRONIC SENSORS
(Open Elective Course –III)

Course Objectives:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

Course Outcomes:

- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT I

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT II

Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT III

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT IV

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT V

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing – Sensors for environmental Monitoring

Textbooks:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

References:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech

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(20A04506) PRINCIPLES OF COMMUNICATION SYSTEMS

Course Objectives:

- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Course Outcomes:

- Understand the concept of various modulation schemes and multiplexing
- Apply the concept of various modulation schemes to solve engineering problems
- Analyse various modulation schemes, and evaluate various modulation scheme in real time applications

UNIT I Amplitude Modulation

Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation, Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB. Frequency Division Multiplexing. Radio Transmitter and Receiver.

UNIT II Angle Modulation

Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting.

UNIT III Pulse Modulation

Sampling Theorem: Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.

UNIT IV Digital Modulation

Binary Amplitude Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater.

UNIT VCommunication Systems

Satellite, RADAR, Optical, Mobile and Computer Communication (Block diagram approach only).

Note: The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.

Textbooks:

1. Herbert Taub, Donald L Schilling and Goutam Saha, “Principles of Communication Systems”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., 2008.

References:

1. B. P. Lathi, Zhi Ding and Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.
2. K. Sam Shanmugam “Digital and Analog Communication Systems”, Wiley India Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A27704) HUMAN NUTRITION
(OPEN ELECTIVE-III)

Course Objectives:

- To get knowledge on Concepts and content of nutrition source and metabolic functions.
- To know about Balanced diets for various groups; Diets and disorders, recommended dietary allowances
- To learn about Epidemiology of under nutrition and over nutrition.
- To understand Nutrition and immunity.

Course Outcomes:

- To study the Salient features of Concepts and content of nutrition, Malnutrition, Nutrition education
- Assessment of nutritional status, disorders Food fad and faddism.

UNIT I

Concepts and content of nutrition: Nutrition agencies; Nutrition of community; Nutritional policies and their implementation; Metabolic function of nutrients. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings;

UNIT II

Water and energy balance: Water intake and losses; Basal metabolism- BMR; Body surface area and factors affecting BMR Formulation of diets: Classification of balanced diet; Balanced diets for various groups; Diets and disorders. Recommended dietary allowances (RDA); For various age group; According physiological status; Athletic and sports man; Geriatric persons

UNIT III

Malnutrition: Type of Malnutrition; Multi-factorial causes; Epidemiology of under nutrition and over nutrition; Nutrition and immunity.

UNIT IV

Nutrition education Assessment of nutritional status: Diet surveys; Anthropometry; Clinical examination; Biochemical assessment; Additional medical information

UNIT V

Blood constituents; Hormone types; Miscellaneous disorders Food fad and faddism. Potentially toxic substances in human food.

Textbooks:

1. Swaminathan M, Advanced Text Book on Food & Nutrition (Volume I and II) , The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006
2. Stewart Truswell, ABC of Nutrition (4th edition) , BMJ Publishing Group 2003, ISBN 0727916645.
3. Martin Eastwood, Principles of Human Nutrition , Blackwell Publishing, Boca Rotan

Reference:

1. Mike Lean and E. Combet ,Barasi's Human Nutrition – A Health Perspective , Second Edition CRC Press, London
2. Introduction to Human Nutrition, Micheal J. G., Susan A.L. Aedin C. and Hester H.V, Wiley-Blackwell Publication, UK 2009 , ISBN 9781405168076
3. Bogert L.J., Goerge M.B, Doris H.C., Nutrition and Physical Fitness, W.B. Saunders Company, Toronto, Canada

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A54702) NUMERICAL METHODS FOR ENGINEERS (OPEN ELECTIVE-III)

Course Objectives:

This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.

Course Outcomes:

- Apply numerical methods to solve algebraic and transcendental equations.
- Understand fitting of several kinds of curves.
- Derive interpolating polynomials using interpolation formulae.
- Solve differential and integral equations numerically.

UNIT I Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT II Curve Fitting

Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.

UNIT III Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT IV Numerical Integration

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

UNIT V Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A56702) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OPEN ELECTIVE-III)

Course Objectives:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To enlighten the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To identify the required sensor and actuator for interdisciplinary application

Course Outcomes:

- To recognize the need of sensors and actuators
- To understand working principles of various sensors and actuators
- To identify different type of sensors and actuators used in real life applications
- To exploit basics in common methods for converting a physical parameter into an electrical quantity
- To make use of sensors and actuators for different applications

UNIT I Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators.

UNIT II Temperature and Mechanical Sensors

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: strain gauges, tactile sensors, Pressure sensors: semiconductor, piezoresistive, capacitive, VRP.

UNIT III Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT IV Magnetic, Electromagnetic Sensors and Actuators

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT V Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A51702) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (OPEN ELECTIVE-III)

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- To characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

Course Outcomes:

- Understand the state of art synthesis of nano materials
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
- Analyze nanoscale structure in metals, polymers and ceramics
- Analyze structure-property relationship in coarser scale structures
- Understand structures of carbon nano tubes

UNIT I

Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Synthetic Methods**:** Bottom-Up approach**:** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT II

Top-Down approach: Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling.

UNIT III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals.

UNIT V

Engineering Applications of Nanomaterials

Textbooks:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

References:

1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.
3. Nanomaterials Chemistry, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A01705) HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICES
(Open Elective Course-IV)

Course Objectives:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard . control, environmental issues and management
- To get exposed to accidents modeling, accident investigation and reporting, concepts of. HAZOP and PHA
- To be familiar with safety measures in design and process operations.
- To get exposed to risk assessment and management, principles and methods

Course Outcomes :

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard.
- To get exposed to accidents modelling, accident investigation and reporting control, environmental issues and management
- To get concepts of HAZOP and PHA.
- To be familiar with safety measures in design and process operations.

UNIT I

Introduction to safety, health and environmental management - Basic terms and their definitions - Importance of safety - Safety assurance and assessment - Safety in design and operation - Organizing for safety.

UNIT II

Hazard classification and assessment - Hazard evaluation and hazard control.
Environmental issues and Management - Atmospheric pollution - Flaring and fugitive release - Water pollution - Environmental monitoring - Environmental management.

UNIT III

Accidents modelling - Release modelling - Fire and explosion modelling - Toxic release and dispersion Modelling

UNIT IV

Accident investigation and reporting - concepts of HAZOP and PHA.
Safety measures in design and process operations - Inserting, explosion, fire prevention, sprinkler systems.

UNIT V

Risk assessment and management - Risk picture - Definition and characteristics - Risk acceptance criteria - Quantified risk assessment - Hazard assessment - Fatality risk assessment - Risk management principles and methods.

Textbooks:

1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.

Reference Books:

1. Introduction to Safety and Reliability of Structures, by Jorg Schneider
2. Structural Engineering Documents Vol. 5, International Association for Bridge and

Structural Engineering (IABSE), 138pp., 1997.
3. Safety and Health for Engineers, by Roger L. Brauer, John Wiley and Sons Inc. pp. 645-663, 2006.
4. Health, Safety and Environmental Management in Offshore and Petroleum Engineering, Srinivasan Chandrasekaran, John Wiley and Sons, 2016.

Online Learning Resources:

https://nptel.ac.in/courses/114106017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A02705) RENEWABLE ENERGY SYSTEMS
(Open Elective Course – IV)

Course Objectives:

- Understand various sources of Energy and the need of Renewable Energy Systems.
- Understand the concepts of Solar Radiation, Wind energy and its applications.
- Analyze solar thermal and solar PV systems
- Understand the concept of geothermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes:

- Understand various alternate sources of energy for different suitable application requirements
- Understand the concepts of solar energy generation strategies and wind energy system
- Analyze Solar and Wind energy systems
- Understand the basics of Geothermal Energy Systems, various diversified energy scenarios of ocean, biomass and fuel cells

UNIT I SOLAR ENERGY

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT II PV ENERGY SYSTEMS

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT III WIND ENERGY

Principle of wind energy conversion; Basic components of wind energy conversion systems; windmill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT IV GEOTHERMAL ENERGY

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT V MISCELLANEOUS ENERGY TECHNOLOGIES

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Textbooks:

1. Stephen Peake, “Renewable Energy Power for a Sustainable Future”, Oxford International Edition, 2018.
2. G. D. Rai, “Non-Conventional Energy Sources”, 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A03705) INTRODUCTION TO COMPOSITE MATERIALS
(Open Elective-IV)

Course Objectives:

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

Course Outcomes:

- Identify the practical applications of composites. (L3)
- Identify the polymer matrix composites. (L3)
- Classify of bio- degradable composites. (L2)
- Outline the various types of ceramic matrix materials. (L2)

UNIT I Introduction to composites

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT II Polymer matrix composites

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT III Metal matrix composites

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

UNIT IV Ceramic matrix composites

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT V Advances & Applications of composites

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Textbooks:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Online Learning Resources:

- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A27705) WASTE AND EFFLUENT MANAGEMENT (OPEN ELECTIVE-IV)

Course Objectives:

- To understand the wastewater treatment process.
- To gain knowledge on waste disposal in various ways.
- To know about advances in wastewater treatment.

Course Outcomes:

- Acquires knowledge on technologies used for chemical and biological methods of waste water and effluent treatment

UNIT I

Wastewater Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents. Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

UNIT II

Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.

UNIT III

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry.

Chemical Unit Processes: Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage

UNIT IV

Biological Treatment: Overview of biological Treatment – Microbial metabolism – Bacterial growth and energetics – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

UNIT V

Advanced Wastewater Treatment: Technologies used in advanced treatment – Classification of technologies. Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration- Absorption – Ion Exchange – Advanced oxidation process.

Textbooks:

1. Herzka A & Booth RG; "Food Industry Wastes: Disposal and Recovery"; Applied Science Pub Ltd. 1981,
2. Fair GM, Geyer JC & Okun DA; "Water & Wastewater Engineering"; John Wiley & Sons, Inc. 1986,

References:

1. GE; "Symposium: Processing Agricultural & Municipal Wastes"; AVI. 1973,
2. Inglett Green JH & Kramer A; "Food Processing Waste Management"; AVI. 1979,
3. Rittmann BE & McCarty PL; "Environmental Biotechnology: Principles and Applications"; Mc-Grow-Hill International editions2001,.
4. Bhattacharyya B C & Banerjee R; "Environmental Biotechnology"; Oxford University Press.
5. Bartlett RE; " Wastewater Treatment; Applied Science" Pub Ltd.
6. G. Tchobanoglous, FI Biston, "Waste water Engineering Treatment and Reuse": Mc Graw Hill, 2002.
7. "Industrial Waste Water Management Treatment and Disposal by Waste Water" 3rd Edition Mc Graw Hill 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
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(20A54703) NUMBER THEORY AND ITS APPLICATIONS (OPEN ELECTIVE-IV)

Course Objectives:

This course enables the students to learn the concepts of number theory and its applications to information security.

Course Outcomes:

- Understand number theory and its properties.
- Understand principles on congruences
- Develop the knowledge to apply various applications
- Develop various encryption methods and its applications.

UNIT I Integers, Greatest common divisors and prime Factorization

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT II Congruences

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT III Applications of Congruences

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem-Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT IV Finite fields & Primality, factoring

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT V Cryptology

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers-Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:

1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.

Reference Books:

1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press

Online Learning Resources:

https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
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(20A56703) SMART MATERIALS AND DEVICES (OPEN ELECTIVE-IV)

Course Objectives:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To enlighten the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Course Outcomes:

- to recognize the need of smart materials
- to understand the working principles of smart materials
- to know different techniques used to synthesize and characterize smart materials
- to exploit the properties of smart materials
- to make use of smart materials for different applications

UNIT I

Introduction: Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

UNIT III: Synthesis of smart materials: Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Co-precipitaiton. Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Sol-gel, spray pyrolysis.

UNIT IV: Characterization techniques: X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V: Materials and Devices: Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.

Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Textbooks:

1. Encyclopaedia of Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

References:

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.
2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.
3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, 2nd Edn., John Wiley & Sons, 2003.
4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, 2002.
5. Optical Metamaterials: Fundamentals and Applications -W. Cai and V. Shalaev, springer,2010.
6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
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(20A51703) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-IV)

Course Objectives:

- Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

Course Outcomes:

- Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT II: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water-based coatings, Ionic liquids as catalyst and solvent

UNIT IV: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Renewable Feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency: Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis. Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions).

UNIT V: GREEN PROCESSES FOR GREEN NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Textbooks:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

References:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.
2. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

HONOURS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (IoT)

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3	1	0	4

(20A35H01) IOT INFRASTRUCTURE

Pre-requisite Introduction to IoT

Course Objectives:

- Study the real industrial environment
- Discuss case study of Google, AWS and AZURE
- Understand industrial data flow.

Course Outcomes:

- Understand the Industrial IoT
- Apply IoT techniques in Industrial IoT
- Use Google, AWS and AZURE for Industrial IoT

UNIT I **Introduction to Industrial IoT and Process** Lecture 8 Hrs

Technical requirements, IoT background, IoT key technologies, what is the I-IoT, use cse of the IoT and I-IoT similarities and differences, IoT analytics and AI, Industry environments and scenarios covered by I-IoT,

Process - The Industrial Process, The CIM pyramid, The I-IoT data flow,

UNIT II **Industrial data flow and devices** Lecture 8 Hrs

Technical requirements, The I-IoT data flow in the factory, Measurements and the actuator chain, controllers, Industrial protocols, Supervisory control and data acquisition, Historiean, ERP and MES

UNIT III **Implementing the Industrial IoT data flow** Lecture 9 Hrs

Discovering OPC, Understanding the I-IoT edge, Implementing the I-IoT data flow

UNIT IV **Implementing a loud Industrial IoT solution with AWS** Lecture 9 Hrs

Technical requirements, AWS architecture, registering for AWS, IoT core, Storing data, AWS Analytics.

UNIT VImplementing a Cloud industrial IoT solution with Google cloud, Azure Lecture 8 Hrs

Technical requirements, Google Cloud IoT, Starting with IoT core, Bigtable, Cloud Functions, GCP for analytics

Technical requirements, Azure IoT, Azure analytics, Building visualizations with Power BI, Time series insights, Connecting a device with IoT Edge

Textbooks:

1. Ciacomo Veneri and Antonio Capasso, Hands on Industrial Internet of Things, Packt Publisher, 2018

Reference Books:

1. Deep Learning for Internet of Things Infrastructure Edited By Uttam Ghosh, Mamoun Alazab, Ali Kashif Bas, First Edition.

2. Raffaele Giaffreda, Dagmar Caganova, Yong Li, Roberto Riggio, Agnes Voisard(Eds), Internet of Things. IoT Infrastructures, Second International Summit, IoT 360° 2015, Rome, Italy, October 27-29, 2015, Revised Selected Papers, Part II.

Online Learning Resources:

1. NPTEL Course by Sudip Misra, IIT Kharagpur

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B.Tech CSE (IoT)

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(20A35H02) INTRODUCTION TO UAV

Pre-requisite Introduction to Internet of Things

Course Objectives:

- To make the students to understand the basic concepts of UAV systems design.
- Understand the capabilities and limitations of the UAS and data post-processing systems;
- Understand fundamental concepts surrounding operating a UAS
- A thorough understanding of aircraft flight dynamics.
- Understanding the static stability of various UAVs. Significance of location of Neutral point and Centre of gravity for a stable flight.

Course Outcomes:

- Ability to design UAV system
- Ability to identify different hardware for UAV
- Evaluate strength and weakness of different phases of the design
- Design example for hand launch fixed wing UAV for various mission requirement
- Develop subroutine for design process.

UNIT I Lecture 8 Hrs

History and Overview: Overview, history, overview of UAV Systems, The Aquila.
Classes and Missions of UAVs: Overview, Examples of UAV Systems, Expendable UAVs, Classes of UAV Systems, Missions.

UNIT II Lecture 8 Hrs

Mission Planning and Control Station: Overview, MPCS Architecture, Physical Configuration, Planning and Navigation, MPCS Interfaces.
Data-Link Functions and Attributes: Overview, Background, Data-Link Functions, Desirable Data-Link Attributes, System Interface Issues.

UNIT III Lecture 9 Hrs

Introduction to Design and Selection of the System: Conceptual Phase, Preliminary Design, Detail Design, Selection of the System.
Communications: Communication Media, Radio Communication, Mid-air Collision (MAC) Avoidance, communications Data Rate and Bandwidth Usage.
Design for Reliability: Determination of the Required Level of Reliability, Achieving Reliability, Reliability Data Presentation, Multiplexed Systems, Reliability by Design, Design for Ease of Maintenance.

UNIT IV Lecture 9 Hrs

Introduction to System Development and Certification: System Development, Certification, Establishing Reliability.
System Ground Testing: UAV Component Testing, UAV Sub-assembly and Sub-system Testing, Testing Complete UAV, Control Station Testing, Catapult Launch System Tests, Documentation.
System In-flight Testing: Test Sites, Preparation for In-flight Testing, In-flight Testing, System Certification.
Civilian, Paramilitary and Commercial Roles

UNIT V Lecture 8 Hrs

Future Prospects and Challenges: Introduction, Operation in Civilian Airspace, Power-plant Development, Developments in Airframe Configurations, Autonomy and Artificial Intelligence, Improvement in Communication Systems.
UAV Systems Continuing Evolution: Introduction, Cruise Missiles, World War II Systems, The 1950s, The 1960s, The 1970s, The 1980s, The 1990s, The 2000s, The 2010s, Into the Future.

Textbooks:

1. Paul Gerin Fahlstrom and Thomas James Gleason, Introduction to UAV Systems, Fourth Edition, Aerospace Series.
2. Reg Austin, UNMANNED AIRCRAFT SYSTEMS, UAVS DESIGN, DEVELOPMENT AND DEPLOYMENT, Aerospace Series, Ian Moir, Allan Seabridge and Roy Langton.

Reference Books:

1. Andey Lennon, "Basics of R/C Model Aircraft Design" Model Airplane News Publication
2. John Baichtal, Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.
3. K Valavanis, George J Vachtsevanos, Handbook of Unmanned Aerial Vehicles, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
4. DGCA RPAS Guidance Manual, Revision 3 – 2020.

Online Learning Resources:

1. Edx: Drones for Agriculture: Prepare and Design Your Drone (UAV) Mission
2. Coursera: Robotic: Aerial Robotics

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(20A32H01) SOFTWARE PROJECT MANAGEMENT USING AGILE

Pre-requisite **Software Engineering Fundamentals**

Course Objectives:

- Teach how to manage a Project
- Discuss Agile method of handling projects

Course Outcomes:

After completion of the course, students will be able to

- Apply Agile methodology for software development
- Critically analyze quality of software
- Estimate the software cost

UNIT I Introduction, The Agile Business Case Lecture 8Hrs

History, Background, and the Manifesto, Traditional Lifecycle, Agile Lifecycle, Scaling for Enterprise Agile, Four Agile Methodologies

The Agile Business Case: The Business Case, Business Value Models, Project Balance Sheet, Building the Business Case by Levels

UNIT II Quality in the Agile Space Lecture 9Hrs

Quality Values and Principles, Thought Leaders and Agile Quality, Sampling for Quality Validation, Agile in the Waterfall: First Principles and Requisite Conditions, The Black Box, Interfaces, and Connectivity, Governing

UNIT III Scope and Requirements Lecture 9Hrs

Developing the Scope and Requirements: Agile Scope, Envisioning, Requirements, Planning at a Distance

Planning and Scheduling: Planning in the Enterprise Context, Scheduling, Other Plans in the Enterprise Agile Project

UNIT IV Estimating Cost and Schedule Lecture 8Hrs

The Nature of Estimates, Drivers on Cost and Schedule, Building Estimates

Teams Are Everything: The Social Unit, Principle and Values Guide Teams, Teams Are Building Blocks, Some Teams Work; Others Do Not, Matrix Management in the Agile Space

UNIT V Governance, Managing Value Lecture 8Hrs

Governance Is Built on Quality Principles, Governance Verifies Compliance

Managing Value: Defining and Accounting for Value, Burn-down Charts and Value Scorecards

Textbooks:

1. John C. Goodpasture, PMP, “Project Management the Agile Way”, Second Edition, J. Ross Publishing 2016.

Reference Books:

1. Kalpesh Ashar, Agile Essentials you always wanted to know, Vibrant publishers, 2020
1. Jutta Eckstein, Agile Software development in the large: Diving into the Deep, Jutta Eckstein Publisher, 2022

Online Learning Resources:

1. Coursera: Agile Project Management offered by Google
2. Coursera: Alex Cowan, Agile Development Specialization

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(20A35H03) IOT APPLICATIONS

Course Objectives:

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

Course Outcomes:

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

- Understand the basics of IoT.
- Implement the state of the Architecture of an IoT.
- Understand design methodology and hardware platforms involved in IoT.
- Understand how to analyse and organize the data.
- Compare IoT Applications in Industrial & real world.

UNIT I **Application domains – Introduction, Smart Cities** Lecture 8 Hrs

Introduction, Market overview, Energy, Health care, Manufacturing, Smart cities, Transportation, Interoperability and Technologies, Connectivity, Communication, Data Exchange, Alliances, Industrial Internet Consortium, Platform Industries.

Internet of Things Applications for Smart Cities: Introduction Applications for smart cities, specific smart city applications, Driverless vehicles, crowdsensing, Smart buildings, Smart Campuses, Smart grid, Optimal enablement of video and multimedia capabilities in IoT, Key Underlying technologies for smart cities IoT Applications.

UNIT II **Smart connected homes, Energy internet things** Lecture 8 Hrs

Smart Connected Homes: Introduction, The smart connected Home Domain, smart connected home systems, The smart connected home technologies, Smart connected home architectures, Smart connected home challenges and research directions.

The Emerging "Energy of Internet of Things":

Introduction, Power management trends and EIoT support, smart cities/smart buildings, Smart Metering and the Advanced Metering Infrastructure, Demand response, office/home intelligence, Energy storage, Real-Life power management optimization approaches, Challenges and Future directions.

UNIT III **IoT for Renewable energy and healthcare** Lecture 9 Hrs

Introduction, Managing the impact of sustainable energy, EIoT deployment, EIoT elements, Network functionality industry standards for EIoT, Open automated demand response, Building energy data exchange specification, Institute of electrical and electronics engineers (IEEE), Security considerations in EIoT and Clean energy environments.

IoT in Health Care :Introduction, The smart health care ecosystem, the patient at the centre, Health care providers, Devices and sensors, Applications and Interfaces, Other stakeholders: Social Support, Connecting the components, Dimensions of IoT applications in health care, Well-being-Illness Dimension, Physical-Mental Dimension, Temporary-Chronic Dimension, Prevent-Cure Dimension, Monitor-Manage Dimension, Internal-External Measures Dimension, Health care Provider, Examples of IoT related health care applications and their dimensions.

UNIT IV **IoT for Emergency medicine and Agriculture** Lecture 9 Hrs

Introduction in Emergency Medicine, Point of care Environment, Biosensing Network, Hierarchal Cloud Architecture, Weather observation for remote rescue, Integration and Compatibility, Operational Consistency and Reliability Assurance, Electronic patient record retrieval in multihop communication, Case study: Chronic Obstructive Pulmonary Disease, On-scene Diagnosis and prognosis, Data Acquisition and analytics, Decision and Selection process, Patient and the Ambient Environment, Smart Ambulance Environment, Smart Ambulance challenges, Reliability, Standards.
IoT Applications for Agriculture: Introduction, IoT based precision agriculture, Data collection, Site specific Operation, IoT application in PA, IoT application in Agriculture Irrigation, Crop water stress Index, Data Acquisition, IoT Irrigation system, IoT Application in agricultural fertilization, IoT Application in Crop disease and pest management, IoT Application in precision livestock farming, Smart Chicken Farm, Smart Cow Farm, IoT Aquaculture.

UNIT V IoT for Flying things, Autism Lecture 8 Hrs

Introduction, Flying Things, Unmanned Aircraft Systems, Flying Ad Hoc Networks, Flying Things: Unmanned Aerial Vehicles & More, The internet of Flying Things, General Modern Applications of the Internet of Flying Things, Applications in Emerging situations, Applications in smart cities, Applications in smart farms, Government official Missions, Novel applications of IoFT Challenges, General Issues, Security issues at different IoFT conceptual layers, Safety issues of IoFT, Case studies.
Autism: Introduction, Background, Current approaches of technology, challenges of technology based Intervention on Autism Spectrum Disorder in China, Emotion Recognition in Autism Spectrum Disorder, Emotion Expressiveness of Individuals with Autism Spectrum disorder, Emotion Expressiveness of individuals with Autism Spectrum Disorder, Emotion Recognition by Neuro-Typical Individuals, Affecting computing, Multisensory data collection in naturalistic settings and Ubiquitous Affective Objects, Sensing the emotion from behavioural data analysis, the IoT in monitoring and tracking individuals for ASD Intervention, The IoT environment for emotion recognition, System background and Architecture, The Naturalistic play environment, Sensors and sensor fusion, Hardware design on emotion and actuation, Pressure sensors, Data Management and Visualization for Indoor Temperature & Humidity Detection, Emotion Recognition through Microsoft Kinect, The Emotional Facial Action Coding System(EMFACS) and Kinect HD Face API, Emotion Recognition, Emotion Visualization and Broadcasting through Affective Object.

Textbooks:
1. Qusay F. Hassan, Internet of Things A to Z, IEEE Press, Wiley, 2018

Reference Books:
1. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
4. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O'Reilly Media,2011.

Online Learning Resources:
1. Coursera: Industrial IoT on Google Cloud
2. Coursera: Industrial IoT fundamentals on AWS