



(Autonomous Institution under VTU, Accredited by NAAC A+ Grade)

Department of Information Science and Engineering

VII to VIII Semesters Scheme and Syllabus

Outcome-based Education and Choice-based Credit System

With effect from Academic Year 2022 - 23

VISION

To disseminate the IT knowledge among the students for achieving excellence in education and to irradiate budding engineers as leaders in information technology.

MISSION

M1: To maintain leadership and excellence in Information Technology.

M2: Achieving excellence in IT through analysis, design, development of software products

M3: Developing communication skills, leadership qualities and team work among students' community by providing opportunities to work on various projects through internship with industry partners

M4: To inculcate Ethics and Human values for solving societal problems and environmental protection.

M5: Promoting research, higher studies and entrepreneurship among the students through outside world interaction

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfil the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs)

Graduates of the Information Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Information Science and Engineering principles to the solution of complex problems in Information Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Information Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Information Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Information Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Information Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Information Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional **Information Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Information Science and Engineering practice.

PO9: Individual and Team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Information Science and Engineering activities with the

NCET Scheme and Syllabus VII to VIII Semesters

engineering community and with society at large, such as, being able to comprehend and write Effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Information Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

NCET Scheme and Syllabus VII to VIII Semesters

Seventh Semester B.E. – Scheme w.e.f. 2022-2023

Sr. No.	Course Code	Course Name	Total Credits	L : T : P : S (Hrs/Week)	CIE	SEE	Marks	Weekly load
1	19ISI71X	Professional Elective-IV	4	3 : 0 : 2 : 0	50	50	100	5
2	19IST72X	Professional Elective –V	3	3 : 0 : 0 : 0	50	50	100	3
3	19ISI73X	Professional Elective-VI	4	3 : 0 : 2 : 0	50	50	100	5
4	19IST74X	Industrial Elective-I (IC)	3	3 : 0 : 0 : 0	50	50	100	3
5	19IST75X	Industrial Elective-II (IC)	3	3 : 0 : 0 : 0	50	50	100	3
6	19IST76	Online Certification	1	0 : 0 : 0 : 4	50	50	100	4
7	19ISP77	Project Phase – I	2	0 : 0 : 4 : 0	50	50	100	4
Total			20	15 : 0 : 8 : 4	350	350	700	27

Note: Internship has to be completed compulsorily before VIII Semester

Professional Elective-IV

Course Code	Course Name
19IST711	UML& AGILE PRACTICES
19IST712	Internet of Things
19IST713	Advanced Cloud Computing (AWS)

Professional Elective-V

Course Code	Course Name
19IST721	Storage Area Network
19IST722	Adhoc Networks
19IST723	Management Information System (MIS)

Professional Elective-VI

Course Code	Course Name
19ISI731	Robotics
19ISI732	Advanced Algorithms
19ISI733	Pattern Recognition and Anomaly Detection

Industry Elective-I

Course Code	Course Name
19IST741	Decision Support Systems (DSS)
19IST742	Enterprise Resource Planning (ERP)
19IST743	Supply Chain Management

Industry Elective-II

Course Code	Course Name
19IST751	Digital Marketing
19IST752	Operation Research
19IST753	Management Entrepreneurship

Eighth Semester B.E. – Scheme w.e.f. 2022-2023

Sr. No.	Course Code	Course Name	Total Credits	L : T : P : S (Hrs/Week)	CIE	SEE	Marks	Weekly load
1	19ISP81	Technical Seminar	1	0 : 0 : 0 : 4	50	50	100	4
2	19ISP82	Internship	3	0 : 0 : 4 : 4	50	50	100	8
3	19ISP83	Project Phase, Evaluation and Viva voce(External)	11	0 : 0 : 18 : 8	100	100	200	26
Total			15	0 : 0 : 22 : 16	200	200	400	38

Note: AICTE Activity points (Mandatory)

7th Semester Courses' Syllabus

UML & AGILE PRACTICES

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI711	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 Hours	PEC - IV

Course Objectives:

This course will enable students to:

- Understand the basic concepts of Object Orientation and UML.
- Get a clear understanding of how to use UML and design diagrams.
- Know iterative, incremental and development process.
- Study the principles and practices of extreme programming.
- Understand the essence of agile development methods and develop prototyping in the software process.

Syllabus

Module - I

UML Diagrams: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history. UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.

08 Hours

Module - II

Advanced Modelling and Design: System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams derived data; Packages; Practical tips. State Modelling, Advanced: Events, States, Transitions and Conditions; State diagrams; State diagram behaviour nested states signal generalization concurrency; Relation of class and state models.

08 Hours

Module - III

The Agile Movement - A Five Minute Primer, What is Agile Development? The Agile Methodologies Agile Values, Agile Practices, Agile Principles. **Agile Characteristics**-The Characteristics of an Agile Project, The Development Team Project Management, The Customer, Processes and Tools The Contract, What Projects Can Benefit from Agile Development.

08 Hours

Module - IV

The Agile Methodologies: Common Themes, Methodology Descriptions, Extreme Programming, Scrum, Feature Driven Development, The Crystal Methodologies, Adaptive Software Development, Dynamic Systems Development Method, Lean Software Development, Starting Monday: Investigate Further. **Selecting an Approach that Fits:** Choosing between an Agile or Traditional Approach, Selecting the Right Agile Approach.

08 Hours

Module - V

Agile Practices and Testing: Getting Started, Agile Practices Explained, Selecting the Next Practice, Rejecting a Practice, Adopt Practices before Tools Learn Programming Practices in Pairs, Agile Practices in this Book Agile Practices Explained, Why these Practices were Chosen, An Agile Approach to Testing, The Good Enough Approach Testing as the Best Défense.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Lab Programs:

- 1) Using UML, design Abstract Factory design pattern
- 2) Using UML, design Builder design pattern
- 3) Using UML, design Façade design pattern
- 4) Using UML, design Bridge design pattern
- 5) Using UML, design Decorator design pattern
- 6) User gives a print command from a word document. Design to represent this chain of responsibility design pattern
- 7) Agile Software Development: A Case Study of Web Application

Course Outcomes

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

CO1: Use the basic concepts of object orientation, analyze and design object-oriented system using UML.

CO2: Describe the advanced UML analysis and design diagrams.

CO3: Apply the common characteristics of an agile development process.

CO4: Analyze agile software development process models and plan driven process models.

CO5: Determine software project characteristics that would be suitable for an agile process

Text Books:

- 1) Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005. (module 1 and 2), ISBN-13: 9781584509876
- 2) Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (module 1 and 2), ISBN-13:9781584509876
- 3) Ken Schwaber And Mike Beedle, Agile Software Development With Scrum, Pearson Education, 2015. ISBN-13: 9780132074896
- 4) Peter Schuh, Integrating Agile Development In The Real World (Charles River Media Programming), 2004 Cengage Learning, ISBN-13: 9781584503644

Reference Books:

- 1) Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
- 2) Alistair Cockburn, Agile Software Development: The Cooperative Game, Pearson Education, 2015. ISBN-13: 9780321482754
- 3) Mike Cohn, Succeeding With Agile : Software Development Using Scrum, Pearson Education Limited, 2016, ISBN-13: 9789332547964

E Resources:

- 1) <https://www.gurock.com/testrail/agile-testing?>
- 2) https://cucumber.io/tools/cucumberstudio/?utm_source

INTERNET OF THINGS

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI712	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 Hours	PEC - IV

Course Objectives:

This course will enable the students to:

- Gain the knowledge about IOT concepts.
- Know different Application protocols for IOT.
- Understand methods of deploying smart objects and connect them to network.
- Know the diverse methods of deploying smart objects and connect them to network.
- Learn about genesis and impact of IOT applications

Syllabus

Module – I

Introduction to Internet of Things: Definition and Characteristics of IOT, Physical Design of IOT – IOT Protocols, IOT communication models, IOT Communication APIs IOT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IOT Levels and Templates. Overview of Microprocessor and Microcontroller, Basics of Sensors and actuators.

08 Hours

Module – II

Prototyping IoT Objects Using Microprocessor/Microcontroller: Working principles of sensors and actuators – Setting up the board - Programming for IOT – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, Wi-Fi, Ethernet, Zigbee, RFID, NFC.

08 Hours

Module – III

IOT Architecture and Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IOT reference Model. Protocols- 6LowPAN, RPL, CoAP, MQTT.

08 Hours

Module – IV

Smart Objects: The “Things” in IOT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria.

08 Hours

Module – V

Cloud Services For IOT: Introduction to Cloud Storage models and communication APIs Webserver – Web server for IOT, Cloud for IOT, Python web application framework designing a RESTful web API, Amazon Web services for IOT.

08 hours

Lab Programs:

- 1) Familiarization with concept of IOT, Arduino/Raspberry pi and perform necessary software Installation
- 2) Study of different operating systems for Raspberry-Pi Understanding the process of OS installation on Raspberry-Pi
- 3) Study the Connectivity and configuration of Raspberry-Pi circuit with basic peripherals, LEDs. Understanding GPIO and its use in program.
- 4) The connectivity of Raspberry-PI circuit with temperature sensor and write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated users using LEDs.
- 5) GPS Module Interfacing with Raspberry-PI

NCET Scheme and Syllabus VII to VIII Semesters

- 6) Optional Understanding and connectivity of Raspberry-Pi with a Zigbee module. Write a network application for communication between two devices using Zigbee
- 7) Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.PPT
- 8) Write a server application to be deployed on Raspberry-Pi. Write client applications to get services from the server application
- 9) Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe

Course Outcomes:

After studying this course, students will be able to

CO1: Analyze IOT architectural components.

CO2: Interfacing Sensor and Actuator with Arduino development board.

CO3: Describe protocols of resource constraint network.

CO4: Compare and contrast the deployment of smart objects and the technologies to connect them to network.

CO5: Design and develop IOT applications.

Text Books:

- 1) "Internet of Things (A Hands-on-Approach)" by Vijay Madiseti and ArshdeepBahga, 1st Edition, VPT, 2014. ISBN 13: 9780996025515
- 2) Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017 ISBN: 9789386858955
- 3) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IOT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books:

- 1) Vijay Madiseti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
- 2) Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)
- 3) "TheInternet of Things – Key applications and Protocols" by Olivier Hersent, David Boswarthick, Omar Elloumi , , Wiley, 2012 ISBN: 978-1-119-99435-0

E-resources

- 1) www.coursera.org/specializations/IOT
- 2) www.futurelearn.com/courses/internet-of-things

NCET Scheme and Syllabus VII to VIII Semesters

Advanced Cloud Computing (Amazon Web Services)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI713	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 hours	PEC - IV

Course Objectives:

This course will enable students to:

- Identify the security and compliance benefits of by using the AWS Cloud.
- Understand the access control and management features of AWS.
- Learn about data encryption methods to secure all types of sensitive data.
- Get knowledge about the important steps for managing various AWS resources.
- Study the AWS services to protect network security.

Syllabus

Module-I

Introduction to AWS: AWS history, AWS Infrastructure, AWS services, AWS ecosystem
Programming, management console and storage on AWS: Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service(S3), Glacier - Content delivery platforms.

08 Hours

Module-II

AWS identity services, security and compliance: Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.

08 Hours

Module-III

AWS computing and marketplace: Elastic cloud compute (EC2) - Introduction to servers, Imaging computers, Auto scaling, elastic load balancing, cataloging the marketplace, AMIs, Selling on the marketplace. **AWS networking and databases:** Virtual private clouds, Cloud models, Private DNS servers (Route 53), Relational database service – DynamoDB, ElastiCache, Redshift.

08 Hours

Module-IV

Other AWS services and management services: Analytics services, Application services, Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks. **Configuration management:** Introduction.

08 Hours

Module-V

AWS billing and Dealing with disaster: Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs.

08 Hours

Lab Programs:

- 1) Accessing the AWS Management Console and Creating AWS Identity and Access Management(IAM) providing Security Credentials
- 2) Build the VPC and Configure and Customize an EC2 Instance to run a Web server.

NCET Scheme and Syllabus VII to VIII Semesters

- 3) Create, Launch and Monitoring an Amazon EC2 Instance perform scaling on EC2 Instance and Termination.
- 4) Creation of Amazon Elastic Block Store(EBS) and apply File System EBS Volume then perform Back up EBS
- 5) Create and Build a Database Server Amazon RDS and perform setup, operate and scale a relational Database in the Cloud.
- 6) Perform Elastic Load Balance (ELB) and Auto Scale the Services to Load Balance the Infrastructure.

Course Outcomes:

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

- CO1:** Discuss system virtualization and outline its role in enabling the cloud computing system model.
- CO2:** Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- CO3:** Design various management and other distinguish services of AWS.
- CO4:** Develop security and compliances for AWS.
- CO5:** Analyze the billing of resources and other paradigm: how to deal with disasters.

Text Books:

- 1) Barrie Sosinsky. John Wiley & Sons. Cloud Computing Bible.. First Edition January 2011. ISBN-13: 978-0470903568.
- 2) Bernard Golden Amazon Web Services For Dummies. For Dummies publication; 1 edition (9 August 2013) ISBN-13: 978- 1118571835
- 3) Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition(3 January 2011).ISBN: 9780470887998

Reference Books:

- 1) Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779
- 2) Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758
- 3) Building Applications in the Cloud: Concepts, Patterns and Projects by Christopher M. Moyer, Pearson Addison-Wesley Professional, ISBN-10: 0321720202, ISBN-13: 978-0321720207
- 4) Cloud Computing Design Patterns by Thomas Erl, Prentice Hall, ISBN-10: 0133858561, ISBN-13: 978-0133858563

E-Resources:

- 1) Amazon Security overview whitepaper- <https://aws.amazon.com/whitepapers>
- 2) IAM Getting started Guide <http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>

STORAGE AREA NETWORK

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST721	3 : 0 : 0 : 0	3	CIE : 50 SEE : 50	3 Hours	PEC - V

Course Objectives

This course will enable students to:

- Understand the fundamentals of Storage Area Networks.
- Understand the metrics used for designing storage area networks.
- Understand RAID concepts.
- Understand the various storage technologies like NAS, SAN.
- Enable the students to understand how data centres' maintain data with the concepts of backup.

Syllabus

Module - I

Introduction: Server Centric IT Architecture and its Limitations, Storage-Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks, The Data Storage and Data Access problem, The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems, Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels, Caching, Acceleration of Hard Disk Access, Intelligent disk subsystems, Availability of disk subsystems.

08 Hours

Module - II

I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

08 Hours

Module - III

Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

08 Hours

Module - IV

SAN Architecture and Hardware devices: Overview, creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. **Software Components of SAN:** The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs.

08 Hours

Module - V

Management: System Management, Requirement of Management System, Support by Management System Management Interface, Standardized Mechanisms, Property Mechanisms, In- band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-I), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course outcomes:

On completion of this course, the students are able to:

- CO1:** Identify the need for performance evaluation and the metrics used for it.
- CO2:** Apply the techniques used for data maintenance.
- CO3:** Realize storage virtualization concept
- CO4:** Develop techniques for policies for LUN masking, file systems
- CO5:** Analyze System management.

Text Book:

- 1) Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013. ISBN:9780-470-741-346
- 2) Robert Spalding: "Storage Networks - The Complete Reference", Tata McGraw-Hill, 2011 ISBN: 8580-780-651-643

Reference Books:

- 1) Marc Farley: Storage Networking Fundamentals – An Introduction to Storage devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
- 2) Richard Barker and Paul Massiglia: "Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs", Wiley India, 2006.

E Resources:

- 1) <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470741430,subjectCd-EE25.html>
- 2) <https://www.kobo.com/us/en/ebook/storage-networks-explained>

NCET Scheme and Syllabus VII to VIII Semesters

AD-HOC NETWORKS

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST722	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	PEC - V

Course objectives:

This course will enable students to:

- Learn the mathematical models and network protocol designs in wireless multihop-networks.
- Understand exposition of network protocols and their cross-layer interactions.
- Learn the active research areas in wireless multihop networks.
- Gain knowledge on network protocols.
- Understand the importance of network security.

Syllabus

Module – I

Introduction Ad-hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.

08 Hours

Module – II

MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms.

08 Hours

Module – III

Routing -Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol. Hybrid routing protocol, routing protocols with effective flooding mechanisms.

08 Hours

Module – IV

Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols for Ad hoc wireless Networks.

08 Hours

Module – V

Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad hoc wireless Networks.

08 Hours

Course Outcomes:

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

- C01:** Design their own wireless network.
- C02:** Evaluate the existing network and improve its quality of service.
- C03:** Choose appropriate protocol for various applications.
- C04:** Examine security measures present at different level.
- C05:** Analyze energy consumption and management.

NCET Scheme and Syllabus VII to VIII Semesters

Text Book:

- 1) C Shiva Rama Murthy and B. S Manoj: Ad Hoc Wireless networks, 2nd Edition, Pearson Education, 2005. *ISBN 0-13-147023-X*.
- 2) Jyoti Prakash Singh, Paramartha Dutta, Amlan Chakrabarti; Ad Hoc Networks: A Statistical Perspective Hardcover Springer; 1st ed. 2018 edition (13 April 2018) -ISBN-13: 978-9811087691.

Reference Book:

- 1) Rahim Hekmat, Ad-hoc Networks: Fundamental Properties and Network Topologies Paperback, Springer; Softcover reprint of the original 1st ed. 2006 edition (30 April 2017) ISBN-10: 940177661X.
- 2) Prasant Mohapatra, Srikanth Krishnamurthy; AD HOC NETWORKS: Technologies and Protocols 2005th Edition, Springer; 2005 edition (September 23, 2004), ISBN- 10: 9780387226897.

E-Resources:

- 1) https://www.webopedia.com/TERM/H/hybrid_routing_protocol.html
- 2) <https://www.cynet.com/cyber-attacks/network-attacks-and-network-security-threats/>

NCET Scheme and Syllabus VII to VIII Semesters

MANAGEMENT INFORMATION SYSTEM (MIS)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST723	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	PEC - V

Course objectives:

This course will enable students to:

- Understand the role of Information Technology and Strategies to manage system implementation process.
- Analyze the principles of Transaction Processing Systems.
- Evaluate the roles of various types of Information system in business environment and Customer relationship and supply chain management system.
- Understand the trends and issues in e-commerce Applications.
- Effectively communicate strategic alternatives to facilitate decision making.

Syllabus

Module - I

Foundations of information systems in business: Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, the fundamental role of IS in business, Trends in IS, Managerial challenges of IT. **System Concepts:** Components of an Information System, Information System Resources and activities, Recognizing Information Systems.

08 Hours

Module - II

Fundamentals of strategic advantages: Competitive strategy concepts, Strategic uses of IT, Building a customer-focused business, Reengineering in business processes, Becoming an agile company creating a virtual company, Building a knowledge-creating company. **Enterprise Business Systems:** Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. **Functional Business Systems:** Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, financial management systems.

08 Hours

Module - III

Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM **Enterprise resource planning:** Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. **Supply chain Management:** Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM.

08 Hours

Module - IV

Electronic commerce fundamentals: Introduction, The scope of ecommerce, Essential e-commerce, processes, Electronic payment processes. **e-Commerce applications and issues:** E-commerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to- Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce.

08 Hours

Module - V

Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, Online analytical processing, Knowledge management systems.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course outcomes:

On completion of this course, the students are able to:

- CO1:** Describe the role of information technology and information systems in business
- CO2:** Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.
- CO3:** Apply a framework and process for aligning organization's IT objectives with business strategy.
- CO4:** Analyze the various solutions for business Applications.
- CO5:** Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.

Text Books:

- 1) James A.O'Brien, George M Marakas, Ramesh Behl, Management Information Systems, 10th Edition, 2013, Tata Mc Graw Hill Education, ISBN:13-978-1-25-902671-3, ISBN:10-1-25-902671-X Chapter: 1, 7,8,10.

Reference Books

- 1) Kenneth C. Laudon and Jane P.Laudon, Management Information System, Managing the Digital Firm, Pearson Education, 12th Edition, ISBN: 9780136078463.
- 2) Steven Alter, Information Systems the Foundation of E-Business, 4th Edition, Pearson Education, ISBN-10-8129702533, ISBN-13-978-8129702531.
- 3) W.S.Jawadekar, Management Information System, Tata McGraw-Hill Publishing Company Limited, 1998, ISBN 0074631977, 9780074631973
- 4) Goyal, D.P.: "Management Information System", MACMILLAN India Limited, New Delhi, 2008. Ref no 9788171006054.

E-Resources

- 1) https://books.google.co.in/books/about/Management_Information_System.
- 2) [html. http://www.pearsoned.co.uk/bookshop](http://www.pearsoned.co.uk/bookshop)
- 3) <https://www.pearson.com/us/higher-education/product/Laudon-Management-Information-Systems-Managing-the-Digital-Firm-9th-Edition/9780131538412.html><https://www.amazon.com/Information-Systems-Foundations-Business-4th/dp/8129702533>
- 5) https://books.google.co.in/books/about/Management_Information_Systems.html?id=5JupAAACAAJ

NCET Scheme and Syllabus VII to VIII Semesters

ROBOTICS

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI731	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 hours	PEC - VI

Course objectives:

This course will enable students to:

- Understand the basics of robotics & its simulation.
- Study working of actuators & encoders.
- Learn ability to use software tools for working with sensors.
- Exposed to Robot Operating System.
- Acquire the knowledge of automation in various sources.

Syllabus

Module – I

BASICS OF ROBOTICS: History – Definition – Components – Building a robot – The Robot drive mechanism. **ROBOT SIMULATION:** Mathematical modelling of the robot - Robot kinematics - Concepts of ROS and Gazebo.

08 Hours

Module – II

DESIGNING CHEFBOT HARDWARE: Specifications - Block diagram - Working with Robotic Actuators and Wheel Encoders - Interfacing DC geared motor with Tiva C Launch Pad - Interfacing quadrature encoder with Tiva C Launch pad - Working with Dynamixel actuators.

08 Hours

Module – III

WORKING WITH ROBOTIC SENSORS: Working with ultrasonic distance sensors - Working with the IR proximity sensor - Working with Inertial Measurement Unit.

08 Hours

Module – IV

PYTHON AND ROS: Introduction to OpenCV, OpenNI, and PCL - Programming Kinect with Python using ROS, OpenCV, and OpenNI - Working with Point Clouds using Kinect, ROS, OpenNI, and PCL.

08 Hours

Module – V

INTERFACING IT INTO ROS, USING PYTHON: Building ChefBot hardware - Writing a ROS Python driver for ChefBot - Understanding ChefBot ROS launch files - Working with ChefBot Python nodes and launch files - The Calibration and Testing of ChefBot - The Calibration of Xbox Kinect using ROS - Wheel odometry calibration - Testing of the robot using GUI.

08 Hours

Lab Programs:

PART-A

- 1) Study components of real robot and its DH parameters
- 2) Experiment on the forward kinematics and validate using software (Robo Analyzer or any other free software)
- 3) Design a computer vision to capture and process the image / video by using open-source computer vision programming tool OpenCV

NCET Scheme and Syllabus VII to VIII Semesters

- 4) Consider images as a dataset and process the dataset using image processing for colour and shape detection
- 5) Experiment to communicate and make decisions based on the data captured using sensors.

PART-B

Mini Project to build Robotic Applications

Course Outcomes:

On completion of this course, the students are able to:

CO1: Explain the concept of robotics & simulating it.

CO2: Develop simple robot models.

CO3: Deploy various sensors for effective use.

CO4: Use Robot Operating system effectively.

CO5: Demonstrate some simple robotic applications.

Text Books:

- 1) Lentin Joseph, "Learning Robotics using Python", PACKT Publishing, 2015, ISBN: 978-1783287536.
- 2) Aaron Martinez and Enrique Fernandez, "Learning ROS for Robotics Programming", PACKT Publishing, 2013, ISBN: 9781782161455.

Reference Books:

- 1) Bill Smart, Brian Gerkey, Morgan Quigley, "Programming Robots with ROS: A Practical Introduction to the Robot Operating System", O'Reilly Publishers, 2015, ISBN: 978-1449323899.

E-Resources:

- 1) <https://blog.oureducation.in/best-available-robotics-reference-books/>
- 2) <https://www.robotics.org/Robotic-Resources>

ADVANCED ALGORITHMS

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI732	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 hours	PEC - VI

Course Objectives:

This course will enable students to:

- Learn the different amortized analysis.
- Know the modular arithmetic for solving problems.
- Explore the knowledge of different graph algorithms.
- Understand familiarity with major algorithms and data structures.
- Synthesize efficient algorithms in common engineering design situations.

Syllabus

Module - I

Analysis Techniques: Growth functions, Recurrences and solution of recurrence equations; Amortized analysis: Aggregate, Accounting, and Potential methods, String Matching Algorithms: Naïve Algorithm; Robin-Karp Algorithm, String matching with Finite Automata, Knuth-Morris-Pratt and Boyer-Moore Algorithms.

08 Hours

Module - II

Number Theoretic Algorithms: Elementary notions, GCD, Modular arithmetic, solving modular linear equations, The Chinese remainder theorem, Powers of an element RSA Cryptosystem, primarily testing, Integer factorization, - Huffman Codes, Polynomials. FFT-Huffman codes: Concepts, construction, Proof correctness of Huffman's algorithm; Representation of polynomials.

08 Hours

Module - III

DFT and FFT efficient implementation of FFT, Graph Algorithms, Bellman-Ford Algorithm Shortest paths in a DAG, Johnson's Algorithm for sparse graphs, Flow networks and the Ford-Fulkerson Algorithm, Maximum bipartite matching.

08 Hours

Module - IV

Computational Geometry-I: Geometric data structures using, C, Vectors, Points, Polygons, Edges Geometric objects in space; Finding the intersection of a line and a triangle, Finding star-shaped polygons using incremental insertion.

08 Hours

Module - V

Computational Geometry-II: Clipping: Cyrus-Beck and Sutherland-Hodman Algorithms; Triangulating, monotonic polygons; Convex hulls, Gift wrapping and Graham Scan; Removing hidden surfaces.

08 Hours

Lab Programs:

- 1) Given a text of length N $txt[0...N-1]$ and a pattern of length M $pat[0...M-1]$, Write a function search using String Matching Algorithms: Naïve Algorithm. You may assume that $N > M$.
- 2) Given a text of length N $txt[0...N-1]$ and a pattern of length M $pat[0...M-1]$, Write a function search using Boyer-Moore Algorithms. You may assume that $N > M$.

NCET Scheme and Syllabus VII to VIII Semesters

- 3) Write a program for generation and evaluation of variable length source coding using Huffman Coding and decoding. Calculate the entropy, average length and efficiency of Huffman Coding.
- 4) Given a graph and a source vertex src in the graph, find the shortest paths from src to all vertices in the given graph using Bellman-Ford Algorithm. The graph may contain negative weight edges.
- 5) A term, flow network, is used to describe a network of vertices and edges with a source (S) and a sink (T). Each vertex, except S and T, can receive and send an equal amount of stuff through it. Use Ford-Fulkerson algorithm for calculating the maximum possible flow in a network or a graph.
- 6) A differentiable Python implementation of the Sutherland–Hodgman algorithm for clipping polygons in 2D.

Course Outcomes

After studying this course, students will be able to

CO1: Explain the principles of algorithms analysis approaches.

CO2: Apply different theoretic based strategies to solve problems.

CO3: Illustrate the complex signals and data flow in networks with usage of tools.

CO4: Compare between different data structures algorithms.

CO5: Describe the computational geometry criteria.

Text Books:

- 1) Thomas H. Cormen et al: Introduction to Algorithms, third edition Prentice Hall India, 1990 ISBN-10: 9780262033848
- 2) Michael J. Laszlo: Computational Geometry and Computer Graphics in C' Prentice Hall India, 1996 ISBN-13: 978-0132908429.

Reference Books:

- 1) E. Horowitz, S. Sahni and S. Rajasekaran, Fundamentals of Computer Algorithms, University Press, Second edition, 2007 ISBN: 9788173716126
- 2) Kenneth A Berman & Jerome L Paul, Algorithms, Cengage Learning, First Indian reprint, 2008 ISBN-13: 978-8131505212.

E-resources:

- 1) <https://www.coursera.org/learn/advanced-algorithms-and-complexity>
- 2) <https://www.freecodecamp.org/news/these-are-the-best-free-courses-to-learn-data-structures-and-algorithms-in-depth-4d52f0d6b35a/>

PATTERN RECOGNITION AND ANOMALY DETECTION

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISI733	3 : 0 : 2 : 0	4	CIE:50 SEE:50	3 hours	PEC - VI

Course Objectives:

This course will enable students to:

- Understand the mathematical morphology necessary for Pattern recognition.
- Introduce the student to various Pattern recognition techniques.
- Learn the Representation and description and feature extraction.
- Comprehend various anomaly detection approaches
- Cognize real world problems and applications related to pattern recognition & anomaly detection

Syllabus

Module - I

Introduction to Pattern Recognition and Anomaly Detection: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

08 Hours

Module - II

Statistical Approaches for Pattern Recognition: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation.

08 Hours

Module - III

Machine Learning Approaches for Pattern Recognition: Nearest neighbour algorithm, variants of NN algorithms use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayesian belief network.

08 Hours

Module - IV

Anomaly Detection & Anomaly Detection Approaches: The different aspects of anomalies, Classification- based approaches, **Unsupervised Approaches:** Clustering, Nearest-neighbour, other statistical techniques, **Non-Standard Approaches:** Information-theoretic methods, Spectral techniques.

08 Hours

Module - V

Real-world problems: Network intrusion detection: Types of cyber-attacks on networks, Network Anomaly Detection techniques, Anomaly Detection in BIG DATA: The nature of big data, Key challenges, relevant technologies, relevant approaches and examples.

08 Hours

Lab Program

1. Implement nearest neighbour` classifier for the feature vectors of different length? Also find the accuracy of the NN classifier?
2. Write function that computes the values gaussian distribution $N(m,s)$ at a given vector x . Hence plot the effect of varying mean and variance to the normal distribution.
3. Find Linear Perceptron Learning for given data set
4. Implement the process to generate random numbers with a desired density/distribution.

NCET Scheme and Syllabus VII to VIII Semesters

5. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
6. Write a program to find (MLE) parameters of a given statistical model given observations, by finding the parameter values that maximize the likelihood of making the observations given the parameters.
7. Apply k-Means algorithm to cluster a set of data stored in a .CSV file.

Course Outcomes:

On completion of this course, the students are able to:

CO1: Illustrate pattern recognition fundamentals

CO2: Explain the advantages and disadvantages of various statistical methods for pattern recognition

CO3: Determine how to apply a supervised learning algorithm to a classification problem for anomaly detection

CO4: Explain the limitations of supervised learning for anomaly detection

CO5: Practice applying the various techniques to different problems in different domains

Text Books:

- 1) Pattern Recognition (An Introduction), V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
- 2) Pattern Recognition & Image Analysis, Earl Gose, Richard Johnson Baugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.
- 3) Statistical Pattern Recognition Second Edition, Andrew R. Webb QinetiQ Ltd., Malvern, UK, ISBN 0-470-84513-9, ISBN 0-470-84514-7.
- 4) Anomaly Detection Principles and Algorithms, Kishan G. Mehrotra, Chilukuri Mohan, Huaming Huang, Springer International Publishing, 2017,ISBN 978-3-319-67526-8

References:

- 1) Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

DECISION SUPPORT SYSTEMS (DSS)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST741	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC - I

Course objectives:

This course will enable students to:

- Identify among data processing systems, management information systems, and decision support/ expert systems
- Learn decision rules based on knowledge provided by an acknowledged expert and codify those rules as assertions, rules, and ad hoc procedures
- Outline the major components of Decision Support Systems (DSS)
- Learn how information is used to solve problems
- Utilize commercial spreadsheet and database integrated packages to develop
- Simulation models to support the decision-making process.

Syllabus

Module - I

Introduction to Decision Support Systems (DSS): Different types of Managerial Decision Problems and the Role of a DSS in solving them. Management Information System versus DSS, Range of Capabilities of a DSS, Components of a DSS, Examples of DSS, Basics of DSS Design Cycle.

08 Hours

Module - II

Models in Decision Support Systems: What is a Model? Classification of Models, Purpose of Modelling in DSS, Solution Techniques: Optimization, Heuristics, and Simulation, Traditional approach to modelling and its weaknesses, Desirable features for Models in DSS, Models and Managers: The Concept of a Decision Calculus’.

08 Hours

Module - III

Decision Support in Business: Introduction, Decision Support Trends, Management Information Systems, Online Analytical Processing, Using Decision Support Systems, Executive Information Systems, Enterprise Portals and Decision Support, Knowledge Management Systems.

08 Hours

Module - IV

Data and Dialog Management Systems: Database, Sources of Data, Data Directory, Data Structure and Database Languages, Query Facility, Data Management System, DBMS as DSS Development Tool. User Interface, Graphics, Multimedia, Visual Interactive Modelling Natural Language Processing.

08 Hours

Module -V

Development and Applications of DSS: Development process, Software and Hardware and Data Acquisition, Model Acquisition, Dialog Development, Evaluation of Investment Proposals, Forecasting Demand for Independent Items, Determination of Product Mix, Vehicle Scheduling, Customer Centric Value Driven Decisions, Pricing Decisions.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course outcomes:

On completion of this course, the students are able to:

CO1: Develop and implement DSS

CO2: Describe the decision-making process, the concepts and principles of a decision support system.

CO3: Identify decision support tools that can aid decision making.

CO4: Apply system development methodology to develop a decision support system.

CO5: Develop a functional prototype of a decision support system for a given case

Text Books:

- 1) Peter G.W. Keen and Michael S. Scott Morton, 'Decision Support Systems: An Organizational Perspective' Addison-Wisely Publishing Company ISBN-9780201036671
- 2) Efraim turban and Jay E Aronson, 'Decision Support Systems and Intelligent Systems', Prentice Hall International, 1998, ISBN-9780130894656
- 3) Decision Support Systems: Concepts and Resources for Managers', Daniel J.Power, Greenwood Publishing Group, ISBN-9781567204

References:

- 1) Mc Cosh, Andrew M, and Michael S. Scott Morton., "Management Decision Support Systems', The Mac Millan Press Limited, 1978, ISBN-10: 0333190394
- 2) Sprague, Ralf H., Carlson, Eric D., "Building Effective Decision Support Systems". Prentice Hall Inc., 1982, ISBN-978-0-13-086215-0
- 3) 'Decision Support and Data Warehouse systems by E.G. Mallach – Tata McGraw Hill ISBN-978007299818

E-Resources:

- 1) www.doccity.com/en/decision-support-system
- 2) <http://web.fsktm.um.edu.my/~norjihan/wmes3302.html>

ENTERPRISE RESOURCE PLANNING (ERP)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST742	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC - I

Course Objectives:

This course will enable students to:

- Know contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
- Focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
- Train to learn the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
- Aim at preparing technological competitive and make them ready to self-upgrade with the higher technical skills.
- Gain the knowledge of existing modules of ERP systems.

Syllabus

Module – I

Introduction to ERP: Common ERP myths, Evolution of ERP, Advantages, Characteristics, Process integration with ERP system, Implementation costs, Roadmap for successful ERP implementation.

ERP Market and Vendors: ERP market, ERP vendors, Service oriented architecture, ERP package features.

08 Hours

Module – II

Extended ERP services: Defining Extended ERP, Supply chain Management (SCM) and ERP, ERP and Business Intelligence(BI), ERP and E-commerce. **Business Process Re-engineering (BPR) and ERP:** Defining BPR, BPR Vs TQM, BPR and change management, approaches in BPR implementation, Methodologies for BPR implementation, BPR success/failure factors.

08 Hours

Module – III

Planning for ERP: Planning for ERP implementation, understanding organizational requirement, Economic and strategic justification, Project scope, determining resources, organizational commitment to change, budget for ERP, select right ERP package. **Implementation of ERP:** Designs of ERP system, ERP implementation approach, ERP implementation life cycle, different phases of ERP implementation.

08 Hours

Module – IV

Managing ERP projects: Risk/Failure factors in ERP implementation, Example of ERP failure, Critical success factors, Complexities of ERP projects, Evaluating ERP projects. **ERP: Going Live and post implementation:** Preparing to go live, Strategies for migration to new ERP system, Managing ERP after Go Live, Maintenance of ERP system.

08 Hours

Module-V

ERP, Internet and WWW – ERP II: The internet explosion, ERP, Internet and WWW, ERP to ERP II, Best practices of ERP II. **Future directions and Trends in ERP:** New markets, New channels, Easier communication tools, Business models, Need based applications, Expenditures, Reduction in implementation time, Market snap shots, Shifting revenue models.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course Outcomes

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

- CO1:** Compare the concepts and importance of ERP system.
- CO2:** Design ERP market and vendors.
- CO3:** Differentiate the relationship of ERP and SCM.
- CO4:** Evaluate the concept ERP implementation.
- CO5:** Design the concepts of internet with respect to WWW.

Text Books:

- 1) Enterprise Resource Planning, Ashim Raj Singla, Cengage Learning India Pvt. Ltd., Second edition (1 July 2016) New Delhi, 2008. ISBN-No: 8131532046.
- 2) Enterprise Resource Planning, Alexis Leon, 2nd edition, Tata Mcgraw Hill Education Pvt. Ltd., New Delhi, 2008. ISBN-No: 1259005917.

Reference Books:

- 1) E-Business and ERP: Transforming the Enterprise, Grant Norris, James R. Hurley, Kenneth M. Hartley, John R. Dunleavy, John D. Balls, John Wiley and Sons publications, 2000. ISBN-10: 0471392081.
- 2) Enterprise Resource Planning: Concepts and Practice, V.K. Garg. Second edition, PHI Learning Pvt. Ltd., Publications 2003 ISBN 8120322541.

E-Resources:

- 1) <http://8thinktank.com/erp/erp-implementation-life-cycle/#:~:text=ERP%20Implementation%20Life%20Cycle%20is,%2C%20implementation%2C%20transition%20and%20operations>
- 2) https://en.wikipedia.org/wiki/Enterprise_resource_planning
- 3) <https://www.cio.com/article/2439502/what-is-erp-key-features-of-top-enterpriseresourceplanning-systems.html>

SUPPLY CHAIN MANAGEMENT

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST743	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC- I

Course Objectives:

This course will enable students to:

- Understand differences between logistics and supply chain management.
- Understand the framework of supply chain network.
- Learn about the components of inventory management.
- Understand the tools and techniques used in logistics management.
- Learn about the professional opportunities in supply chain management.

Syllabus

Module – I

Introduction: Basic concepts & philosophy of SCM, essential features, decision phases – process view, supply chain framework, key issues in SCM and benefits.

08 Hours

Module – II

Designing the supply chain network: Designing the distribution network, role of distribution, factors influencing distribution, design options, distribution networks in practice, network design in the supply chain, factors affecting the network design decisions. Designing and Planning Transportation Networks, role of transportation, modes, design options, tailored transportation.

08 Hours

Module – III

Inventory Management: Concept, various costs associated with inventory, EOQ, buffer stock, lead time reduction, reorder point / re-order level fixation, ABC analysis, SDE/VED Analysis.

08 Hours

Module – IV

Inventory Management: Concept, various costs associated with inventory, EOQ, buffer stock, lead time reduction, reorder point / re-order level fixation, ABC analysis, SDE/VED Analysis.

08 Hours

Module – V

Recent issues in SCM: Role of computer/ IT in supply chain management, CRM Vs SCM, Benchmarking concept, features and implementation, outsourcing – basic concepts, value addition in SCM.

Case study:

- Students are expected to choose any 4 Indian Organizations and study their supply chain in terms of drivers of the Supply chain and submit a report.
- Students should visit different logistics companies and understand the services provided by them and submit a report.
- Students should identify the various types of IT applications employed by Indian Organizations in their Supply chain.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course Outcomes:

On completion of this course, the students are able to:

- C01:** Identify and Analyze Business Models, Business Strategies and, corresponding Competitive Advantage.
- C02:** Formulate and implement supply chain management Best Practices
- C03:** Analyze supply chain management and Logistics operations for optimum utilization of resources.
- C04:** Evaluate cases for effective supply chain management and its implementation.
- C05:** Demonstrate the risk and issues involved in supply chain management.

Text Books:

- 1) Oyle, Bardi, Langley, A Logistic approach to Supply Chain Management –1st Edition, Cengage Learning, *ISBN: 9781337415750*.
- 2) Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, 2nd Edition, TMH, 2008, *ISBN 0-07- 1 1 23067*.

Reference Books:

- 1) Chopra Sunil and Peter Meindl, Supply chain management, - 3rd edition, Pearson, 2007, *ISBN 13: 9780131730427*.
- 2) Amith Sinha, Supply Chain Management-A Managerial Approach, Herbert, 2nd edition, TMH. *ISBN :9780071333436*.
- 3) Agarwal D.K., A Text Book of Logistics and Supply chain management, - 1st edition, Macmillan. *ISBN-13: 978-1403909954*.

E-Resources:

- 1) <http://library.jgu.edu.in/content/logistics-and-supply-chain-management>
- 2) <https://ggu.libguides.com/supplychain>

NCET Scheme and Syllabus VII to VIII Semesters

DIGITAL MARKETING (IE)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST751	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC - II

Course Objectives:

This course will enable students to:

- Comprehend business advantages of digital marketing and its importance for marketing success and to develop a digital marketing plan.
- Learn Website and SEO optimization techniques and also, to outline Google Ad Words campaigns.
- Acquire knowledge of Google Analytics for measuring effects of digital marketing and to get insights of future trends that will affect the development of digital marketing.
- Learn to use various social media platforms in order to create, manage and evaluate digital marketing efficiently.
- Cognize strategies used for email marketing, resource planning and budgeting.

Syllabus

Module - I

Introduction to digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites.

08 Hours

Module - II

SEO Optimization, Writing the SEO content, Web design, Optimization of Web sites, Google AdWords- creating accounts, Google AdWords- types, Introduction to CRM, CRM platform, CRM models, Introduction to Web analytics, Web analytics - levels.

08 Hours

Module - III

Introduction of Social Media Marketing, Creating a Facebook page, Visual identity of a Facebook page Types of publications, Business opportunities and Instagram options, Optimization of Instagram profiles, Integrating Instagram with a Web Site and other social networks, Keeping up with posts.

08 Hours

Module - IV

Business tools on LinkedIn, Creating campaigns on LinkedIn, Analyzing visitation on LinkedIn, Creating business accounts on YouTube, YouTube Advertising, YouTube Analytics, Facebook Ads, Creating Facebook Ads, Ads Visibility.

08 Hours

Module - V

E-mail marketing, E-mail marketing plan, E-mail marketing campaign analysis, Keeping up with conversions, Digital Marketing Budgeting- resource planning - cost estimating - cost budgeting - cost control.

08 Hours

NCET Scheme and Syllabus VII to VIII Semesters

Course Outcomes:

On completion of this course, the students are able to:

C01: Examine the importance of digital marketing and create suitable plans for marketing success.

C02: Assess customer relationships across all digital channels and build better customer Relationships.

C03: Create a digital marketing plan, starting from SWOT analysis and there by defining a target group.

C04: Use social media channels to achieve maximum benefit for the business, by using web analytics.

C05: Develop different ways for the integration of marketing plans taking into consideration the available resources and budget.

Text Book:

- 1) Damian Ryan & Calvin Jones, "Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Kogan Page Limited, 1st Edition, 2009, ISBN-978-0749453893.

Reference Books:

- 1) Joe Pulizzi, "Epic Content Marketing", McGraw-Hill Education, 1st Edition 2013, ISBN-978-0071819893.
- 2) The Beginner's Guide to Digital Marketing (2015), Digital Marketer. (PDF)

E-Resources:

- 1) <https://www.digitalmarketer.com/digital-marketing/>
- 2) https://www.tutorialspoint.com/digital_marketing/index.htm
- 3) <https://www.javatpoint.com/digital-marketing>

OPERATION RESEARCH

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST752	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC - II

Course Objectives:

This course will enable students to:

- Learn quantitative methods and techniques for effective decision- making, model formulation and applications that are used in solving real world problems.
- Know the various techniques of OR, their applications and the relationship between a linear program and its dual.
- Learn different types of transportation and assignment models for optimization.
- Expose with techniques that are used to plan, schedule and monitor large projects such as building construction, maintenance of computer system, research and development design etc.
- Acquire knowledge on decision making techniques under conflicting situations where there are one or more opponents.

Syllabus

Module – I

Introduction, Linear Programming: Introduction: The Origins, Nature and Impact of OR; Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation. **Linear Programming:** Prototype Example; The Linear Programming Model; Assumptions of Linear Programming; Additional Examples.

08Hours

Module – II

The Simplex Method: The Essence of the Simplex Method; Setting Up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method; Adapting to Other Model Forms. **Duality Theory:** The Essence of Duality Theory; Primal-Dual Relationships; Adapting to Other Primal forms; The Dual Simplex Method.

08Hours

Module – III

Transportation and Assignment Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel’s Approximation Method. Optimal solution by Modified Distribution Method (MODI). **The Assignment problem:** A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in transportation and assignment problems.

08 Hours

Module – IV

Project Management with PERT/CPM: A Prototype Example- The Reliable Construction Co. Project; Using a Network to Visually Display a Project; Scheduling a Project with PERT/CPM; Dealing with Uncertain Activity Durations; Considering Time-Cost Trade-Offs; Scheduling and Controlling Project Costs; An Evaluation of PERT/CPM.

08 Hours

Module – V

Game Theory, Decision Analysis: Game Theory: The Formulation of Two-Person, Zero-Sum Games; Solving Simple Games--A Prototype Example; Games with Mixed Strategies; Graphical

NCET Scheme and Syllabus VII to VIII Semesters

Solution Procedure; Solving by Linear Programming; Extensions. Decision Analysis: A Prototype Example; Decision Making without Experimentation; Decision Making with Experimentation; Decision Trees.

08 Hours

Course Outcomes:

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

- C01:** Develop Linear Programming models, interpret the models, solutions and infer solutions to the real-world problems.
- C02:** Explain optimization techniques for various problems.
- C03:** Understand the given problem as transportation and assignment problem and solve.
- C04:** Construct network diagrams and determine critical path, floats for deterministic and PERT networks including crashing of Networks.
- C05:** Illustrate game theory for decision support system

Text Books:

- 1) Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, Preetam Basu: "Introduction to Operations Research", 9th Edition, Tata McGraw Hill, 2013, ISBN-13: 9780071333467.

Reference Books:

- 1) S D Sharma: "Operations Research", 18th Edition, KedarNath RamNath, 2017, ISBN-13: 9789380803388.
- 2) Hamdy A Taha: "Operations Research, An Introduction", 10th Edition, Pearson Education, 2017, ISBN-13: 9780134480220.

E-Resources:

- 1) www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html2.
- 2) www.freevideos.com/courses/2678/advanced-operations-research

NCET Scheme and Syllabus VII to VIII Semesters

MANAGEMENT & ENTREPRENEURSHIP

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST753	3 : 0 : 0 : 0	3	CIE:50 SEE:50	3 hours	IEC- II

Course Objectives:

This course will enable students to:

- Understand basic concepts in the area of management.
- Understand the role and importance of organizing and staffing
- Apply personal creativity in new venture as an entrepreneur.
- Analyze the key steps in elaboration of business idea.
- Create and analyze project with various advantages.

Syllabus

Module - I

Management and Planning: Management: Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession. Planning: Planning-Nature, Importance, Types, Steps and Limitations of Planning; Decision Making – Meaning, Types and Steps in Decision Making.

08 Hours

Module - II

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization, Committees– Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; Staffing-Need and Importance, Recruitment and Selection Process.

08 Hours

Module - III

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship.

08 Hours

Module - IV

Modern Small Business Enterprises: Modern Small Business Enterprises: Role of Small-Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small-Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry.

08 Hours

Module - V

Projects Management: A Project. Search for a Business idea: Introduction, Choosing an Idea, Selection of product, The Adoption process, Product Innovation, Product Planning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification: Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The project Cycle, Features and Phases of Project management, Project Management Processes. Project Identification: Feasibility Report, Project Feasibility Analysis. Project Formulation: Meaning, Steps in Project formulation, Sequential Stages of Project

NCET Scheme and Syllabus VII to VIII Semesters

Formulation, Project Evaluation. Project Design and Network Analysis: Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences.

08 Hours

Course Outcomes:

On completion of this course, the students are able to:

CO1: Describe the basics principles of management.

CO2: Distinguish clearly between the importance and role of organizing and staffing.

CO3: Discuss entrepreneur mindset to develop and plan for a new venture.

CO4: Interpret the concepts in establishing business idea.

CO5: Demonstrate functions and types of project management.

Text Books:

- 1) Principles of Management – P. C. Tripathi, P.N. Reddy – Tata McGraw Hill. ISBN: 15-978
- 2) Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House. ISBN: 98345789
- 3) Entrepreneurship Development – Poornima. M. Charantimath, Small Business Enterprises Pearson Education - 2006 (2 & 4). ISBN – 15: 34519801

Reference Books:

- 1) Management Fundamentals - Concepts, Application, Skill Development – Robers Lusier, Thomson. ISBN-10: 0324306083
- 2) Entrepreneurship Development - S. S. Khanka, S. Chand & Co. New Delhi. ISBN: 9788121920148.
- 3) Management - Stephen Robbins, Pearson Education/PHI - 17thEdition, 2003. ISBN: 4388876091.

E-Resources:

- 1) <https://www.grin.com/document/453320>
- 2) <https://som.yale.edu/faculty-research-centers/centers-initiatives/program-on->
- 3) <https://businesscasestudies.co.uk/category/case-studies/people/>

NCET Scheme and Syllabus VII to VIII Semesters

ONLINE CERTIFICATION

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19IST76	0 : 0 : 0 : 4	1	CIE:50 SEE:50	3 hours	Online Course

Activity of Online Certification Course

Students need to select one course on Information Technology from any of the following online platforms: NPTEL, Swayam, edx, Udemy, etc., and had to complete the course online. The student should submit the online certification course completion certificate and report.

PROJECT PHASE - I

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISP77	0 : 0 : 4 : 0	2	CIE:50 SEE:50	3 hours	Project

Activity of Phase - I

Batch formation, project identification, literature survey, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of selected topic and objectives.

8TH SEMESTER
COURSES SYLLABUS

NCET Scheme and Syllabus VII to VIII Semesters

EIGHT SEMESTER B.E. – SYLLABUS

TECHNICAL SEMINAR

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISP81	0 : 0 : 4 : 0	1	CIE:50 SEE:50	3 hours	Seminar

Activity of Technical Seminar

Students need to select one technical topic on latest trends in Information Technology and has to present seminar on the topic selected. The technical seminar report to be submitted.

INTERNSHIP

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISP82	0 : 0 : 4 : 4	3	CIE:50 SEE:50	3 hours	Internship

Activity of Internship

Students need to complete Internship at Industry and should submit the certificate along with the report.

PROJECT PHASE, EVALUATION AND VIVA VOCE (EXTERNAL)

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
19ISP83	0 : 0 : 18 : 8	3	CIE:100 SEE:100	3 hours	Project

Activity of Phase

Design, Theoretical/experimental investigation and Midterm seminar to review the progress of the work and documentation (Mid-term report).

Completion of the project work, participation in the project exhibition, Submission of project report
Final Internal seminar and demonstration, Publications.