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Remarks:
- Of the 40 marks of internal assessment, 25 marks for test and 15 marks for assignment. End semester exam is conducted by the University.
- Do
- No End Sem Examinations
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* Students can select a subject from the subjects listed under stream electives for the second semester as advised by the course coordinator.
** Students can select a subject from the subjects listed under department electives for the second semester as advised by the course coordinator.
List of Stream Electives
INE 2011 Access Networks and Cellular Communication
INE 2012 High Speed Switching Architecture
INE 2013 Embedded Networks
INE 2014 Adhoc and Sensor Networks
INE 2015 Cloud Computing

List of Department Electives
INE 2016 Soft Computing
INE 2017 Advanced Database Systems
INE 2018 Web Technologies
INE 2019 Information Retrieval Techniques
INE 2020 Datamining and Warehousing
## SEMESTER III

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* Students can select a subject from the subjects listed under stream electives for the second semester as advised by the course coordinator

*** Students can select a subject from the subjects listed under interdisciplinary electives for the second semester as advised by the course coordinator

### List of Stream Electives
- INE 3001 Multimedia Communication and Networks
- INE 3002 Mathematical Model for Internet
- INE 3003 Performance Evaluation of Computer Systems and Networks
- INE 3004 Network Architecture and Design
- INE 3005 Interconnection Networks
### SEMESTER IV

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SEMESTER I
INC 1001 MATHEMATICAL FOUNDATIONS OF COMPUTING SYSTEMS  3-0-0-3

Structure of the Course
Lecture : 3 hrs/ Week                Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination         : 60 Marks

Course Objectives
• To understand the foundational ideas in computing systems and be able to use this knowledge to guide their thinking in technical problem-solving.
• Be effective in the design and construction of software applications.

Learning Outcomes
• Students will develop a strong foundation in programming, software development and data manipulation.
  . Ability to analyze a problem and identify and define the computing requirements to solution.
• Students will develop proficiency with the techniques of mathematics, the ability to evaluate logical arguments, and the ability to apply mathematical methodologies to solving real world problems.

Module I
  Relations, Functions, and Matrices – Relations, Topological Sorting, Relations and Databases, Functions, Matrices
  Group, Subgroup, Abelian Group, Cyclic Group, Elementary Probability Theory, Bayes Theorem.

Module II
  Graph Algorithms - Directed Graphs and Binary Relations; Warshall's Algorithm, Euler Path and Hamiltonian Circuit, Shortest Path and Minimal Spanning Tree, Traversal Algorithms, Articulation Points and Computer Networks

Module III
  Fundamental Theorem of Arithmetic (Euclidean Algorithm, Chinese Remainder Theorem) -
  Arithmetic Function: Euler totient Function, product formula, Congruences: definition and basic properties of congruencies, Residue classes and complete residue systems, Linear congruences, Quadratic Residues

Reference
2. Introduction to Analytical Number Theory – Tom. M. Apostol

Structure of the Question paper
For the end semester examination, the question paper consists of at least 60% problems and derivations. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week       Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

Develop an understanding of the principles and practices employed in the design and evaluation of processors and computer systems.

Learning Outcomes

- Understand the issues in high performance processor design.
- Quantitatively analyze the performance of computer systems

Module I

Module II

Module III
MEMORY HIERARCHY - Cache Performance – Cache Optimizations – Virtual Memory – Protection and Examples of Virtual Memory – Memory Technology and Optimizations – Protection – Virtual Memory and Virtual Machines

Textbook


References

Structure of the Question paper
For the End Semester Examination the question paper will have three questions from each module out of which two questions are to be answered by the students.
Structure of the Course
Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives:
This course contributes to the development of the following capabilities:

- Enabling Knowledge: the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications.
- Problem Solving: Ability to model, abstract, and implement efficient software solutions in a complex system environment.
- Critical Analysis: Ability to compare, contrast, and evaluate the key trade-offs between multiple approaches to operating system design, and identify appropriate design choices when solving real-world problems.

Learning Outcomes
On completion of this course, students will be able to describe the basic principles used in the design of modern operating systems. Specifically, to:

- Explain the objective and functions of modern operating systems.
- Analyse the tradeoffs inherent in operating system design.
- Summarize techniques for achieving synchronization, mutual exclusion in an uni-processor and distributed operating systems.
- Handle issues like critical section problem, deadlocks in distributed environment.
- Design solution for the issues in distributed resource management, distributed shared memory and distributed scheduling.
- Provide fault tolerance and failure recovery in distributed systems and distributed database systems.

Module 1
DISTRIBUTED SYSTEMS - Introduction - Advantages of distributed system over centralized system, Limitations of Distributed system.

Module 2
SYNCHRONIZATION IN DISTRIBUTED SYSTEMS - Clock synchronization – Lamport’s logical clock, Vector clock, Causal ordering of messages, Causal Ordering of Messages; Mutual exclusion – Non token based algorithms – Lamport’s Algorithm – Ricart-Agrawala Algorithm - Token based algorithms – Suzuki-Kasami’s Broadcast Algorithm – Raymond’s Tree-based Algorithm; Distributed deadlock detection and prevention - Issues- Centralized Deadlock-Detection Algorithms – Distributed Deadlock-Detection algorithms. DISTRIBUTED RESOURCE MANAGEMENT -
Distributed file system – Design Issues; Distributed Shared Memory (DSM) – Consistency Models – Memory Coherence, Distributed Scheduling – Issues in Load Distributing – Load Distributing Algorithms.

**Module 3**
FAILURE RECOVERY AND FAULT TOLERANCE - Recovery – Classification, Backward and forward error recovery, Recovery in concurrent systems, synchronous check pointing and recovery, Check pointing for Distributed database system. Fault tolerant – commit protocols, Voting protocols, Dynamic vote reassignment protocol.

**References:**

**Structure of the Question paper**
For the End Semester Examination, there will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course
Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives
• Provide an introduction to the most important basic results in the area of distributed Algorithms.
• Should be able to use basic distributed algorithms and impossibility results
• Ability to apply distributed algorithms in large computer networks to multiprocessor shared-memory systems.

Learning Outcomes
• Understand various synchronous algorithms and consensus problems
• Understand various asynchronous shared memory algorithms and asynchronous network algorithms with the help of I/O automata.
• Understand partially synchronous algorithms

Module I

Module II

Module III

Reference

Structure of the Question paper
For the End Semester Examination the question paper will consist of 30% proof, 20% problems and 50 % Theory. There will be three questions from each module out of which two question are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Credits : 3

Course Objectives

- Create in-depth awareness of circuit switching network routing and routing in packet switching network.
- Should be able identify the capabilities, addressing and routing of High speed networks such as ATM networks.
- Should be able to analyse Mobile Communication networks and mobility management.
- Analyse various next generation routing techniques.
- Ability to apply RTOS concepts for solving multi task applications

Learning Outcomes

- Understand various communication architectures and protocols used in circuit switched and packet switched networks.
- Understand capabilities of High speed networks and the addressing and routing of ATM networks.
- Understand, Analyse Mobile networks, simulate switching techniques and QOS.
- The Student should be able to apply the correct routing algorithm on a network depending on the type the network and the condition of the network.

Module I


Module II


Module III

Mobility and Routing in Cellular Digital Packet Data (CDPD) network, Packet Radio Routing-DARPA packet radio network, Routing algorithms for small, medium and large sized packet radio networks. Internet based mobile ad-hoc networking, communication strategies, routing algorithms – Table-driven routing - Destination Sequenced Distance Vector (DSDV), Source initiated ondemand routing- Dynamic Source Routing (DSR), Ad-hoc On- demand Distance Vector (AODV),
Hierarchical based routing - Cluster head Gateway Switch Routing (CGSR) and Temporally-Ordered Routing Algorithm (TORA), Quality of Service.

Reference

Structure of the Question paper
There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

• Understanding of basic issues, concepts, principles, and mechanisms in network security.
• To identify the set of activities designed to protect the network.
• To understand how network security helps to protect customers’ data and reduce the risk of legal action from data theft.

Learning Outcome

• Prevent/Mitigate/Limit the security threats that step bad software.
• To understand how to secure a system, students have to understand what sort of attacks is possible.
• Learning effective network security will target a variety of threats and stops them from entering or spreading on the network.
• Network Security enhances the ability to determine appropriate mechanisms for protecting the networked system.
• Students will be able to determine where to apply/use cryptography.

Module I

Introduction to Classical and Modern techniques - Attacks, services and mechanisms, classical encryption techniques, DES, Block cipher design principles and modes of operation. Encryption Algorithms and Hash Functions - Triple DES, RC5, key management.

Module II


Module III

Reference


Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

LAB : 2 hrs/ Week  
Internal Continuous Assessment : 100 Marks

Credits : 1

Course Objectives

- Perform and verify static and dynamic routing protocols within and between networks.
- Understand switch operations. Configure and use IPv6
- Understand Network Management. Identify the common issues associated with a network’s configuration, management, and security.
- Identify the basic parameters to configure on a wireless network, compare and contrast wireless security features.

Learning Outcomes

- Design and develop networks to meet varying need of an organization depending on the available resources.
- Implement and verify WAN Links.
- Select the appropriate administrative tasks required for a WLAN
- Implement, verify and troubleshoot NAT and ACLs in a medium sized office network.

Familiarization of different network cables – Color coding – Crimping – routers & Switches

Experiments using routers
Configuring routers – Implementing static & dynamic routing – Implementing BGP –
Experiments using switches
Configuring IPv6 – Configuring RIPng – Configuring OSPFv3
Security - Access control List - Network Address Translation –
Configuring Client –Server Component – enable SNMP probe using Access Lists
Wide Area networks -Configuring PPP
Experiments using wireless networking
Experiments on network security – Network reconnaissance – Network sniffers – address spoofing – network monitoring – Configuring firewalls, IDS and VPN – wireless security tools
### Structure of the Course

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Each student is required to select a topic on advanced technologies in Network Engineering/Computer Science/Information Technology, and get it approved by the faculty-in-charge of seminar. Each student should also prepare a well documented report on the seminar as per an approved format and submit to the department. The seminar and report will be evaluated for the award of sessional marks.
SEMESTER II

INC 2001 APPLIED CRYPTOGRAPHY 3-0-0-3

Structure of the Course
Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives
At the end of the course students should be able to:
- Understand intermediate-level issues of deploying cryptographic mechanisms.
- Apply a crypto or security standard to fit the solution sought.
- Judge pros and cons of crypto methods considered for deployment.
- Independently design and test simple cryptographic solutions.
- Evaluate common crypto protocols in terms of security and efficiency.

Learning Outcome
- Prevent /Mitigate/Limit the security threats that step bad software.
- To understand how to secure a system, students have to understand what sort of attacks is possible.
- Learning effective network security will target a variety of threats and stops them from entering or spreading on the network.
- Network Security enhances the ability to determine appropriate mechanisms for protecting the networked system.
- Students will be able to determine where to apply/use cryptography.

Module I

Module II
The RSA Cryptosystem - Introduction to Public–key Cryptography, Number theory,The RSA Cryptosystem, Attacks on RSA, The ELGamal Cryptosystem, Shanks’ Algorithm, Signature Scheme –Digital Signature Algorithm. Identification Scheme and Entity Attenuation-Challenge – and – Response in the Secret-key Setting,Challenge–Response in the Public key Setting,The Schnorr Identification Scheme, Key distribution - Diffie-Hellman key exchange, Unconditionally Secure key Predistribution, Key Agreement Scheme- Diffie-Hellman Key agreement, PKI,
Certificates, Trust Models.

**Module III**


**Reference**


**Structure of the Question paper**

For the End Semester Examination the question paper will consist of 60% Design problems and 40% Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks  

Credits : 3

Course Objectives

• The ability to work with various computing revolutions like HPC, Cluster, Grid and Cloud computing  
• Ability to use virtualization techniques to implement computing approaches like cloud computing

Learning Outcomes

• Understand various computing paradigms, its issues and its applications in the business  
• Understand various tools and methods to implement Grid and Cloud computing

Module I

High performance computing - cluster, grid, meta-computing, middleware. Programming models: shared memory, message passing, peer-to-peer, broker-based. Introduction to PVM and MPI.  

Module II

Familiarization of EUCALYPTUS – an open source software framework for cloud computing.  
Familiarization of CloudSim: A Toolkit for Modeling and Simulation Cloud Computing Environments

Module III


Software framework for distributed computing - MapReduce - Hadoop.
References
3. Kris Jamsa, Cloud Computing, Jones and Bartlett Learning, LLC

Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.
ICC2000 RESEARCH METHODOLOGY

Structure of the Course
Lecture : 2 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Credits : 2

Course Objectives
Gives students an insight into the steps to be followed in doing a research, provide an idea about technical report writing etc.

Module I
Introduction - Meaning of research - Objectives of research - Motivation in research - Types of research - Research approaches - Significance of research - Research methods vs Methodology - Criteria of good research.

Defining Research Problem - What is a research problem - Selecting the problem - Necessity of defining the problem - Literature review - Importance of literature review in defining a problem - Critical literature review - Identifying gap areas from literature review

Module II
Research design - Meaning of research design - Need- Features of good design - Important concepts relating to research design - Different types - Developing a research plan

Method of data collection - Collection of data- observation method - Interview method - Questionnaire method - Processing and analysis of data - Processing options - Types of analysis - Interpretation of results

Module III

References

Structure of the Course
Lecture : 2 hrs/ Week
Internal Continuous Assessment : 100 Marks
Credits : 1

Course Objectives
- Understanding software testing automation

Learning Outcomes
- Ability to perform various types testing

Understanding Software Testing Tasks – Test planning – Test automation.
Experiments on testing desktop applications
- Forms testing
- Page content testing
- Navigation testing
- Functional testing

Experiments on testing Web applications
– Functional testing
– Usability Testing
– Navigation Testing
– Forms Testing
– Page content testing

Experiments on Performance testing
– Scalability testing
– Load testing
– Stress testing
– Configuration & Compatibility testing

Experiments on Security testing
– End to end transaction testing
Structure of the Course

Weekly Hours: 2 hrs/ Week
Internal Continuous Assessment : 100 Marks
Credits : 2

The student is expected to start the preliminary background studies towards the Thesis by conducting a literature survey in the relevant field. He/she should broadly identify the area of the Thesis work, familiarize with the design and simulation tools required for the Thesis work and plan the experimental platform, if any, required for Thesis work. The student will submit a detailed report of these activities at the end of the semester.

Thesis-Preliminary comprises of two seminars and submission of an interim thesis report. This report shall be evaluated by the Evaluation Committee. The second thesis would be an extension of this work in the same area. The first presentation would highlight the topic, objectives, methodology and expected results. It shall be conducted in the first half of the semester. The second presentation should include scope of work, literature survey and problem definition(s) along with a report.

Distribution of marks

Internal assessment of work by the guide: 50%
Internal Evaluation by Committee: 50%
Structure of the Course

Weekly Hours: 2 hrs/ Week  
Internal Assessment: 100 Marks  
Credits: 2

Each student is required to select a topic on advanced technologies in Network Engineering/Computer Science / Information Technology, and get it approved by the faculty-in-charge of seminar. Each student should also prepare a well documented report on the seminar as per an approved format and submit to the department. The seminar and report will be evaluated for the award of sessional marks.

Distribution of marks

Seminar Report Evaluation: 40  
Seminar Presentation: 60
STREAM ELECTIVES – ELECTIVE I and II

INE2011 ACCESS NETWORKS AND CELLULAR COMMUNICATION 3-0-0-3

Structure of the Course
Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Credits : 3

Course Objectives
• The course describes in detail how communication services are conceived, developed and deployed in wireless networks.
• Describes optical access networks, its architecture, routing techniques and types of passive optical networks.

Learning Outcomes
• The ability to understand technologies used in wireless and mobile communication
• Able to understand access network technologies, its architecture, routing techniques and analyse the working of different types of passive optical networks.

Module I

Module II
Cellular System Design & Signalling-Channel assignment, cell planning, power control, erlang capacity, database and mobility management, power control, interference and system capacity, signalling standards, antennas for mobile radio. WAP- Architecture, protocols, security issues, Routing Techniques in Ad Hoc wireless networks.

Module III

References
5. Leonid G. Kazovsky, Ning Cheng, Wei-Tao Shaw, David Gutierrez, Shing-Wa Wong Broadband Optical Access Networks, Wiley

Structure of the Question paper
There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week  
Credits : 3  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks

Course Objectives

• Introduction to the most important switching architectures.
• Understanding the architecture of different switching technology like store and forward/cut-through switching technology
• half-duplex and full duplex modes
• several methods for flow control and it’s needs

Learning Outcomes

• Understand various switching architectures.
• Characterization of different communication services.
• Understanding features and properties of underlying communication network that support services.
• Understanding LAN switching that increase the efficiency of local area networks and solve the current bandwidth problems.
• Understand how switches can be used to implement virtual LANs and ease management functions.
• Classification of ATM switching architectures

MODULE I
LAN SWITCHING TECHNOLOGY  - Switching Concepts, switch forwarding techniques, switch path control, LAN Switching, cut through forwarding, store and forward, virtual LANs.
QUEUES IN ATM SWITCHES  - Internal Queueing -Input, output and shared queueing, multiple queueing networks..

MODULE II
HIGH PERFORMANCE PACKET SWITCHING ARCHITECTURES - Architectures of Internet Switches and Routers- Bufferless and buffered Crossbar switches,  Multi-stage switching, Optical Packet switching; Switching fabric on a chip; Internally buffered  Crossbars.

MODULE III
IP SWITCHING - Addressing model, IP Switching types - flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting, Ipv6 over ATM.

REFERENCES:

Structure of the Question paper
For the End Semester Examination the question paper will consist of 30% proof, 20% problems and 50 % Theory. There will be three questions from each module out of which two question are to be answered by the students.
Structure of the Course

- Lecture: 3 hrs/ Week
- Internal Continuous Assessment: 40 Marks
- End Semester Examination: 60 Marks

Credits: 3

Course Objectives

- To study the concepts of embedded networking.
- To explore CAN open standard, Configuration, underlying technology.
- To Implement CAN open and identify various issues associated with it.

Learning Outcome

- Understand embedded network requirements, CAN open features and testing
- Design and analyse an application using CAN open Configuration

Module I


Module II


Module III


References

3. Raj Kamal, iEmbedded Systems, TMH
4. 2. David E. Simon, iAn Embedded Software Primer ”, Pearson Education

Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Credits : 3

Course Objectives

- The primary objective of this course is to introduce to the area of wireless sensor networks and learn the concepts and principles behind WSN.
- To learn WSN network design, sensor node embedded system design and implementation.
- On WSN network management, the focus is mainly on wireless network security which is a very important issue in WSN.

Learning Outcomes

- After passing the course, a student comprehends the Wireless Sensor Networks (WSN) as a new technology area in research and industry.
- A student is familiar with the main standards and specifications of WSNs and identifies the key building blocks for them.
- A student can define and explain the essential challenges of resource constrained WSN design and implementation, including applications, interfaces, energy-efficient protocols and platform functionalities.
- A student can apply both theoretical and practical tools for WSN design and utilization and design potential application scenarios for WSNs.

Module I

Introduction : Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet. Introduction to adhoc/sensor networks: Key definitions of adhoc/sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

Module II


Module III

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

Text book

Reference Book

Structure of the Question paper
For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Course Structure

Lecture: 3 hrs/ Week
Internal Continuous Assessment: 40 Marks
End Semester Examination: 60 Marks

Course Objectives

- Understanding cloud computing, and compare with existing technologies.
- Understand how to develop a cloud service

Learning Outcomes

- Design and develop cloud services for everyone.
- Use Cloud Service and collaborate it with various application and taking it online.

Module I


Module II

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

Module III


References


Structure of the Question paper

For the End Semester Examination the question paper will have three questions from each module out of which two questions are to be answered by the students.
DEPARTMENTAL ELECTIVES

INE 2016          SOFT COMPUTING          3-0-0-3

Structure of the Course

Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks

Course Objectives

• To familiarize the salient approaches in soft computing, based on artificial neural networks, fuzzy logic, and genetic algorithms.
• To introduce applications of soft computing to different research areas in Computer Science / Information Technology.

Learning Outcomes

• Understand advantages and disadvantages of soft computing.
• Students will be able to apply soft computing techniques to research problems

Module I


Module II


Module III


Reference


Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To provide an understanding of the needs for and uses of database management systems.
- To understand the context, phases and techniques for designing and building database information systems and an understanding of the components of a computerized database information system (application)
- To develop an ability to correctly use the techniques, components and tools of a typical database management system
- To have an understanding of some advanced topics in database management, e.g., object-oriented data modeling and object-oriented database development

Learning Outcomes

After completing this course the student must demonstrate the knowledge and ability to:
- Explain the advantages of the database approach, compared to traditional file processing.
- Describe the components of a typical database environment.
- Describe the purpose of database analysis, design, and implementation activities.
- Draw simple data models that show the scope of a database.

Module I


Module II


Module III

EMERGING TECHNOLOGIES - Mobile Databases: Location and Handoff Management -Effect of Mobility on Data Management - Location Dependent Data Distribution – Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols – Web Databases - Information Retrieval - Data Warehousing - Data Mining. ENHANCED DATA MODELS - Active Database

References

Structure of the Question paper
For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course
Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks  
Credits : 3

Course Objectives
1. Understand concepts and principles of web application, architecture, and its role in the bigger system.
2. Understand basics of server side technologies and apply them to develop dynamic web applications.
3. Know how to use the state-of-the-art development environments, frameworks, and toolkits.
4. Understand current issues and latest developments in web technologies and applications.

Learning Outcome
Upon successful completion of this course, students will be able to apply the technologies to develop an web application.

Module I

Module II

Module III

Textbook
References


Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40% Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course
Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objective
To provide an introduction to the methods used in the storage and retrieval of textual, pictorial, graphic, and voice data.

Learning Outcome
- understand the complexity of information retrieval;
- understand the functions of an information retrieval system;
- be able to understand and measure the contribution of the components of an information retrieval system to its performance;
- be able to isolate the factors which optimize the information retrieval process;
- be aware of current issues in information retrieval, including search engines.

Overview

Relevance and similarity measures- Effects of Weighting- Effects of scaling- the Matching process, Indexing- Matrix representations- Term Association- Document Analysis- stemming- thesauri- user profiles and their use, Multiple Reference point systems- document clusters- Retrieval Effectiveness- Precision and Recall- Operating curves- Expected search Length- satisfaction and Frustration, Effectiveness Improvement Techniques, Relevance feedback,

Genetic Algorithms- TREC Experiments- Alternative Retrieval Techniques- Citation Processing- Hypertext links- Information Filtering and passage Retrieval.

References

Structure of the Question paper
For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks

Course Objective

- Identify the key processes of data mining, data warehousing and knowledge discovery process;
- Describe the basic principles and algorithms used in practical data mining and understand their strengths and weaknesses of the functions of an information retrieval system;

Learning Outcome

- Apply data mining techniques to solve problems in other disciplines in a mathematical way
- Apply data mining methodologies with information systems and generate results which can be immediately used for decision making in well-defined business problems.

Module I


Module II

Classification and Prediction Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Other Classification Methods – Prediction – Clusters Analysis – Types of Data in Cluster Analysis – Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods.

Module III


Text book

Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
References


Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.
SEMESTER III

INC3101 THESIS – PRELIMINARY – PART II

Structure of the Course

Thesis : 15 hrs/ Week
Internal Continuous Assessment : 200 Marks

Credits : 5

The student is expected to start the preliminary background studies towards the Thesis by conducting a literature survey in the relevant field. He/she should broadly identify the area of the Thesis work, familiarize with the design and simulation tools required for the Thesis work and plan the experimental platform, if any, required for Thesis work. The student will submit a detailed report of these activities at the end of the semester.

Thesis-Preliminary comprises of two seminars and submission of an interim thesis report. This report shall be evaluated by the Evaluation Committee. The fourth semester thesis would be an extension of this work in the same area. The first seminar would highlight the design plan and data collection, analysis techniques used in the project. The first seminar shall be conducted in the first half of this semester. The second seminar is presentation of the interim thesis report of the work they have completed.

Internal assessment of work by the guide: 50%
Internal Evaluation by Committee: 50%
STREAM ELECTIVES – ELECTIVE III and IV

INE 3001 MULTIMEDIA COMMUNICATION AND NETWORKS 3-0-0-3

Structure of the Course

Lecture : 3 hrs/ Week  
Credits : 3
Intern. Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- The ability to model and analyze IP networks like Internet
- Ability to design various routing policies for IP networks, and handle issues with IP routing with QoS management
- To discuss multimedia requirements in the communication systems
- To know the Internet protocol suite for multimedia communications.
- To illustrate multimedia networks in wired and wireless medium

Learning Outcomes

- Understand IP Networks and its issues, Intra and Inter Routing architecture, Network Performance parameters and QoS aware routing
- Understand streaming characteristics of multimedia and various multimedia communication standards and frame works for wired and wireless networks

Module I

Open Data Network Model – Narrow Waist Model of the Internet - Success and Limitations of the Internet – Suggested Improvements for IP and TCP – Significance of UDP in modern Communication – Network level Solutions – End to End Solutions – BestEffort service model – Scheduling and Dropping policies for Best Effort Service model

Module II


Module III

References


Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.
Autotag:Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

• To introduce mathematical models for internet.

Learning Outcomes

• Students will be able to apply mathematical models to study different various mechanisms such as network congestion.

Module I

Definition and characteristics of mathematical models. Modelling the network - queuing systems, modelling the QoS for improvement. Mathematical models of fairness and stability.

Module II

Modelling a self-managed internet. Moving away from the end to end concept. Modelling required in an untrustworthy world.

Module III

Mathematical modelling of the internet, Mathematical models of traffic control in internet, Modelling of an internet based application.

Reference

8. Frank Kelly, Models for a Self Managed Internet, Philosophical Transactions of the Royal Society A358, pp. 2335-2348, 2000

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40% Theory. There will be three questions from each module out of which two questions are to be answered by the students.
INE3003 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS

Structure of the Course

Lecture : 3 hrs/ Week  
Internal Continuous Assessment : 40 Marks  
End Semester Examination : 60 Marks  
Credits : 3

Course Objectives

• The objective of this course to understand the fundamental concepts of computer system performance evaluation
• Ability to perform mathematical modeling techniques, discrete event simulation modeling, experiment design, workload characterization, measurement of performance metrics, and presentation of results.

Learning Outcomes

• Understand computer system, networks and various evaluation criteria
• Understand modelling techniques, computational methods and simulation process for computer system and network
• Understand and analyse tools and methods for system performance evaluation

Course prerequisite

Undergraduate Operating Systems course, Undergraduate Computer Networks course, Basics of Probability and Statistics

Module I


Module II


Module III

Simulation – Analysis – Database System Performance – Computer Networks Components – Simulation Modeling of LAN.

References

Structure of the Question paper
There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course
Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objective
- Understand the principles of structured cabling network design criteria for LAN and WAN implementations and their application
- Understand the concepts and characteristics of high-speed networks, user-network interface, routing, switching, distributed resource management, distributed network management, and measures of network performance.
- Understand how to determine the network design most appropriate for a given site or combination of sites.
- Master local and wide area network concepts and terminology
- Understand and be able to identify the network standards, protocols, and access methods to be implemented in a given network design

Learning Outcome
- Verify component health
- Verify network communications
- Verifying infrastructure devices
- Verify cabling and termination
- Troubleshoot and repair problems

Module I

Module II

Module III
References


Structure of the Question paper
There will be three questions from each module out of which two questions are to be answered by the students.
Structure of the Course

Lecture : 3 hrs/ Week
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Credits : 3

Course Objectives

- To provide an in-depth study of interconnection networks for high-performance computing (HPC) systems and multi-cores. Interconnection networks offer an attractive and economical solution to this communication crisis and are fast becoming pervasive at all levels of digital system, whether it be on-chip, inter-chip, inter-board and inter-rack.

Learning Outcomes

In-depth understanding of the design and engineering of interconnection networks
- Ability to understand techniques for designing various network/interconnect topologies
- Ability to differentiate between various switching and routing techniques
- Ability to understand various flow control techniques implemented by interconnection networks
- Ability to understand the working of the router microarchitecture
- Ability to evaluate future technologies for implementing the interconnection network

Module I
Introduction Parallel computing and networks, network design considerations, classification of interconnection network, shared medium networks Message switching layer- n/w and router model, Basic switching techniques, virtual channels, hybrid switching techniques, Optimizing switching techniques, Comparison of switching techniques.

Module II
Deadlock , live lock and Starvation—Deadlock avoidance , Deadlock prevention, Deadlock recovery, Live lock avoidance Routing algorithms-Deterministic routing algorithms, Different types adaptive routing algorithms, Backtracking and Non minimal routing algorithms, backtracking protocols, Routing in MIN's, routing in switch based network with irregular topologies, resource allocation policies.

Module III
Collective communication Support- system support, models for multi cast communication- h/w and s/w implementation of multi cast, Fault tolerant routing- fault induced deadlock and live lock, channel and network redundancy, fault models, fault tolerant routing, dynamic fault recovery Network architecture- network topologies and physical constraints- router architecture-performance evaluation

REFERENCE


Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students
SEMESTER IV

INC4101 THESIS

Structure of the Course

Weekly Hours : 21 hrs/ Week
Internal Continuous Assessment : 300 Marks
End Semester Examination : 300 Marks

Credits : 12

In the fourth semester there will be only thesis work. Towards the end of the semester there would be a pre-submission seminar to assess the quality and quantum of the work by the Department Evaluation Committee. This would be the pre-qualifying exercise for the students for getting approval for the submission of Thesis-Final. Students are encouraged publish technical papers in Journals/ Conferences. The final evaluation of the Thesis-Final would be external evaluation.

Distribution of marks

Internal evaluation of the Thesis work by the guide: 150 marks
Internal evaluation of the Thesis by the Evaluation Committee: 150 marks
Final evaluation of the Thesis Work by the Internal and External Examiners:
[Evaluation of Thesis: 200 marks *+ Viva Voce: 100 marks (*5% of the marks is earmarked for publication in Journal/Conference) ] TOTAL – 300 marks