MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005
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DEPARTMENT OF INFORMATION TECHNOLOGY

# DATA MINING & PREDICTIVE MODELLING
# 160714 (DE-3)

## COURSE OBJECTIVES

- To understand the value of data mining in solving real-world problems.
- To gain understanding of algorithms commonly used in data mining tools.
- To learn, how to develop models to predict categorical and continuous outcomes, using various models.

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**Unit - I**

**Introduction:** Data Mining Process, KDD Process Model, Functions of Data Mining, Applications of Data Mining. Data Warehouse and its Architecture.

**Data Preparation:** Data Exploration, Data Quality, Missing Values, Data Types and Conversion, Transformation, Outliers, Feature Selection, Data Sampling.

**Unit - II**

**Association Rules:** Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single Dimensional Boolean Association Rules from Transactional Databases: The Apriori Algorithm, Generating Association Rules from Frequent Items, Improving the Efficiency of Apriori, FP-Growth Algorithm, Partitioning Algorithms.

**Unit - III**

**Regression & Classification:** Overview of supervised learning, Linear regression models, Multiple Regression, Subset Selection, Linear Discriminant Analysis, Logistic Regression.

Introduction to Classification, Decision Trees, Rule Induction, K-Nearest Neighbors, Naïve Bayesian, Artificial Neural Networks, Support Vector Machines.

**Unit – IV**

**Unsupervised Learning:** Clustering, Major Clustering Methods: Partitioning Algorithms- K-Means, Hierarchical Algorithms, real life example of clustering.

**Unit - V**

**Model Assessment and Selection:** Ensemble Methods, Bagging and Boosting, Cross-Validation and Resampling, Measuring Classifier Performance, Assessing a Classification Algorithm's Performance (ROC Curve), Comparing Two Classification Algorithms.

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**RECOMMENDED BOOKS**

- Data Mining: Concepts and Techniques, Han and Kamber, Morgan Kaufmann Publications.
- Data Mining Techniques, A. K. Pujari, Universities Press Pvt. Ltd.
- Applied Predictive Analytics Principles and Techniques for the Professional Data Analyst, Wiley Publications 2014.
- An Introduction to Statistical Learning with Applications in R, Gareth James, Daniela Witten et. al., Springer, 2015.

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**COURSE OUTCOMES**

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

CO1. identify the key processes of data mining.

CO2. understand the basic principles and algorithms used in practical data mining.

CO3. compare the underlying predictive modeling techniques.

CO4. select appropriate predictive modelling approaches to identify cases to progress with.

CO5. develop different supervised and unsupervised learning.

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DEPARTMENT OF INFORMATION TECHNOLOGY

# SOFT COMPUTING
# 160715 (DE-3)

## COURSE OBJECTIVES

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and Design the required and related systems.
- To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

---

**Unit-I**

**Introduction and Fundamental Concept of ANN:** Basic models of Artificial Neural Networks, Terminologies of ANNs McCulloch-Pitts Neurons, Linear Separability, Hebb Network, **Supervised Learning Networks:** Introduction, Perceptron Networks, Back Propagation Networks, Radial Basis Function Networks, Hopefield networks.

**Unit-II**

**Unsupervised Learning:** Fixed weight Competitive Nets, Kohonen Self-Organizing Map, Learning vector quantization. Counter propagation Networks, Adaptive Resonance Theory Network.

**Unit-III**

**Fuzzy Set Theory:** Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Fuzzy rules, Fuzzy Reasoning, **Defuzzification:** Lembda-Cuts for Fuzzy sets (Alpha-Cuts), Lembda-Cuts for Fuzzy Relations. Fuzzy Inference System: Introduction, Mamdani Fuzzy Model, Takagi-Sugeno Fuzzy Model.

**Unit-IV**

**Introduction:** Biological Background, Traditional optimization and Search Techniques, Basic Terminologies in GA, Operators in Genetic Algorithm, Stopping Condition for Genetic Algorithm Flow, Classification of Genetic Algorithm, Comparison with Evolutionary algorithm, Application of Genetic algorithm.

**Unit-V**

**Hybrid Soft Computing Techniques:** Introduction, Neuro-fuzzy Hybrid system, Adaptive Neuro fuzzy inference system(ANFIS), Genetic Neuro Hybrid system, Application of Soft Computing Techniques.

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**RECOMMENDED BOOKS**


- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley
- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications-S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson.
- Neural Networks and Learning Machines-Simon Haykin PHI.
- Fuzzy Logic and Engineering Application, Tomthy Ross, TMH


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## COURSE OUTCOMES

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

CO1. define basic concepts of neural network and fuzzy systems.

CO2. compare solutions by applying various soft computing approaches on a given problem.

CO3. develop and train different supervised and unsupervised learning.

CO4. classify various nature inspired algorithms according to their application aspect.

CO5. compare the efficiency of various hybrid systems.

CO6. design a soft computing model for solving real world problems.

---

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DEPARTMENT OF INFORMATION TECHNOLOGY

# MOBILE COMPUTING
# 160716 (DE-3)

## COURSE OBJECTIVES

- To introduce the basic concepts and principles in mobile computing.
- To provide a computer systems perspective on the converging areas of wireless networking, mobile devices, and network protocols.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.

---

**Unit-I**

**Review of Personal Communication Services (PCS):** Basic Concepts of Cellular Systems, Global System for Mobile Communication (GSM), Protocols, Handover, Data Services, and Multiple Division Techniques.

**Unit-II**

**General Packet Radio Services (GPRS):** GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 Standard. Mobile IP.

**Unit-III**

**Wireless Application Protocol (WAP):** Mobile Internet Standard. WAP Gateway and Protocols, Wireless Markup Languages (WML).

**Unit-IV**

**Third Generation (3G) Mobile Services:** Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of Services in 3G.

**Unit-V**

**Wireless Local Loop (WLL):** Introduction to WLL Architecture, WLL Technologies. Global Mobile Satellite Systems: Case Studies of IRIDIUM and GLOBALSTAR Systems. Bluetooth Technology, Wi-Fi and Wi-Max.

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## RECOMMENDED BOOKS

- Mobile communications, J. Schiller, Pearson Education.
- Wireless and Mobile Networks Architecture, by Yi —Bing Lin, John Wiley & Sons.
- Mobile & Personnel Communication Systems and Services, Raj Pandya, Prentice Hall India.

- Wireless Communication- Principles and Practices, Theodore S. Rappaport, Pearson Education.
- The Wireless Application Protocol, Singhal & Bridgman, Pearson Education.

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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the basic concepts of mobile telecommunications system.

CO2. demonstrate the infrastructure to develop mobile communications system.

CO3. classify the different generations and technology for mobile communications.

CO4. examine the working of different protocols of wireless mobile communication technology.

CO5. determine the importance of each technology suitable for different situation of mobile and wireless communications.

CO6. develop protocols for adhoc and infrastructure based wireless networks.

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DEPARTMENT OF INFORMATION TECHNOLOGY

**ANNEXURE-II**

# *List & Syllabi of Open Category (OC) Courses offered by Department of IT in B.Tech VII Semester (Batch Admitted in 2018-19) Under Flexible Curriculum*

*[ITEM-3]*

**MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005**
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DEPARTMENT OF INFORMATION TECHNOLOGY

| Open Category (OC-2) Courses | Open Category (OC-3) Courses |
|---|---|
| • Soft Computing<br>• Network Security | • R Programming<br>• Computer Networks |

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DEPARTMENT OF INFORMATION TECHNOLOGY

# SOFT COMPUTING
# 900208 (OC-2)

## COURSE OBJECTIVES

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and Design the required and related systems.
- To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

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**Unit-I**

**Introduction and Fundamental Concept of ANN:** Basic models of Artificial Neural Networks, Terminologies of ANNs McCulloch-Pitts Neurons, Linear Separability, Hebb Network, **Supervised Learning Networks:** Introduction, Perceptron Networks, Back Propagation Networks, Radial Basis Function Networks, Hopefield networks.

**Unit-II**

**Unsupervised Learning:** Fixed weight Competitive Nets, Kohonen Self-Organizing Map, Learning vector quantization. Counter propagation Networks, Adaptive Resonance Theory Network.

**Unit-III**

**Fuzzy Set Theory:** Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Fuzzy rules, Fuzzy Reasoning, **Defuzzification:** Lembda-Cuts for Fuzzy sets (Alpha-Cuts), Lembda-Cuts for Fuzzy Relations. Fuzzy Inference System: Introduction, Mamdani Fuzzy Model, Takagi-Sugeno Fuzzy Model.

**Unit-IV**

**Introduction:** Biological Background, Traditional optimization and Search Techniques, Basic Terminologies in GA, Operators in Genetic Algorithm, Stopping Condition for Genetic Algorithm Flow, Classification of Genetic Algorithm, Comparison with Evolutionary algorithm, Application of Genetic algorithm.

**Unit-V**

**Hybrid Soft Computing Techniques:** Introduction, Neuro-fuzzy Hybrid system, Adaptive Neuro fuzzy inference system(ANFIS), Genetic Neuro Hybrid system, Application of Soft Computing Techniques.

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## RECOMMENDED BOOKS


- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley
- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications-S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson.
- Neural Networks and Learning Machines-Simon Haykin PHI.
- Fuzzy Logic and Engineering Application, Tomthy Ross, TMH


---

## COURSE OUTCOMES

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

CO1. define basic concepts of neural network and fuzzy systems.

CO2. compare solutions by applying various soft computing approaches on a given problem.

CO3. develop and train different supervised and unsupervised learning.

CO4. classify various nature inspired algorithms according to their application aspect.

CO5. compare the efficiency of various hybrid systems.

CO6. design a soft computing model for solving real world problems.

---

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DEPARTMENT OF INFORMATION TECHNOLOGY

# NETWORK SECURITY
# 900209 (OC-2)

## COURSE OBJECTIVES

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

---

**Unit-I**

**Security:** Principles and Attacks, **Basic Number Theory:** Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

**Unit-II**

**Cryptography:** Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

**Unit-III**

**Hash Functions:** Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm). **Authentication:** Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

**Unit -IV**

**IP & Web Security Overview:** SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). **IDS (Intrusion Detection System):** Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration Testing, Risk Management. **Firewalls:** Types, Functionality and Polices.

**Unit -V**

**Phishing:** Attacks and Its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. **Denial of Service Attacks:** Smurf Attack, SYN Flooding, Distributed Denial of Service. **Hacker:** Hacking and Types of Hackers, Footprinting, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared and Switched Networks, Sniffing Detection & Prevention, Spoofing.

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**RECOMMENDED BOOKS**


- Cryptography and Network Security, William Stallings, Pearson Education.
- Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
- Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill.


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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define various aspects of network security.

CO2. illustrate fundamentals of number theory and cryptography.

CO3. apply security mechanisms to achieve principles of network security.

CO4. analyze the cause for various existing network attacks.

CO5. examine the vulnerabilities in applications over internet.

CO6. develop a secure protocol for achieving various network security services.

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DEPARTMENT OF INFORMATION TECHNOLOGY

# R PROGRAMMING
# 900220 (OC-3)

## COURSE OBJECTIVES

- To understand the critical programming language concepts.
- To perform data analysis using R commands.
- To make use of R loop functions and debugging tools.

---

**Unit-I**

**Introduction to R**: R Commands, Objects, Functions, Simple Manipulations, Matrices and Arrays, Factors, Lists, Data Frames.

**Unit-II**

**Programming Using R**: Introduction, Function Creation, Scripts, Logical Operators, Conditional Statements, Loops in R, Switch Statement, Creating List and Data Frames, List and Data Frame Operations, Recursive List.

**Unit-III**

**Object- Oriented Programming in R**: Introduction, S3 Classes, S4 Classes, References Classes, Debugging Principle in R, Import and Export Data from CSV, SAS and ODBC.

**Unit-IV**

Mathematical and Statistical Concepts, Hypothesis Testing, Different Statistical Distribution, Regression, Time Series Analysis.

**Unit-V**

**Graphics in R:** Basic Plots, Labelling and Documenting Plots, Adjusting the Axes, Specifying Colour, Fonts and Sizes, Plotting symbols, Customized Plotting, Packages in R for Windows, Linus and Mac.

---

**RECOMMENDED BOOKS**

- "R for Beginners", Sandip Rakshit, Tata Mc Graw Hill Education.
- "R programming for Data Science", Roger D. Peng, Learn publishing.

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## COURSE OUTCOMES

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

CO1. define basic programming constructs used in R.

CO2. explain the various commands used in R.

CO3. apply various concept of programming for controlling the flow of data using R.

CO4. analyze the concept of concept of object oriented programming in R.

CO5. choose appropriate packages of R programming for dealing various tasks.

CO6. predict results from the datasets using R commands.

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DEPARTMENT OF INFORMATION TECHNOLOGY

# COMPUTER NETWORKS
# 900222 (OC-3)

## COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable Students to deal with various networking problems such as flow control, error control and congestion control.

---

**Unit-I**

**Introduction:** Computer Network, Types- LAN, MAN & WAN, Data Transmission Modes- Serial & Parallel, Simplex, Half Duplex & Full Duplex, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Cables- Twisted Pair, Coaxial Cable & Optical Fiber, Networking Devices-Repeaters, Hub, Switch, Bridge, Router, Gateway and Modem, Performance Criteria- Bandwidth, Throughput, Propagation Time & Transmission Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode.

**Unit-II**

**Physical Layer:** Network Topologies- Bus, Ring, Star & Mesh, Line Coding- Unipolar, Polar and Bipolar, Switching- Circuit Switching, Message Switching & Packet Switching, Multiplexing: FDM – Frequency Division Multiplexing, WDM – Wavelength Division Multiplexing & TDM – Time Division Multiplexing.

**Unit-III**

**Data Link Layer:** Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- The Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5.

**Unit-IV**

**Network Layer & Transport Layer:** Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Flooding, Congestion

Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token Bucket Algorithm. Connection Oriented & Connectionless Service, IP Addressing.

**Unit-V**

**Presentation, Session& Application Layer:** Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail.

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**RECOMMENDED BOOKS**


- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.


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## COURSE OUTCOMES

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

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network.

CO3. Identify various parameter for affecting the performance of computer network.

CO4. analyze the concepts of communication using various layer of OSI model.

CO5. evaluate the performance of computer network in congestion and Internet.

CO6. design the network environment and applications for implementation of computer networking concept.

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# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

## (A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)

## Scheme of Examination

## B.Tech. V Semester (Information Technology)

***(For batches admitted in Academic Session 2019-20)***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | Total Marks | Contact Hours per week | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | Practical Slot | | | | | | |
| | | | | End Sem. | Mid Sem Exam. | Quiz/ Assisgn ment | End Sem. | Lab work & Sessional | | L | T | P | |
| 1. | 100005* | HSMC | Ethics, Economics, Entrepreneurship & Management (HSMC-4) | 70 | 20 | 10 | - | - | 100 | 3 | - | - | 3 |
| 2. | 160501 | BSC | Discrete Structures (BSC- 6) | 70 | 20 | 10 | - | - | 100 | 3 | 1 | - | 4 |
| 3. | 160502 | DC | Software Engineering (DC-9) | 70 | 20 | 10 | 30 | 20 | 150 | 2 | 1 | 2 | 4 |
| 4. | 160503 | DC | Theory of Computation (DC-10) | 70 | 20 | 10 | 30 | 20 | 150 | 2 | 1 | 2 | 4 |
| 5. | 160504 | DC | Microprocessor & Interfacing (DC-11) | 70 | 20 | 10 | 30 | 20 | 150 | 2 | 1 | 2 | 4 |
| 6. | 160505 | DLC | Minor Project-I** (DLC-3) | - | - | - | 30 | 20 | 50 | - | - | 2 | 1 |
| 7. | 160506 | DLC | Summer Internship Project-II (Evaluation) (DLC-4) | - | - | - | 25 | - | 25 | - | - | 6 | 3 |
| 8. | 160507 | SEMINAR/ SELF STUDY | Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)# | - | - | - | - | 25 | 25 | - | - | 2 | 1 |
| Total | | | | 350 | 100 | 50 | 145 | 105 | 750 | 12 | 4 | 16 | 24 |
| 9. | 100006$ | MC | Indian Constitution & Traditional Knowledge (Audit Course) (MC) | 70 | 20 | 10 | - | - | 100 | 3 | | - | 03 |
| Department level activity/workshop/awareness programme to be conducted; certificate of compliance to be submitted by HoD to the Exam Controller through Dean Academics | | | | | | | | | | | | | |
| Additional Course for Honours or minor Specialization | | | Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization | | | | | | | | | | |

* Group A/B programmes will offer this course in V/VI Semester respectively.

$ Group A/B programmes will offer this course in V/VI Semester respectively. (This is a non-credit course and it is optional to appear & pass in the end semester examination. However, a separate mark sheet will be issued to those who will qualify)

** The minor project-I may be evaluated by an internal committee for awarding sessional marks.

# Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)

GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

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DEPARTMENT OF INFORMATION TECHNOLOGY

**ANNEXURE - III**

# *Syllabi*
# *of*
# *Departmental Core (DC) Courses*
# *B.Tech V Semester*
# *(Batches Admitted in 2019-20)*
# *(Information Technology)*
# *Under Flexible Curriculum*
## *[ITEM-5]*

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DEPARTMENT OF INFORMATION TECHNOLOGY

# SOFTWARE ENGINEERING
# 160502 (DC-9)

## COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

---

**Unit - I**

**Introduction to Software Engineering:** Definition, software engineering-layered Technology, Software Characteristics and Components, **Software model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection criteria of model**: Characteristics of Requirements, Status of Development Team, Users participation, Type of Project and Associated Risk.

**Unit - II**

**Requirement Engineering:** Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

**Unit - III**

**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural design, Procedural design, data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

**Unit - IV**

**Software Metrics, Project Management and Estimation:** Metrics in Process and Project domains, Software Measurement, Software Quality Metrics, **Project**

**Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

**Unit - V**

**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic issues, Criteria for completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

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**RECOMMENDED BOOKS**


- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.


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## COURSE OUTCOMES

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

**CO1.** explain the various fundamental concepts of software engineering.

**CO2.** develop the concepts related to software design & analysis.

**CO3.** compare the techniques for software project management & estimation.

**CO4.** choose the appropriate model for real life software project.

**CO5.** design the software using modern tools and technologies.

**CO6.** test the software through different approaches.

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DEPARTMENT OF INFORMATION TECHNOLOGY

# THEORY OF COMPUTATION
# 160503 (DC-10)

## COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

---

**Unit-I**

**Introduction of Automata Theory**: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

**Unit-II**

**Types of Finite Automata**: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.

**Unit-III**

**Grammars:** Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

**Unit-IV**

**Push down Automata:** example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

**Unit-V**

**Turing Machine:** Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages,

undecidable languages, Halting problem of Turing machine & the post correspondence problem.

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**RECOMMENDED BOOKS**

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication.
- Element of the Theory Computation, Lewis & Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.
- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

---

## COURSE OUTCOMES

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

**CO1.** explain the basic concepts of switching and finite automata theory & languages.

**CO2.** relate practical problems to languages, automata, computability and complexity.

**CO3.** construct abstract models of computing and check their power to recognize the languages.

**CO4.** analyse the grammar, its types, simplification and normal form.

**CO5.** interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.

**CO6.** develop an overview of how automata theory, languages and computation are applicable in engineering application.

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DEPARTMENT OF INFORMATION TECHNOLOGY

# MICROPROCESSOR & INTERFACING
# 160504 (DC-11)

## COURSE OBJECTIVES

- To understand different processors and basic architecture of 16 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
- To understand 8051 microcontroller.

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**Unit-I**

**Microprocessors:** Introduction to x86 microprocessors, RISC and CISC processors, 8086 Architecture-Functional Diagram, Register Organization, Memory Segmentation, Programming Model, Memory Address, Physical Memory Organization, Minimum and maximum mode signals, Bus Cycle and Timing Diagrams, Instruction Formats, Addressing Modes, Instruction Set, Interrupts of 8086.

**Unit-II**

**Basic Peripherals and Interfacing:** 8212, 8155, 8255, 8755, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing.

**Unit-III**

**Special Purpose Programmable Peripheral Devices and Interfacing:** 8253, 8254 programmable interval timer, 8259A programmable interrupt controller and 8257 DMA controllers, Keyboard and Display Interfacing.

**Unit-IV**

**Serial and Parallel Data Transfer:** Serial and Parallel data transmission, Types of communication system, Baud rate RS-232C, Modem and various bus standards, USART – 8251A.

**Unit-V**

**Introduction to Microcontrollers**: 8051 Microprocessor and its Architectures, Pin Description, Input-Output configurations, Interrupts, Addressing Modes, An overview of 8051 Instruction Set.

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**RECOMMENDED BOOKS**


- The Intel Microprocessors, Architecture, Programming and Interfacing, B.B. Brey, PHI.
- Microprocessor 8086: Architecture, Programming and Interfacing, Sunil Mathur, PHI.
- Advanced Microprocessor and Interfacing, D.V. Hall, Mc-Graw Hill.
- Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
- Interfacing Techniques in Digital Design with Emphasis on Microprocessors, R.L. Krutz, John Wiley.


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## COURSE OUTCOMES

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

**CO1.** compare the architecture and feature of different 16-bit microprocessor interfacing chips & microcontrollers.

**CO2.** develop programming skills in assembly language of 8086 microprocessor and 8051 microcontroller.

**CO3.** demonstrate the concept of interfacing with peripheral devices.

**CO4.** make use of different interrupts and addressing modes.

**CO5.** design an interfacing for I/O devices.

**CO6.** build a system based on 8086 microprocessor and 8051 microcontroller.

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# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)**

## Department of Information Technology

## Scheme of Evaluation

## B. Tech. Internet of Things (IoT)

## III Semester

*for batches admitted in academic session 2020 – 21 onwards*

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam. | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assign ment | | Lab work & Session al | Skill Based Mini Project | | | | | | | |
| 1. | 250103 | BSC | Probability and Random Process | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | 1 | - | 4 | Offline | PP |
| 2. | 230301 | DC | Design & Analysis of Algorithms | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Blended (2/1) | PP |
| 3. | 230302 | DC | Operating System | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | PP |
| 4. | 230303 | DC | Computer Networks and Protocols | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Offline | PP |
| 5. | 230304 | DC | Database Management System | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Blended (2/1) | MCQ |
| 6. | 230305 | DLC | Design and Thinking Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | - | 2 | 1 | Offline | SO |
| 7. | 230306 | DLC | Self-learning/Presentation (SWAYAM/NPTEL/MOOC) | - | - | - | - | - | 40 | - | 40 | - | - | 2 | 1 | Online and Mentoring | SO |
| 8. | 200XXX | CLC | **Novel Engaging Course (Informal Learning)** | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| 9. | 230307 | DLC | Summer Internship Project–1 (Institute Level) (Evaluation) | - | - | - | - | 60 | - | - | 60 | - | - | 4 | 2 | Offline | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **290** | **100** | **60** | **950** | **14** | **2** | **14** | | - | - |
| 10. | 100002 | MAC | Biology for Engineers | 50 | 10 | 20 | 20 | - | - | - | 100 | - | - | - | GRADE | Online | MCQ |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | SIP/ SLP/ NEC | |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | |
| | | Offline | Online | | | | | | | | |
| 7 | - | 6 | 3 | 6 | 1 | 13 | - | 3 | 3 | 4 | 23 |
| 30.43% | - | 26.09% | 13.04% | 26.09% | 4.35% | 10.57% | - | 13.04% | 13.04% | 17.39% | Credits % |

27/7/2021.

DEAN (ACADEMICS)
M.I.T.S
GWALIOR

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## Department of Information Technology

## Scheme of Evaluation

## B. Tech. Internet of Things (IoT)

## IV Semester

***For batches admitted in academic session 2020 – 21 onwards***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam. | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assign ment | | Lab Work & Sessional | Skill Based Mini Project | | | | | | | |
| 1. | 230401 | DC | Computer Architecture and Microprocessor | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Offline | PP |
| 2. | 230402 | DC | Cloud Computing | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | PP |
| 3. | 230403 | DC | Software Engineering | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Blended (2/1) | MCQ |
| 4. | 230404 | DC | IoT Architecture and Protocols | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Offline | PP |
| 5. | 230405 | DC | Network & Web Security | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Offline | PP |
| 6. | 230406 | DLC | Python Programming Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | 1 | 2 | 2 | Blended (2/1) | SO |
| 7. | 200XXX | CLC | **Novel Engaging Course (Informal Learning)** | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **230** | **60** | **60** | **850** | **14** | **02** | **08** | | - | - |
| 8. | 100006 | MAC | Indian Constitution and Traditional Knowledge | 50 | 10 | 20 | 20 | - | - | - | 100 | - | - | - | GRADE | Online | MCQ |
| **Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester** | | | | | | | | | | | | | | | | | |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | NEC | |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | |
| | | Offline | Online | | | | | | | | |
| 09 | - | 04 | 03 | 03 | 01 | 12 | - | 03 | 04 | 01 | 20 |
| 45% | - | 20% | 15% | 15% | 5% | 60% | - | 15% | 20% | 5% | Credits % |

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Department of Information Technology

# DESIGN & ANALYSIS OF ALGORITHMS
# 230301

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

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**Unit-I**

**Introduction to Computational Model:** Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

**Unit-II**

**Divide and Conquer Method:** Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and additional real world problems on divide and conquer.

**Unit-III**

**Greedy Method:** Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, **Minimum Cost Spanning Trees :** Prims's and Kruskal's Algorithm, Knapsack Problem, Dijkstra's single source shortest path algorithm, Optimal Storage on Tapes.

**Unit-IV**

**Dynamic Programming:** Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling salesman problem, Floyd's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix chain multiplication

**Unit-V**

**Backtracking:** Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

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**RECOMMENDED BOOKS**


- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.


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## COURSE OUTCOMES

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

CO1. demonstrate a familiarity with major algorithms and data structures.
CO2. apply important algorithmic design paradigms and methods of analysis.
CO3. analyze the asymptotic performance of algorithms.
CO4. compare different design techniques to develop algorithms for computational problems.
CO5. design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.
CO6. understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.

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Department of Information Technology

# OPERATING SYSTEM
# 230302

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

---

**Unit I**

**Basics of Operating System:** Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

**Unit II**

**Process Management:** Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

**Unit III**

**Process Synchronization:** Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

**Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**Unit IV**

**Memory Management:** Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

**Unit V**

**Storage Management:** Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

**File System Interface:** The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

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**RECOMMENDED BOOKS**


- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.


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## COURSE OUTCOMES

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

CO1. tell the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.

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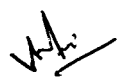

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Department of Information Technology

# COMPUTER NETWORKS AND PROTOCOLS
**230303**

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

---

**Unit-I**

**Introduction:** Computer Network Types, OSI Reference Model & TCP/IP Reference Mode, Circuit Switching, Message Switching & Packet Switching, Frequency Division Multiplexing, Wavelength Division Multiplexing & Time Division Multiplexing, ISDN, SONET.

**Physical Layer :** Data Transmission Modes, Network topologies, Line Coding, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Networking Devices, Performance Criteria.

**Unit-II**

**Data Link Layer:** Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5, HDLC.

**Unit-III**

**Network Layer Protocols:** Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Routing Protocols, Flooding, Connection Oriented & Connectionless Service, IP Addressing, IPV4, IPV6, Internet Protocol Datagram, Fragmentation, ICMP, IGMP.

**Unit-IV**

**Transport Layer Protocols:** Datagram Protocol (UDP) - Process To Process Communication, Port Number, Socket Address, User Datagram, UDP Operation. TCP Services, Process To Process Communication, Stream Delivery Service, Full Duplex Communication, Connection Oriented Service, Reliable Service, TCP Features-Numbering System, Flow Control, Error Control, Congestion Control , TCP Segment, Flow Control-Sliding Window Protocol, Silly Window Syndrome Error Control-Checksum, Acknowledgement, Retransmission, Congestion Control.

**Unit-V**

**Application Layer Protocols:** Introduction, Design Issues, Presentation Layer-Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer-Remote Login, File Transfer & Electronic Mail. Domain Name System (DNS), Telnet, FTP, TFTP, Email Protocol: SMTP, POP, IMAP.

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**RECOMMENDED BOOKS**


- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.
- TCP/IP Protocol Suite, B. A. Fourozan, Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.


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## COURSE OUTCOMES

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

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network protocols.

CO3. develop a concept for understanding advance computer network.

CO4. build the skill of IP addressing and routing mechanism.

CO5. predict the performance of computer network in congestion and internet.

CO6. construct the network environment for implementation of computer networking concept.

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Department of Information Technology

# DATABASE MANAGEMENT SYSTEM
# 230304

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

---

**Unit-I**

**DBMS:** Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model, Comparison between Models.

**Entities and Relationship Model:** Entity types, Entity sets, Attributes and Keys, Relationship Types and Sets, Constraints, Design issue, E-R Diagram, Weak Entity Sets.

**Unit-II**

**Relational Model:** Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views, Database Relations, Properties of Relations, Attributes, Keys, Attributes of Relation, Domain Constraints, Integrity Constraints.

**Relational Algebra:** Concepts and Operations: Select, Project, Division, Intersection, Union, Division, Rename, Join etc.

**Relational Calculus:** Tuple Relational Calculus, Domain Relational Calculus.

**Unit-III**

**SQL:** Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL)

**Unit-IV**

**Relational Database Design:** Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, The Process of Normalization, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

**Unit-V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

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## RECOMMENDED BOOKS


- Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
- Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
- Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
- An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.


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## COURSE OUTCOMES

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

CO1. demonstrate the concepts of different type of database system.
CO2. apply relational algebra concepts to design database system.
CO3. make use of queries to design and access database system.
CO4. analyze the evaluation of transaction processing and concurrency control.
CO5. determine the optimize database for real world applications.
CO6. design a database system for a real world application.

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Department of Information Technology

**ANNEXURE - IV**

# *Scheme & Syllabi*
# *(along with the Course Outcomes)*
# *of*
# *B. Tech. III & IV Semester*
## *(Internet of Things (IoT))*
## *(Offered by Department of Information Technology)*
## *(Batch Admitted in 2020-21)*
## *Under Flexible Curriculum*
## *[ITEM - 7]*

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Department of Information Technology

# DESIGN AND THINKING LAB
## 230305

| L | T | P | Total Credits |
|---|---|---|---|
| - | - | 2 | 1 |

**PREREQUISITES**

We assume that you are already familiar with the basics of C and C++. Knowledge in other programming language especially the OOP is an added advantage. A basic understanding of microcontrollers and electronics is also expected.

**COURSE OBJECTIVE:**

The students will:

- Learn the basics of electronics, including reading schematics (electronics diagrams)
- Learn how to prototype circuits with a breadboard
- Learn the Arduino programming language and IDE
- Program basic Arduino examples
- Prototype circuits and connect them to the Arduino
- Program the Arduino microcontroller to make the circuits work
- Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use
- Explore the provided example code and online resources for extending knowledge about the capabilities of the Arduino microcontroller

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**Unit-I**

**Introduction:** embedded system, Understanding Embedded System, Overview of basic electronics and Digital electronics, Microprocessor vs Microcontroller, Common features of Microcontroller, Comparison between different types of microcontrollers.

**Unit-II**

**Arduino**: introduction, Pin Configuration and Architecture, Device and Platform Features, Concept of Digital and Analog ports, Arduino Interfacing Board, Introduction to Embedded C and Arduino Platform.

**Unit-III**

**Basic Concepts and Functions**: Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions, Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalWrite() Function, analogRead() function, Arduino Interrupts.

**Unit-IV**

**Arduino Time and Displays**: Incorporating Arduino time, delay() function, delay Microseconds() function, millis() function, micros() function. Working with Serial Monitor, Line graph via serial monitor, interfacing 8 bit LCD to Arduino, Fixed one line static message display, Running message display using the LCD Library of Arduino.

**Unit-V**

**Arduino Sensors and Secondary Integrations**: Humidity Sensor, Temperature Sensor, Water Detector/ Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Relay switches). Types of Relay, Controlling Electrical appliances with electromagnetic relays.

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**RECOMMENDED BOOKS**:

- Arduino for Dummies, by John Nussey (2013)

**References:**

1. Arduino Projects for Dummies, by Brock Craft (2013)
2. Programming Arduino – Getting Started with Sketches, Simon Monk (2016)
3. Programming Arduino - Next Steps, by Simon Monk (2016)

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## COURSE OUTCOMES

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

CO1: define the basic concept of Embedded System.

CO2: describe the basic principles of Arduino programming and IDE.

CO3: familiarize with different types of sensors and related systems.

CO4: design, implement, debug and test programs/ system.

CO5: design and develop Smart systems applications.

CO6: build Arduino board using different sensors.

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Department of Information Technology

# COMPUTER ARCHITECTURE AND MICROPROCESSOR
# 230401

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVE

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.
- To understand different processors and basic architecture of 8/16 bit microprocessors.

---

**Unit -I**

**Introduction:** CPU structure and functions, processor organization, ALU, data paths, internal registers, status flags; System bus structure: Data, address and control buses. Processor control, micro-operations, instruction fetch, hardwired control, micro programmed control, microinstruction sequencing and execution.

**Unit- II**

Instruction set principles, machine instructions, types of operations and operands, encoding an instruction set, assembly language programming, addressing modes and formats.

**Unit –III**

**Input-Output Organization:** I/O organization; I/O techniques: interrupts, polling, DMA; Synchronous vs. asynchronous I/O.

**Memory Organization:** Memory system, internal and external memory, memory hierarchy, cache memory and its working, virtual memory concept.

**Unit –IV**

**Microprocessors:** 8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram.

16-bit microprocessors, 8086 architecture, registers, memory segmentation and addressing,

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**Unit-V**

**Basic peripherals and interfacing:** 8255, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing, 8254, 8259, 8251.

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## RECOMMENDED BOOKS


- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.
- The Intel. Microprocessors, Architecture, Programming and Interfacing, B.B. Brey (PHI)
- Microprocessor 8086: Architecture, Programming, and Interfacing, Sunil Mathur(PHI)
- Advanced Microprocessor and Interfacing, D.V. Hall (Mc-Graw Hill)
- Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
- Interfacing techniques in Digital Design with emphasis on Microprocessors, R.L. Krutz (John Wiley)


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## COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. demonstrate the computer architecture and microprocessor for defining basic component and functional unit.
CO2. develop the fundamental concept to understand the working of computer architecture and microprocessor.
CO3. explain the basic concept of input output and memory organization.
CO4. develop the skill of writing assembly language programming.
CO5. build a system using peripheral devices and controllers for 8086 microprocessors.
CO6. apply the concept computer architecture and microprocessor in solving real world problems.

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(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V. Bhopal, M.P.)

Department of Information Technology

# CLOUD COMPUTING
# 230402

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To introduce the broad perceptive of cloud architecture and model.
- To understand the concept of Virtualization.
- To apply different cloud programming model as per need.

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**Unit- I**

**Cloud Architecture and Model:** Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud, Cloud Solutions Cloud ecosystem, Service management, Computing on demand.

**Unit- II**

**Virtualization:** Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices. Virtual Clusters and Resource management, Virtualization for Data-center Automation.

**Unit- III**

**Cloud Infrastructure:** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

**Unit -IV**

**Programming Model:** Parallel and Distributed Programming Paradigms- MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

**Unit -V**

**Security in the Cloud:** Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.

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**RECOMMENDED BOOKS**


- Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012.
- John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
- Kumar Saurabh, " Cloud Computing — insights into New-Era Infrastructure", Wiley India,2011
- George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
- James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.


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**COURSE OUTCOMES**

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

CO1. define various basic concepts related to cloud computing..

CO2. identify the architecture, infrastructure and delivery models of cloud computing.

CO3. apply suitable virtualization concept

CO4. choose the appropriate programming models and approach

CO5. analyse various security issues in cloud computing.

CO6. compose virtualization, security and programming module in cloud computing solutions.

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Department of Information Technology

# SOFTWARE ENGINEERING
# 230403

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

---

**Unit - I**

**Introduction to Software Engineering:** Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

**Unit - II**

**Requirement Engineering:** Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

**Unit - III**

**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

**Unit - IV**

**Software Metrics, Project Management and Estimation:** Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

**Unit - V**

**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

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**RECOMMENDED BOOKS**


- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.


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## COURSE OUTCOMES

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

CO1. explain the various fundamental concepts of software engineering.
CO2. develop the concepts related to software design & analysis.
CO3. compare the techniques for software project management & estimation.
CO4. choose the appropriate model for real life software project.
CO5. design the software using modern tools and technologies.
CO6. test the software through different approaches.

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Department of Information Technology

# IOT ARCHITECTURE & PROTOCOLS
## 230404

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

**COURSE OBJECTIVES**

- Familiarize the student with the basic taxonomy and terminology of the IOT Architecture & Protocols.
- Provide detailed knowledge about various layers, protocols and devices that facilitate IoT service.

---

**Unit-I**

**Introduction:** IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics

**Unit-II**

**IoT Reference Architecture:** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.

**Unit-III**

**IoT Data Link Layer & Network Layer Protocols:** PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

**Unit-IV**

**IoT Transport & Session Layer Protocols:** Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS), Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

**Unit-V**

**IoT Service Layer Protocols & Security Protocols:** Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC802.15.4 , 6LoWPAN, RPL, Application Layer: UPnP, SCADA, Authentication Protocols.

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**RECOMMENDED BOOKS**


- Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, ISBN: 978-1-118-47347-4, Willy Publications ,2016
- From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand,Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2015.
- Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
- Sensors, Actuators and Their Interfaces, N. Ida, Scitech Publishers, 2014.
- IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, CISCO Press, 2017
- Internet of Things: Architectures, Protocols and Standards , Simone Cirani , Gianluigi Ferrari , Marco Picone , Luca Veltri, Willy Publications ,2018.


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## COURSE OUTCOMES

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

CO1. explain the fundamental concepts of IoT Architecture.

CO2. illustrate the basic taxonomy & terminologies of IoT protocols.

CO3. develop a concept for understanding IOT technologies.

CO4. build the skill for establishing communication among IoT devices.

CO5. analyze various IoT Application layer Protocols.

CO6. design IoT-based systems for real-world problems.

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# NETWORK & WEB SECURITY
# 230405

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

---

**Unit-I**

**Security:** Principles and Attacks, Basic Number Theory: Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

**Unit-II**

**Cryptography:** Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

**Unit-III**

**Hash Functions:** Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm). Authentication: Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

**Unit -IV**

**IP & Web Security Overview:** SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). IDS (Intrusion detection system):

Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration Testing, Risk Management. Firewalls: Types, Functionality and Polices.

**Unit -V**

**Phishing:** Attacks and its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. Denial of Service Attacks: Smurf Attack, SYN Flooding, Distributed Denial of Service. Hacker: Hacking and Types of Hackers, Foot Printing, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared And Switched Networks, Sniffing Detection & Prevention, Spoofing.

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**RECOMMENDED BOOKS**


- Cryptography and Network Security, William Stallings, Pearson Education.
- Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
- Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill.


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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain cryptographic algorithms, hash algorithms and authentication mechanisms.

CO2. illustrate fundamentals of number theory, attacks and security principles.

CO3. apply number theory and various algorithms to achieve principles of security.

CO4. analyze the cause for various existing network attacks and describe the working of available security controls.

CO5. examine the vulnerabilities in IT infrastructure.

CO6. predict the attacks and controls associated with IP, transport-level, web and e-mail security.

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Department of Information Technology

# PYTHON PROGRAMMING LAB
## 230406

| L | T | P | Total Credits |
|---|---|---|---|
| - | 1 | 2 | 2 |

## COURSE OBJECTIVES

- Implement an algorithm in Python by using standard programming constructs such as, functions, modules, aggregated data (arrays, lists, etc.)
- Explain the output of a given Python program and identify and correct errors in a given Python program
- Write programs using the features of object-oriented programming language such as, encapsulation, polymorphism, inheritance, etc.

---

**Unit-I**

Introduction to Python programming language Data and Expressions: Literals; Variables and Identifiers; Operators; Expressions and Data Types, Logical operator; Boolean operator; Boolean Expressions; Control Structures; Selection Control, Iterative Control. Lists & tuples: List Structures; Lists in Python, Iterating over Lists in Python.

**Unit-II**

Functions: Arguments in functions; Program routes; Calling Value Returning Functions; Calling Non- value Returning Functions Parameter Passing; Variable Scope; Modular design Modules; Top-Down Design Python Modules; File Handling Operation in file: Reading, Writing and appending in Text Files.

**Unit-III**

String Processing; Dictionaries and sets operations; Exception Handling: Exceptions Data Collections applying lists etc.

**Unit-IV**

Introduction to Object Oriented Programming, Class, Objects, Encapsulation, Data abstraction, Inheritance, Polymorphism.

**Unit-V**

Graphics Programming: Graphics Programming, Using Graphical Objects, Interactive Graphics, Displaying Images, Generating Colors, Graphics Objects, Entry Objects, Test Case: Numpy, scipy; Test Case: panda, Matplotlib.

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**RECOMMENDED BOOKS**


- C. Dierbach, Introduction to Computer Science Using PYTHON: A Computational Problem-Solving Focus (1st ed.), Wiley, 2015. ISBN 978-8126556014.
- Yashavant Kanetkar, Let Us Python (1st ed.), BPB Publishers, 2019. ISBN 978-9388511568


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## COURSE OUTCOMES

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

CO1. solve computational problem using python language

CO2. familiar with basics syntax and features of python programming language

CO3. hands on experience to online coding tools like colab.

CO4. design a program utilizing the features of object oriented concept.

CO5. utilize some of the libraries available for solving problems.

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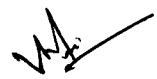

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Department of Information Technology

**ANNEXURE - V**

# *Scheme & Syllabi*
# *(along with the Course Outcomes)*
# *of*
# *B. Tech. III & IV Semester*
# *Information Technology (Artificial Intelligence and Robotics)*
## *(Batch Admitted in 2020-21)*
# *Under Flexible Curriculum*
## *[ITEM - 7]*

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)**

## Department of Information Technology

## Scheme of Evaluation

## B. Tech. in Information Technology (Artificial Intelligence and Robotics)

## III Semester

***for batches admitted in academic session 2020 – 21 onwards***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assignment | | Lab Work & Sessional | Skill Based Mini Project | | | | | | | |
| 1. | 250103 | BSC | Probability and Random Process | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | 1 | - | 4 | Offline | PP |
| 2. | 240301 | DC | Design & Analysis of Algorithms | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Blended (2/1) | PP |
| 3. | 240302 | DC | Operating System | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | PP |
| 4. | 240303 | DC | Computer Networks and Protocols | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Offline | PP |
| 5. | 240304 | DC | Database Management System | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Blended (2/1) | MCQ |
| 6. | 240305 | DLC | Python Programming Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | - | 2 | 1 | Offline | SO |
| 7. | 240306 | DLC | Self-learning/Presentation (SWAYAM/NPTEL/MOOC) | - | - | - | - | - | 40 | - | 40 | - | - | 2 | 1 | Online and Mentoring | SO |
| 8. | 200XXX | CLC | **Novel Engaging Course (Informal Learning)** | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| 9. | 240307 | DLC | Summer Internship Project–I (Institute Level) (Evaluation) | - | - | - | - | 60 | - | - | 60 | - | - | 4 | 2 | Offline | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **290** | **100** | **60** | **950** | **14** | **2** | **14** | [redacted] | - | - |
| 10. | 100002 | MAC | Biology for Engineers | 50 | 10 | 20 | 20 | - | - | - | 100 | - | - | - | GRADE | Online | MCQ |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | SIP/ SLP/ NEC | |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | |
| | | Offline | Online | | | | | | | | |
| 7 | - | 6 | 3 | 6 | 1 | 13 | - | 3 | 3 | 4 | 23 |
| 30.43% | - | 26.09% | 13.04% | 26.09% | 4.35% | 10.57% | - | 13.04% | 13.04% | 17.39% | Credits % |

27/7/2021

(ACADEMICS)

GWALIOR

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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## Department of Information Technology

## Scheme of Evaluation

## B. Tech. in Information Technology (Artificial Intelligence and Robotics)

## IV Semester

***for batches admitted in academic session 2020 – 21 onwards***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam. | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assign ment | | Lab Work & Sessional | Skill Based Mini Project | | | | | | | |
| 1. | 240401 | DC | Computer Architecture and Microprocessor | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Offline | PP |
| 2. | 240402 | DC | Cloud Computing | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | PP |
| 3. | 240403 | DC | Software Engineering | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Blended (2/1) | MCQ |
| 4. | 240404 | DC | Machine Learning and Optimization | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | 2 | 4 | Offline | PP |
| 5. | 240405 | DC | Network & Web Security | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Offline | PP |
| 6. | 240406 | DLC | Design and Thinking Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | - | 2 | 1 | Offline | SO |
| 7. | 200XXX | CLC | **Novel Engaging Course (Informal Learning)** | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **230** | **60** | **60** | **850** | **14** | **01** | **10** | | - | - |
| 8. | 100006 | MAC | Indian Constitution and Traditional Knowledge | 50 | 10 | 20 | 20 | - | - | - | 100 | - | - | - | GRADE | Online | **MCQ** |
| **Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester** | | | | | | | | | | | | | | | | | |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | NEC | |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | Total Credits |
| | | Offline | Online | | | | | | | | |
| 9 | - | 4 | 2 | 4 | 1 | 12 | - | 3 | 4 | 1 | 20 |
| 45% | - | 20% | 10% | 20% | 5% | 60% | - | 15% | 20% | 5% | Credits % |

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Department of Information Technology

# DESIGN & ANALYSIS OF ALGORITHMS
## 240301

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

---

**Unit-I**

**Introduction to Computational Model:** Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

**Unit-II**

**Divide and Conquer Method:** Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and additional real world problems on divide and conquer.

**Unit-III**

**Greedy Method:** Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, **Minimum Cost Spanning Trees :** Prims's and Kruskal's Algorithm, Knapsack Problem, Dijkstra's single source shortest path algorithm, Optimal Storage on Tapes.

**Unit-IV**

**Dynamic Programming:** Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling salesman problem, Floyd's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix chain multiplication

**Unit-V**

**Backtracking:** Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

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**RECOMMENDED BOOKS**


- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.


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## COURSE OUTCOMES

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

CO1. demonstrate a familiarity with major algorithms and data structures.
CO2. apply important algorithmic design paradigms and methods of analysis.
CO3. analyze the asymptotic performance of algorithms.
CO4. compare different design techniques to develop algorithms for computational problems.
CO5. design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.
CO6. understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.

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Department of Information Technology

# OPERATING SYSTEM
## 240302

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

---

**Unit I**

**Basics of Operating System:** Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

**Unit II**

**Process Management:** Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

**Unit III**

**Process Synchronization:** Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

**Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**Unit IV**

**Memory Management:** Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

**Unit V**

**Storage Management:** Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

**File System Interface:** The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

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**RECOMMENDED BOOKS**


- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.


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## COURSE OUTCOMES

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

CO1. tell the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.

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# COMPUTER NETWORKS AND PROTOCOLS
**240303**

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

---

**Unit-I**

**Introduction:** Computer Network Types, OSI Reference Model & TCP/IP Reference Mode, Circuit Switching, Message Switching & Packet Switching, Frequency Division Multiplexing, Wavelength Division Multiplexing & Time Division Multiplexing, ISDN, SONET.

**Physical Layer :** Data Transmission Modes, Network topologies, Line Coding, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Networking Devices, Performance Criteria.

**Unit-II**

**Data Link Layer:** Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5, HDLC.

**Unit-III**

**Network Layer Protocols:** Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Routing Protocols, Flooding, Connection Oriented & Connectionless Service, IP Addressing, IPV4, IPV6, Internet Protocol Datagram, Fragmentation, ICMP, IGMP.

**Unit-IV**

**Transport Layer Protocols:** Datagram Protocol (UDP) - Process To Process Communication, Port Number, Socket Address, User Datagram, UDP Operation. TCP Services, Process To Process Communication, Stream Delivery Service, Full Duplex Communication, Connection Oriented Service, Reliable Service, TCP Features-Numbering System, Flow Control, Error Control, Congestion Control , TCP Segment, Flow Control-Sliding Window Protocol, Silly Window Syndrome Error Control-Checksum, Acknowledgement, Retransmission, Congestion Control.

**Unit-V**

**Application Layer Protocols:** Introduction, Design Issues, Presentation Layer-Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer-Remote Login, File Transfer & Electronic Mail. Domain Name System (DNS), Telnet, FTP, TFTP, Email Protocol: SMTP, POP, IMAP.

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**RECOMMENDED BOOKS**


- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.
- TCP/IP Protocol Suite, B. A. Fourozan, Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.


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## COURSE OUTCOMES

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

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network protocols.

CO3. develop a concept for understanding advance computer network.

CO4. build the skill of IP addressing and routing mechanism.

CO5. predict the performance of computer network in congestion and internet.

CO6. construct the network environment for implementation of computer networking concept.

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# DATABASE MANAGEMENT SYSTEM
# 240304

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

---

### Unit-I

**DBMS:** Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model, Comparison between Models.

**Entities and Relationship Model:** Entity types, Entity sets, Attributes and Keys, Relationship Types and Sets, Constraints, Design issue, E-R Diagram, Weak Entity Sets.

### Unit-II

**Relational Model:** Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views, Database Relations, Properties of Relations, Attributes, Keys, Attributes of Relation, Domain Constraints, Integrity Constraints.

**Relational Algebra:** Concepts and Operations: Select, Project, Division, Intersection, Union, Division, Rename, Join etc.

**Relational Calculus:** Tuple Relational Calculus, Domain Relational Calculus.

### Unit-III

**SQL:** Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL)

**Unit-IV**

**Relational Database Design:** Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, The Process of Normalization, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

**Unit-V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

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**RECOMMENDED BOOKS**


- Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
- Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
- Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
- An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.


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## COURSE OUTCOMES

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

CO1. demonstrate the concepts of different type of database system.
CO2. apply relational algebra concepts to design database system.
CO3. make use of queries to design and access database system.
CO4. analyze the evaluation of transaction processing and concurrency control.
CO5. determine the optimize database for real world applications.
CO6. design a database system for a real world application.

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# PYTHON PROGRAMMING LAB
## 240305

| L | T | P | Total Credits |
|---|---|---|---|
| - | - | 2 | 1 |

## COURSE OBJECTIVES

- Implement an algorithm in Python by using standard programming constructs such as, functions, modules, aggregated data (arrays, lists, etc.)
- Explain the output of a given Python program and identify and correct errors in a given Python program
- Write programs using the features of object-oriented programming language such as, encapsulation, polymorphism, inheritance, etc.

---

**Unit-I**

Introduction to Python programming language Data and Expressions: Literals; Variables and Identifiers; Operators; Expressions and Data Types, Logical operator; Boolean operator; Boolean Expressions; Control Structures; Selection Control, Iterative Control. Lists & tuples: List Structures; Lists in Python, Iterating over Lists in Python.

**Unit-II**

Functions: Arguments in functions; Program routes; Calling Value Returning Functions; Calling Non- value Returning Functions Parameter Passing; Variable Scope; Modular design Modules; Top-Down Design Python Modules; File Handling Operation in file: Reading, Writing and appending in Text Files.

**Unit-III**

String Processing; Dictionaries and sets operations; Exception Handling: Exceptions Data Collections applying lists etc.

**Unit-IV**

Introduction to Object Oriented Programming, Class, Objects, Encapsulation, Data abstraction, Inheritance, Polymorphism.

**Unit-V**

Graphics Programming: Graphics Programming, Using Graphical Objects, Interactive Graphics, Displaying Images, Generating Colors, Graphics Objects, Entry Objects, Test Case: Numpy, scipy; Test Case: panda, Matplotlib.

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**RECOMMENDED BOOKS**


- C. Dierbach, Introduction to Computer Science Using PYTHON: A Computational Problem-Solving Focus (1st ed.), Wiley, 2015. ISBN 978-8126556014.
- Yashavant Kanetkar, Let Us Python (1st ed.), BPB Publishers, 2019. ISBN 978-9388511568


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## COURSE OUTCOMES

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

CO1. solve computational problem using python language

CO2. familiar with basics syntax and features of python programming language

CO3. hands on experience to online coding tools like colab.

CO4. design a program utilizing the features of object oriented concept.

CO5. utilize some of the libraries available for solving problems.

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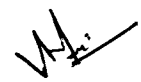

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# COMPUTER ARCHITECTURE AND MICROPROCESSOR
# 240401

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVE

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.
- To understand different processors and basic architecture of 8/16 bit microprocessors.

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**Unit -I**

**Introduction:** CPU structure and functions, processor organization, ALU, data paths, internal registers, status flags; System bus structure: Data, address and control buses. Processor control, micro-operations, instruction fetch, hardwired control, micro programmed control, microinstruction sequencing and execution.

**Unit- II**

Instruction set principles, machine instructions, types of operations and operands, encoding an instruction set, assembly language programming, addressing modes and formats.

**Unit –III**

**Input-Output Organization:** I/O organization; I/O techniques: interrupts, polling, DMA; Synchronous vs. asynchronous I/O.

**Memory Organization:** Memory system, internal and external memory, memory hierarchy, cache memory and its working, virtual memory concept.

**Unit –IV**

**Microprocessors:** 8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram.

16-bit microprocessors, 8086 architecture, registers, memory segmentation and addressing,

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**Unit-V**

**Basic peripherals and interfacing:** 8255, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing, 8254, 8259, 8251.

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**RECOMMENDED BOOKS**


- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.
- The Intel. Microprocessors, Architecture, Programming and Interfacing, B.B. Brey (PHI)
- Microprocessor 8086: Architecture, Programming, and Interfacing, Sunil Mathur(PHI)
- Advanced Microprocessor and Interfacing, D.V. Hall (Mc-Graw Hill)
- Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
- Interfacing techniques in Digital Design with emphasis on Microprocessors, R.L. Krutz (John Wiley)


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## COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. demonstrate the computer architecture and microprocessor for defining basic component and functional unit.

CO2. develop the fundamental concept to understand the working of computer architecture and microprocessor.

CO3. explain the basic concept of input output and memory organization.

CO4. develop the skill of writing assembly language programming.

CO5. build a system using peripheral devices and controllers for 8086 microprocessors.

CO6. apply the concept computer architecture and microprocessor in solving real world problems.

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# CLOUD COMPUTING
## 240402

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To introduce the broad perceptive of cloud architecture and model.
- To understand the concept of Virtualization.
- To apply different cloud programming model as per need.

---

**Unit- I**

**Cloud Architecture and Model:** Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud, Cloud Solutions Cloud ecosystem, Service management, Computing on demand.

**Unit- II**

**Virtualization:** Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices. Virtual Clusters and Resource management, Virtualization for Data-center Automation.

**Unit- III**

**Cloud Infrastructure:** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

**Unit -IV**

**Programming Model:** Parallel and Distributed Programming Paradigms- MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

**Unit -V**

**Security in the Cloud:** Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.

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**RECOMMENDED BOOKS**


- Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012.
- John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
- Kumar Saurabh, " Cloud Computing — insights into New-Era Infrastructure", Wiley India,2011
- George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
- James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.


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**COURSE OUTCOMES**

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

CO1. define various basic concepts related to cloud computing..

CO2. identify the architecture, infrastructure and delivery models of cloud computing.

CO3. apply suitable virtualization concept

CO4. choose the appropriate programming models and approach

CO5. analyse various security issues in cloud computing.

CO6. compose virtualization, security and programming module in cloud computing solutions.

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# SOFTWARE ENGINEERING
# 240403

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

---

**Unit - I**

**Introduction to Software Engineering:** Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

**Unit - II**

**Requirement Engineering:** Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

**Unit - III**

**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

**Unit - IV**

**Software Metrics, Project Management and Estimation:** Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

**Unit - V**

**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

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**RECOMMENDED BOOKS**


- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.


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## COURSE OUTCOMES

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

CO1. explain the various fundamental concepts of software engineering.
CO2. develop the concepts related to software design & analysis.
CO3. compare the techniques for software project management & estimation.
CO4. choose the appropriate model for real life software project.
CO5. design the software using modern tools and technologies.
CO6. test the software through different approaches.

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# MACHINE LEARNING AND OPTIMIZATION
## 240404

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- Identify and develop operational research models from the verbal description of the real system.
- Analyse the results to resolve resource optimization
- To practice their skills on many well-known real-life problems.

---

**Unit-I**

**Introduction to ML:** Statistical Learning, Supervised vs Unsupervised Learning, Regression vs Classification Problems, Formulation of Design Problems as Mathematical Programming Problems, Linear Regression, Multiple Linear Regression, Logistic Regression, K-Nearest Neighbour Classification.

**Unit-II**

**Tree Based Methods:** Decision Tree Learning: Decision Tree Representation, Appropriate Problems for Decision Tree Learning, Random Forest, Issues in Decision Tree Learning. Naïve Bayes Classifier, Support Vector Machines.

**Unit-III**

**Introduction to Optimization Algorithms:** Optimization Algorithms, Engineering Applications of Optimization Algorithms, Objective Function, Optimization Algorithms for Differentiable and Non-Differentiable Objective Functions: Stationary and Critical Point, Functions of Single and Two Variables; Global Optimum, Single Variable Optimization, Two Variable Optimizations. First Order Algorithms, Local Descent Algorithms, Bracketing Algorithms. Stochastic Algorithms, Population Based Algorithms: Introduction, Genetic Algorithms.

**Unit-IV**

**Artificial Neural Network:** Neural Network Representation, Neural Networks as a Paradigm for Parallel Processing, Linear Discrimination, Pairwise Separation, Gradient Descent, Perceptron, Training A Perceptron, Multilayer Perceptron, Back Propagation Algorithm, Dynamically Modifying Network Structure.

**Unit-V**

**Unsupervised Learning:** Clustering, Common Distance Measures, Hierarchical Algorithms – Agglomerative and Divisive, Partitioning Algorithms – K-Means and Derivatives; Design and Analysis of Machine Learning Experiments: Guidelines for Machine Learning Experiments, Factors, Response, and Strategy of Experimentation, Ensemble Methods, Bagging and Boosting, Cross-Validation and Resampling Methods, Measuring Classifier Performance, Assessing a Classification Algorithm's Performance (ROC Curve), Comparing Two Classification Algorithms, Comparing Multiple Algorithms: Analysis of Variance, Comparison over Multiple Datasets.

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**RECOMMENDED BOOKS**


- Algorithms for optimization, Mykel and Tim, The MIT Press
- Principles of Soft Computing, S.N. Deepa, Fundamentals of Computer Algorithms, Wiley.
- Optimization for Engineering Design: Algorithms and Examples (2nd ed.), Kalyanmoy Deb, Prentice Hall India Learning Private Limited, 2012.
- Introduction to Statistical Learning, Gareth James et al, Springer texts in statistics, 2015.
- Machine Learning (1st ed.), T. M. Mitchell, McGraw Hill, 2017. ISBN 978-1259096952.


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## COURSE OUTCOMES

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

CO1. demonstrate a familiarity with major optimization algorithms.
CO2. apply important optimization algorithmic and analyze the results.
CO3. finding out the local and global optimum.
CO4. formulation of design problems as mathematical programming problems.
CO5. Design Supervised and Unsupervised Learning approaches for real-life problems.

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# NETWORK & WEB SECURITY
# 240405

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

---

**Unit-I**

**Security:** Principles and Attacks, Basic Number Theory: Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

**Unit-II**

**Cryptography:** Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

**Unit-III**

**Hash Functions:** Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm). Authentication: Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

**Unit -IV**

**IP & Web Security Overview:** SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). IDS (Intrusion detection system):

Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration Testing, Risk Management. Firewalls: Types, Functionality and Polices.

**Unit -V**

**Phishing:** Attacks and its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. Denial of Service Attacks: Smurf Attack, SYN Flooding, Distributed Denial of Service. Hacker: Hacking and Types of Hackers, Foot Printing, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared And Switched Networks, Sniffing Detection & Prevention, Spoofing.

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**RECOMMENDED BOOKS**


- Cryptography and Network Security, William Stallings, Pearson Education.
- Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
- Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill.


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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain cryptographic algorithms, hash algorithms and authentication mechanisms.

CO2. illustrate fundamentals of number theory, attacks and security principles.

CO3. apply number theory and various algorithms to achieve principles of security.

CO4. analyze the cause for various existing network attacks and describe the working of available security controls.

CO5. examine the vulnerabilities in IT infrastructure.

CO6. predict the attacks and controls associated with IP, transport-level, web and e-mail security.

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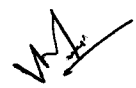

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# DESIGN AND THINKING LAB
## 240406

| L | T | P | Total Credits |
|---|---|---|---|
| - | - | 2 | 1 |

**PREREQUISITES**

We assume that you are already familiar with the basics of C and C++. Knowledge in other programming language especially the OOP is an added advantage. A basic understanding of microcontrollers and electronics is also expected.

**COURSE OBJECTIVE:**

The students will:

- Learn the basics of electronics, including reading schematics (electronics diagrams)
- Learn how to prototype circuits with a breadboard
- Learn the Arduino programming language and IDE
- Program basic Arduino examples
- Prototype circuits and connect them to the Arduino
- Program the Arduino microcontroller to make the circuits work
- Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use
- Explore the provided example code and online resources for extending knowledge about the capabilities of the Arduino microcontroller

---

**Unit-I**

**Introduction:** embedded system, Understanding Embedded System, Overview of basic electronics and Digital electronics, Microprocessor vs Microcontroller, Common features of Microcontroller, Comparison between different types of microcontrollers.

**Unit-II**

**Arduino**: introduction, Pin Configuration and Architecture, Device and Platform Features, Concept of Digital and Analog ports, Arduino Interfacing Board, Introduction to Embedded C and Arduino Platform.

**Unit-III**

**Basic Concepts and Functions**: Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions, Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalWrite() Function, analogRead() function, Arduino Interrupts.

**Unit-IV**

**Arduino Time and Displays**: Incorporating Arduino time, delay() function, delay Microseconds() function, millis() function, micros() function. Working with Serial Monitor, Line graph via serial monitor, interfacing 8 bit LCD to Arduino, Fixed one line static message display, Running message display using the LCD Library of Arduino.

**Unit-V**

**Arduino Sensors and Secondary Integrations**: Humidity Sensor, Temperature Sensor, Water Detector/ Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Relay switches). Types of Relay, Controlling Electrical appliances with electromagnetic relays.

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**RECOMMENDED BOOKS**:

- Arduino for Dummies, by John Nussey (2013)

**References:**

1. Arduino Projects for Dummies, by Brock Craft (2013)
2. Programming Arduino – Getting Started with Sketches, Simon Monk (2016)
3. Programming Arduino - Next Steps, by Simon Monk (2016)

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## COURSE OUTCOMES

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

CO1: define the basic concept of Embedded System.

CO2: describe the basic principles of Arduino programming and IDE.

CO3: familiarize with different types of sensors and related systems.

CO4: design, implement, debug and test programs/ system.

CO5: design and develop Smart systems applications.

CO6: build Arduino board using different sensors.

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**ANNEXURE - VI**

# *Scheme & Syllabi*
# *(along with the Course Outcomes)*
# *of*
# *B. Tech. III & IV Semester*
# *(Information Technology)*
## *(Batch Admitted in 2020-21)*
# *Under Flexible Curriculum*
## *[ITEM - 7]*

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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## Department of Information Technology

## Scheme of Evaluation

## B. Tech. III Semester (Information Technology)

***For batches admitted in academic session 2020 – 21 onwards***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam. | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assign ment | | Lab work & Sessional | Skill Based Mini Project | | | | | | | |
| 1. | 100001 | BSC | Engineering Mathematics-II | 50 | 10 | 20 | 20 | - | - | - | 100 | 2 | 1 | - | 3 | Offline | PP |
| 2. | 160311 | DC | Computer System Organization | 50 | 10 | 20 | 20 | - | - | - | 100 | 2 | 1 | - | 3 | Blended (2/1) | PP |
| 3. | 160312 | DC | Design & Analysis of Algorithms | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Blended (2/1) | PP |
| 4. | 160313 | DC | Database Management System | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Blended (2/1) | MCQ |
| 5. | 160314 | DC | Operating System | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | PP |
| 6. | 160315 | DLC | Java Programming Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | 1 | 2 | 2 | Blended (2/1) | SO |
| 7. | 160316 | DLC | Self-learning/Presentation (SWAYAM/NPTEL/MOOC) | - | - | - | - | - | 40 | - | 40 | - | - | 2 | 1 | Online and Mentoring | SO |
| 8. | 200XXX | CLC | **Novel Engaging Course (Informal Learning)** | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| 9. | 160317 | DLC | Summer Internship Project–I (Institute Level) (Evaluation) | - | - | - | - | 60 | - | - | 60 | - | - | 4 | 2 | Offline | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **290** | **100** | **60** | **950** | **12** | **4** | **14** | | - | - |
| 10. | 100002 | MAC | Biology for Engineers | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | Grade | Online | MCQ |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | NEC | Total Credits |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | |
| | | Offline | Online | | | | | | | | |
| 03 | - | 08 | 05 | 06 | 01 | 12 | - | 03 | 07 | 01 | 23 |
| 13.03% | - | 34.78% | 21.74% | 26.09% | 4.35% | 52.17% | - | 13.04% | 30.43% | 4.35% | Credits % |

DEAN (ACADEMICS)
M.I.T.S
GWALIOR

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)**

## Department of Information Technology

## Scheme of Evaluation

## B. Tech. IV Semester (Information Technology)

***For batches admitted in academic session 2020 – 21 onwards***

| S. No. | Subject Code | Category Code | Subject Name | Maximum Marks Allotted | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Teaching (Offline/ Online) | Mode of Exam. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | Practical Slot | | | | L | T | P | | | |
| | | | | End Term Evaluation | | Continuous Evaluation | | End Sem. Exam. | Continuous Evaluation | | | | | | | | |
| | | | | End Sem. Exam. | $Proficiency in subject /course | Mid Sem. Exam. | Quiz/ Assign ment | | Lab work & Sessional | Skill Based Mini Project | | | | | | | |
| 1. | 100003 | BSC | Engineering Mathematics- III | 50 | 10 | 20 | 20 | - | - | - | 100 | 2 | 1 | - | 3 | Offline | PP |
| 2. | 160411 | DC | Computer Graphics & Multimedia | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 3 | - | 2 | 4 | Offline | PP |
| 3. | 160412 | DC | Software Engineering | 50 | 10 | 20 | 20 | 60 | 20 | 20 | 200 | 2 | 1 | 2 | 4 | Blended (2/1) | MCQ |
| 4. | 160413 | DC | Computer Networks | 50 | 10 | 20 | 20 | - | - | - | 100 | 2 | 1 | - | 3 | Offline | PP |
| 5. | 100004 | MC | Cyber Security | 50 | 10 | 20 | 20 | - | - | - | 100 | 3 | - | - | 3 | Blended (2/1) | MCQ |
| 6. | 160414 | DLC | Python Programming Lab | - | - | - | - | 60 | 20 | 20 | 100 | - | 1 | 2 | 2 | Blended (2/1) | SO |
| 7. | 200XXX | CLC | Novel Engaging Course (Informal Learning) | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Interactive | SO |
| **Total** | | | | **250** | **50** | **100** | **100** | **230** | **60** | **60** | **850** | **12** | **4** | **8** | **20** | **-** | **-** |
| 8. | 100006 | MAC | Indian Constitution and Traditional Knowledge | 50 | 10 | 20 | 20 | - | - | - | 100 | - | - | - | GRADE | Online | MCQ |
| **Summer Internship Project-II (Soft skill Based) for two weeks duration: Evaluation in V Semester** | | | | | | | | | | | | | | | | | |

**$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

| Mode of Teaching | | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Lab | NEC | Theory | | | Lab | NEC | |
| Offline | Online | Blended | | Offline | Interactive | PP | A+O | MCQ | SO | SO | |
| | | Offline | Online | | | | | | | | |
| 09 | - | 04 | 03 | 03 | 01 | 09 | - | 06 | 04 | 01 | 20 |
| 45% | - | 20% | 15% | 15% | 5% | 45% | - | 30% | 20% | 5% | Credits % |

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Department of Information Technology

# COMPUTER SYSTEM ORGANIZATION
# 160311

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | - | 3 |

## COURSE OBJECTIVE

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.

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**Unit -I**

**Introduction:** Von Newman Model, Various Subsystems, CPU, Memory, I/O, System Bus, CPU and Memory Registers, Program Counter, Accumulator, Register Transfer and Micro Operations: Register Transfer Language, Register Transfer, Tree-State Bus Buffers, Bus and Memory Transfers, Arithmetic Micro-Operation, Logic Micro-Operation, Shift Micro-Operation Register Transfer Micro Operations, Arithmetic Micro-Operations, Logic Micro-Operations and Shift Micro-Operations.

**Unit- II**

**Computer Arithmetic:** Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Division Algorithm, Division Algorithms, Floating-Point Arithmetic Operations.

**Central Processing Unit (CPU):** General Purpose Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Hardwired and Microprogrammed Control.

**Unit -III**

**Microprocessors:** Introduction of 8085 Microprocessor: Architecture, Instruction Set, Addressing Modes, Interrupts and Basic Assembly Language Programming.

**Unit -IV**

**Input-Output Organization:** Peripheral Devices, I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA (DMA Controller, DMA

Transfer), Input-Output Processor (IOP), Data Transfer- Serial/Parallel, Simplex/ Half Duplex/ Full Duplex.

**Unit-V**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory- Organization and Mappings, Memory Management Hardware, Introduction to Pipelining & Multiprocessors.

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**RECOMMENDED BOOKS**

- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.

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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. recall the basic building blocks of computer Architecture.
CO2. compare different memories.
CO3. apply the concept of memory mapping, multiprocessor and pipelining in solving real world problems.
CO4. analyze various modes of Input-Output data transfer.
CO5. evaluate the arithmetic related to the number system.
CO6. develop the skill of writing low level programming.

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Department of Information Technology

# DESIGN & ANALYSIS OF ALGORITHMS
## 160312

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

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**Unit-I**

**Introduction to Computational Model:** Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

**Unit-II**

**Divide and Conquer Method:** Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and additional real world problems on divide and conquer.

**Unit-III**

**Greedy Method:** Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, **Minimum Cost Spanning Trees :** Prims's and Kruskal's Algorithm, Knapsack Problem, Dijkstra's single source shortest path algorithm, Optimal Storage on Tapes.

**Unit-IV**

**Dynamic Programming:** Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling salesman problem, Floyd's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix chain multiplication

**Unit-V**

**Backtracking:** Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

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**RECOMMENDED BOOKS**


- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.


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## COURSE OUTCOMES

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

CO1. demonstrate a familiarity with major algorithms and data structures.
CO2. apply important algorithmic design paradigms and methods of analysis.
CO3. analyze the asymptotic performance of algorithms.
CO4. compare different design techniques to develop algorithms for computational problems.
CO5. design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.
CO6. understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.

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Department of Information Technology

# DATABASE MANAGEMENT SYSTEM
# 160313

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

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**Unit-I**

**DBMS:** Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model, Comparison between Models.

**Entities and Relationship Model:** Entity types, Entity sets, Attributes and Keys, Relationship Types and Sets, Constraints, Design issue, E-R Diagram, Weak Entity Sets.

**Unit-II**

**Relational Model:** Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views, Database Relations, Properties of Relations, Attributes, Keys, Attributes of Relation, Domain Constraints, Integrity Constraints.

**Relational Algebra:** Concepts and Operations: Select, Project, Division, Intersection, Union, Division, Rename, Join etc.

**Relational Calculus:** Tuple Relational Calculus, Domain Relational Calculus.

**Unit-III**

**SQL:** Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL)

**Unit-IV**

**Relational Database Design:** Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, The Process of Normalization, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

**Unit-V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

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## RECOMMENDED BOOKS


- Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
- Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
- Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
- An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.


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## COURSE OUTCOMES

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

CO1. demonstrate the concepts of different type of database system.
CO2. apply relational algebra concepts to design database system.
CO3. make use of queries to design and access database system.
CO4. analyze the evaluation of transaction processing and concurrency control.
CO5. determine the optimize database for real world applications.
CO6. design a database system for a real world application.

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Department of Information Technology

# OPERATING SYSTEM
# 160314

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

---

**Unit I**

**Basics of Operating System:** Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

**Unit II**

**Process Management:** Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

**Unit III**

**Process Synchronization:** Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

**Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**Unit IV**

**Memory Management:** Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

**Unit V**

**Storage Management:** Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

**File System Interface:** The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

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**RECOMMENDED BOOKS**


- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.


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## COURSE OUTCOMES

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

CO1. tell the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.

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Department of Information Technology

# JAVA PROGRAMMING LAB
# 160315

| L | T | P | Total Credits |
|---|---|---|---|
| - | 1 | 2 | 2 |

## COURSE OBJECTIVES

- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To acquire the ability to write a computer program to solve specified problems.
- To be able to use Java SDK environment to create, debug and run simple Java programs.

---

**Unit-I**

**Introduction to Java programming:** Overview and Characteristics of Java, The Java Virtual Machine, Installing Java, Java Program Development, Java Source File Structure, Compilation, Executions. Packages, Package access, Variables and data types, Conditional and looping constructs, Arrays.

**Unit-II**

**Object-oriented programming with Java Classes and Objects:** Fields and Methods, Constructors, Overloading methods, Nested classes, Overriding methods, Polymorphism, Making methods and classes final, Wrapper classes.

**Unit-III**

**Extending Classes and Inheritance:** Types of Inheritance in Java, Abstract classes and methods, Interfaces, use of 'super', Polymorphism in inheritance. Garbage collection in JAVA.

**Exception handling:** Try- Catch, Throw, Throws, Finally constructs, The Exception class.

**Unit-IV**

**String Package and Multithreading:** Operation on String, Mutable & Immutable String, Tokenizing a String, Creating Strings using String Buffer class.

**Understanding Threads:** Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities and Synchronizing Threads.

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**Unit-V**

**The I/O Package:** Input Stream and Output Stream classes, Reader and Writer classes, Basics of AWT, Swing and Applets: Layout Managers, Event Handling, Classes for various controls, such as label, choice, list, checkbox, etc., Dialogs and frames using menus.

**Basic concepts of networking:** Working with URLs, Concepts of URLs and Sockets. Basics of database connectivity with JDBC.

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**RECOMMENDED BOOKS**


- Programming with JAVA: A Primer, E. Balagurusamy, Tata McGraw Hill.
- JAVA: The Complete Reference, Herbert Schildt, McGraw Hill Education.
- JAVA-2: The Complete Reference, Patrick Naughton, Herbert Schidt.


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## COURSE OUTCOMES

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

CO1. tell the available features in Java programming language.
CO2. illustrate Java programming concepts for solving problems.
CO3. make use of the Java programming methods for connecting the various databases.
CO4. test for bugs in a software application written in the Java programming language.
CO5. determine different ways for handling exceptions, memory management, file handling, i/o management and internet based application development.
CO6. build a project for application development using Java programming language.

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# COMPUTER GRAPHICS & MULTIMEDIA
# 160411

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | 2 | 4 |

## COURSE OBJECTIVES

- To provide an introduction to the theory and practice of computer graphics.
- To give a good exposure related to Computer Graphics algorithms and to design various graphics primitives.
- To enhance the proficiency in programming skills related to animation and graphics object design

---

**Unit-I**

**Introduction to Computer Graphics:** Interactive Computer Graphics, Application of Computer Graphics, Random and Raster Scan Displays, Storage Tube Graphics Display, Calligraphic Refresh Graphics Display, Flat Panel Display, Refreshing, Flickering, Interlacing, Resolution, Bit Depth, Aspect Ratio etc.

**Unit-II**

**Scan Conversion Technique:** Image representation, Line drawing: DDA, Bresenham's Algorithm. Circle Drawing: General Method, Mid-Point, DDA, Bresenham's Circle Generation Algorithm, Ellipse Generation Algorithm, Curves: Parametric Function, Bezier Method, B-Spline Method.

**Unit-III**

**2D & 3D Transformations:** Translation, Rotation, Scaling, Reflection, Shearing, Inverse Transformation, Composite Transformation, World Coordinate System, Viewing Transformation, Representation of 3D object on Screen, Parallel and Perspective Projections.

**Unit-IV**

**Clipping:** Point clipping, Line Clipping, Simple Visibility Line Clipping Algorithm, Cohen Sutherland Line Clipping Algorithm etc, Polygon Clipping, Convex and Concave Polygon, Sutherland Hodgeman Polygon Clipping Algorithm etc, Hidden Surface Elimination: Z- Buffer algorithm and Painter's Algorithm, Area Filling, Basic

**Illumination Models:** Diffuse Reflection, Specular Reflection, Phong Shading, Gouraud Shading, Color Models like RGB, YIQ, CMY, HSV etc.

**Unit-V**

**Multimedia System:** An Introduction, Multimedia hardware, Multimedia System Architecture, Multimedia Authoring. Data & File Format standards: RTF, TIFF, MIDI, JPEG, DIB, MPEG. Audio: digital audio, MIDI, processing sound, sampling, compression. Video: AVI, 3GP, MOV, MPEG, compression standards, compression through spatial and temporal redundancy.

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## RECOMMENDED BOOKS


- Donald Hearn and M.P. Becker : Computer Graphics, PHI Publication
- FoleyVandam, Feiner, Hughes : Computer Graphics principle and Practice
- Rogers : Principles of Computers Graphics, TMH
- Sinha and Udai : Computer Graphics, TMH
- Prabhat K. Andleigh, Kiran Thakrar : Multimedia Systems Design, Prentice Hall PTR


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## COURSE OUTCOMES

After completion of the course students will be able to:

CO1. explain interactive computer graphics, various display devices and explore applications of computer graphics.
CO2. illustrate various line generations, circle generation, curve generation and shape generation algorithms.
CO3. apply various 2-dimensional and 3-dimensional transformations and projections on images.
CO4. classify methods of image clipping and various algorithms for line and polygon clipping.
CO5. choose appropriate filling algorithms, hidden surface elimination algorithm and apply on various images.
CO6. discuss various color models, shading methods and multimedia.

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# SOFTWARE ENGINEERING
# 160412

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

## COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

---

**Unit - I**

**Introduction to Software Engineering:** Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

**Unit - II**

**Requirement Engineering:** Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

**Unit - III**

**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

**Unit - IV**

**Software Metrics, Project Management and Estimation:** Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

**Unit - V**

**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

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**RECOMMENDED BOOKS**


- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.


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## COURSE OUTCOMES

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

CO1. explain the various fundamental concepts of software engineering.
CO2. develop the concepts related to software design & analysis.
CO3. compare the techniques for software project management & estimation.
CO4. choose the appropriate model for real life software project.
CO5. design the software using modern tools and technologies.
CO6. test the software through different approaches.

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Department of Information Technology

# COMPUTER NETWORKS
# 160413

| L | T | P | Total Credits |
|---|---|---|---|
| 2 | 1 | - | 3 |

## COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable Students to deal with various networking problems such as flow control, error control and congestion control.

---

**Unit-I**

**Introduction:** Computer Network, Types- LAN,MAN & WAN, Data Transmission Modes- Serial & Parallel, Simplex, Half Duplex & Full Duplex, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Cables- Twisted Pair, Coaxial Cable & Optical Fiber, Networking Devices-Repeaters, Hub, Switch, Bridge, Router, Gateway and Modem, Performance Criteria- Bandwidth, Throughput, Propagation Time & Transmission Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode.

**Unit-II**

**Physical Layer:** Network Topologies- Bus, Ring, Star & Mesh, Line Coding- Unipolar, Polar and Bipolar, Switching- Circuit Switching, Message Switching & Packet Switching, Multiplexing: FDM – Frequency Division Multiplexing, WDM – Wavelength Division Multiplexing & TDM – Time Division Multiplexing.

**Unit-III**

**Data Link Layer:** Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- The Channel Allocation Problem, Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5.

**Unit-IV**

**Network Layer & Transport Layer:** Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Flooding, Congestion Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token Bucket Algorithm. Connection Oriented & Connectionless Service, IP Addressing.

**Unit-V**

**Presentation, Session& Application Layer:** Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail.

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**RECOMMENDED BOOKS**


- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.


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## COURSE OUTCOMES

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

CO1. explain the fundamental concepts of computer network.
CO2. illustrate the basic taxonomy & terminologies of computer network.
CO3. Identify various parameter for affecting the performance of computer network.
CO4. analyze the concepts of communication using various layer of OSI model.
CO5. evaluate the performance of computer network in congestion and Internet.
CO6. design the network environment and applications for implementation of computer networking concept.

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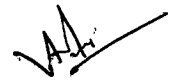

**MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005**
(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V. Bhopal, M.P.)

Department of Information Technology

# CYBER SECURITY
# 100004

| L | T | P | Total Credits |
|---|---|---|---|
| 3 | - | - | 3 |

## COURSE OBJECTIVES

- To provide an understanding of cyber security fundamentals.
- To analyse various cyber-attacks and their countermeasures.
- To provide basics of Internet and networking.
- To identify various cyber security threats and vulnerabilities.
- To apply forensic science to investigate a cybercrime.

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**Unit-I**

**Introduction-** Overview of Cyber Security, Cyber Crime, Cyber Warfare, Cyber Terrorism, Cyber Espionage, Cyber Vandalism (Hacking), Cyber Stalking, Internet Frauds and Software Piracy.

**Unit-II**

**Basics of Internet & Networking-** Wired and Wireless Networks, Internetworking Devices, Topologies, Web Browser, Web Server, OSI Model, IP Addressing, Firewall, E-Commerce, DNS, NAT, VPN, HTTP & HTTPS.

**Unit-III**

**Cryptography and Network Security-** Security Principles, Attacks, Cryptography, Steganography, Cryptanalysis, Symmetric Key and Public Key Cryptography, Digital Signature, Intrusion Detection System, Secure Socket Layer(SSL) & Secure Electronic Transaction(SET).

**Unit-IV**

**Cyber Security Threats and Vulnerabilities-** Hacker, Types of Hacker- White, Gray and Black, **Malicious Software's:** Virus, Worm, Trojan Horse, Backdoors and Spywares. Sniffers, Denial of Service Attack and Phishing.

**Unit-V**

**Cyber Crime Investigation and Legal Issues:** Intellectual Property, Privacy Issues, IT Act 2000, Basics of Cyber Crime Investigation- Cyber Forensics, Electronic Evidences and its Types.

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**RECOMMENDED BOOKS:**

- Cryptography and Network Security, 4/E, William Stallings, 4th edition, Pearson publication
- Computer Security: Principles and Practice, Stallings William, Pearson publication
- Investigating Network Intrusions and Cybercrime, EC-Council Press
- Network Forensics, Tracking Hackers through Cyberspace, Sherri Davidoff, Jonathan Ham, Prentice Hall.
- Cryptography and Network Security, 3e, Atul Kahate, McGraw Hill publication.

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**COURSE OUTCOMES:**

After completion of the course students would be able to:

**CO1.** tell the basic terminologies of cyber security.

**CO2.** explain the basic concept of networking and internet.

**CO3.** apply various methods used to protect data in the internet environment in real world situations.

**CO4.** discover the concept of IP security and architecture.

**CO5.** compare various types of cyber security threats/vulnerabilities.

**CO6.** develop the understanding of cybercrime investigation and IT ACT 2000.

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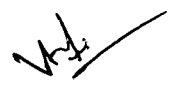

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Department of Information Technology

# PYTHON PROGRAMMING LAB
# 160414

| L | T | P | Total Credits |
|---|---|---|---|
| - | 1 | 2 | 2 |

## COURSE OBJECTIVES

- Implement an algorithm in Python by using standard programming constructs such as, functions, modules, aggregated data (arrays, lists, etc.)
- Explain the output of a given Python program and identify and correct errors in a given Python program
- Write programs using the features of object-oriented programming language such as, encapsulation, polymorphism, inheritance, etc.

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**Unit-I**

Introduction to Python programming language Data and Expressions: Literals; Variables and Identifiers; Operators; Expressions and Data Types, Logical operator; Boolean operator; Boolean Expressions; Control Structures; Selection Control, Iterative Control. Lists & tuples: List Structures; Lists in Python, Iterating over Lists in Python.

**Unit-II**

Functions: Arguments in functions; Program routes; Calling Value Returning Functions; Calling Non- value Returning Functions Parameter Passing; Variable Scope; Modular design Modules; Top-Down Design Python Modules; File Handling Operation in file: Reading, Writing and appending in Text Files.

**Unit-III**

String Processing; Dictionaries and sets operations; Exception Handling: Exceptions Data Collections applying lists etc.

**Unit-IV**

Introduction to Object Oriented Programming, Class, Objects, Encapsulation, Data abstraction, Inheritance, Polymorphism.

**Unit-V**

Graphics Programming: Graphics Programming, Using Graphical Objects, Interactive Graphics, Displaying Images, Generating Colors, Graphics Objects, Entry Objects, Test Case: Numpy, scipy; Test Case: panda, Matplotlib.

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**RECOMMENDED BOOKS**


- C. Dierbach, Introduction to Computer Science Using PYTHON: A Computational Problem-Solving Focus (1st ed.), Wiley, 2015. ISBN 978-8126556014.
- Yashavant Kanetkar, Let Us Python (1st ed.), BPB Publishers, 2019. ISBN 978-9388511568


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## COURSE OUTCOMES

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

CO1. solve computational problem using python language

CO2. familiar with basics syntax and features of python programming language

CO3. hands on experience to online coding tools like colab.

CO4. design a program utilizing the features of object oriented concept.

CO5. utilize some of the libraries available for solving problems.

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# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)**

Department of Information Technology

## M. Tech (Information Technology)

## INTRODUCTION TO INTERNET OF THINGS
## 800206 (OC-2)

## COURSE OBJECTIVES

- Introduction to IoT concepts and Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

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**Unit I**

Introduction to Internet of Things, Background, Monitoring and Controlling of things, IoT Reference Framework, IoT Architectures, Convergence of IT and OT, Mobile device explosion, Social network explosion, Digital Convergence/Transformation, Fast Rate of IoT Technology Adoption, Applications of IoT

**Unit II**

Sensors, Types of sensors, Actuators, Wearable electronics, Arduino board, Raspberry Pi, RFID, IoT Connectivity and Management, Telematics and Telemetry, Telematics vs IoT, M2M vs IoT, IoE, IIoT, V2V, V2X

**Unit III**

Internet & IoT protocols, LR-WPAN, Wimax, Zigbee, Z-Wave, IPv4, IPv6, 6LowPAN, MQTT, CoAP, AMQP, DDS, Websocket, Ethernet, WiFi, Bluetooth, InfraRed, IP Based Cellular Networks.

**Unit IV**

IoT Services Platform: Functions and Requirements, IoT Data Management and Analytics, Framework for distributed data analysis for IoT, Concept of Cloud computing & virtualization, Edge, Fog and Roof computing in IoT.

**Unit V**

IoT Vertical Markets and Connected Ecosystems: IoT Verticals, IoT Agriculture and Farming, IoT Energy Solutions, IoT Oil and Gas Solutions, IoT Smart Building

Solutions, IoT Finance, IoT Healthcare, IoT Industrial, IoT Transportation, IoT Challenges, Security, Privacy and Trust, Standardization gap

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**RECOMMENDED BOOKS**

- Internet of Things from Hype to Reality, The Road to Digitization, Ammar Rayes and Samer Salam, Second Edition, Springer
- Internet of Things (IoT) Technology, Economic View And Technical Standardization, Etienne Schneider, Version 1.0, ILNAS
- Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, Dimitrios Serpanos and Marilyn Wolf, Springer
- Internet of Things Principles and Paradigms, Rajkumar Buyya, Elsevier

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## COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain basic terminology of Internet of Things
CO2. to equip our students with the market perspective of IoT and have the knowledge of architectural overview of IoT.
CO3. identify and use various protocols devices that are used in IoT.
CO4. to be familiar with contemporary issues in IoT and Data and Knowledge Management and use of Devices in IoT Technology..
CO5. investigate challenges, security and privacy.
CO6. discuss different IoT enabled techniques behind interaction between things.

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Department of Information Technology

## M. Tech (Information Technology)

### CLOUD COMPUTING

### 800207 (OC-2)

**COURSE OBJECTIVES**

- To introduce the broad perceptive of cloud architecture and model.
- To understand the concept of Virtualization.
- To apply different cloud programming model as per need.

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**Unit- I**

Cloud Architecture and Model: Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics, Cloud Services, Cloud models, Public vs Private Cloud, Cloud Solutions Cloud ecosystem, Service management, Computing on demand.

**Unit- II**

Virtualization: Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices. Virtual Clusters and Resource management, Virtualization for Data-center Automation.

**Unit- III**

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

**Unit -IV**

Programming Model: Parallel and Distributed Programming Paradigms- MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

**Unit -V**

Security in the Cloud: Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.

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**RECOMMENDED BOOKS**


1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. Kumar Saurabh, " Cloud Computing — insights into New-Era Infrastructure", Wiley India,2011
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.


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**COURSE OUTCOMES**

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

CO1. define various basic concepts related to cloud computing.

CO2. identify the architecture, infrastructure and delivery models of cloud computing.

CO3. apply suitable virtualization concept

CO4. choose the appropriate programming models and approach

CO5. analysis of various security issues in cloud computing.

CO6. compose virtualization, security and programming module in cloud computing solutions.

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