ANNEXURE-I

Syllabi
of
Departmental Core (DC) Courses
B.Tech V Semester
(Computer Science & Engineering)
Under Flexible Curriculum

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 Computer Science & Engineering and Information Technology

SOFTWARE ENGINEERING
150502 (DC-9)

L	T	P	C
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.

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.

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 Computer Science & Engineering and Information Technology

THEORY OF COMPUTATION
150503 (DC-10)

L	T	P	C
2	1	2	4

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.

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 Computer Science & Engineering and Information Technology

MICROPROCESSOR & INTERFACING
150504 (DC-11)

L	T	P	C
2	1	2	4

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.

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.

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.

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.

Syllabi

of

Departmental Core (DC) Courses

B.Tech VI Semester

(Computer Science & Engineering)

Under Flexible Curriculum

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Department of Computer Science & Engineering and Information Technology

COMPILER DESIGN
150601 (DC-12)

L	T	P	C
2	1	2	4

COURSE OBJECTIVES

- To learn finite state machines and context free grammar.
- To learn, various phases of compiler
- To understand process of compiler implementation.

Unit-I

Overview of Translation Process: Introduction to Compiler, Major Data Structures in Compiler, Other Issues in Compiler Structure, BOOT Strapping and Porting, Compiler Structure: Analysis-Synthesis Model of Compilation, Various Phases of a Compiler, Tool Based Approach to Compiler Construction.

Unit-II

Lexical Analysis: Input Buffering, Symbol Table, Token, Recognition of Tokens, Lexeme and Patterns, Difficulties in Lexical Analysis, Error Reporting and Implementation. Regular Grammar & Language Definition, Transition Diagrams, Design of a Typical Scanner using LEX.

Unit-III

Syntax Analysis: Context Free Grammars (CFGs), Ambiguity, Basic Parsing Techniques: Top Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing LL(1) Grammar, Bottom-UP Parsing, Operator Precedence Parsing, LR Parsers (SLR, CLR, LALR), Design of a Typical Parser Using YACC.

Unit-IV

Semantic Analysis: Compilation of expression, control, structures, conditional statements, various intermediate code forms, syntax directed translation, Memory allocation and symbol table organizations, static and dynamic array allocation, string allocation, structure allocation etc., error detection indication and recovery, Routines or

printing various lexical, syntax and semantic errors.

Unit-V

Code generation and Code Optimization: Issues, Basic Blocks and Flow Graphs, Register Allocation, Code Generation, DAG Representation of Programs, Code Generation from DAGS, Peep-hole Optimization, Code Generator Generators, Specification of Machine. Code Optimization: Source of Optimizations, Optimization of Basic Blocks, Loops, Global Data Flow Analysis, Solution to Iterative Data Flow Equations, Code Improving Transformations, Dealing with Aliases, Data Flow Analysis of Structured Flow Graphs.

RECOMMENDED BOOKS

- Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. D. Ullman, Pearson Education.
- Compiler Construction: Principles and Practice, K.C. Louden, Cengage Learning.

COURSE OUTCOMES

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

CO1. define the concepts of finite automata and context free grammar.

CO2. build the concept of working of compiler.

CO3. examine various parsing techniques and their comparison.

CO4. compare various code generation and code optimization techniques.

CO5. analyze different tools and techniques for designing a compiler.

CO6. design various phases of compiler.

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Department of Computer Science & Engineering and Information Technology

COMPUTER NETWORKS
150602 (DC-13)

L	T	P	C
4	-	-	4

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.

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.

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 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.

Syllabi

of

Mandatory Course(MC)

B.Tech V Semester

(Computer Science & Engineering)

Under Flexible Curriculum

Department of Computer Science & Engineering and Information Technology

Indian Constitution and Traditional Knowledge
100006

100006	Indian Constitution and Traditional Knowledge	Theory	Midterm	Quiz/Assignment	TOTAL	L	T	P	C
		70	20	10	100	3	-	-	-

COURSE OBJECTIVES

- The course aims to provide students with the continuous, comprehensive and cumulative understanding of Indian Knowledge Tradition (Philosophy, Language, Art) and its modern interpretation and analysis.
- It intends to connect the students' modern advanced knowledge system with the roots of Indian Knowledge Tradition for their development and better understanding of the essentials of thought process, intellection and inference.
- To impart the knowledge of the Yogic Science and an insight into Sanskrit Literature which will promote interest among students in discerning the significance of health and wisdom with an Indian perspective.
- The objective of the syllabus is to familiarize students with the essential features and basic principles of the constitution of India.
- It will acquaint them with the concept of government, its organs and various types.
- It will provide students with a comprehensive and clear understanding of the basic fundamental rights and duties.

Unit-I

- Introduction to Basic Structure of Indian Knowledge System
- Homogeneity of modern science and Indian Knowledge Tradition
- Yoga: Promoting positive health and personality
- Case Studies

Unit-II

- Indian Philosophy or Darshanas: Jainism, Buddhism, Yoga, Śaiva and Vedanta
- Indian Linguistic Tradition: Panini's Ashtadhyayi
- Indian Art: Mauryan art, Buddhist art, Gupta art, Muslim Art & Culture Contemporary art

- Case Studies

Unit III:

Introduction to Political Science

- Nature and scope of political science
- Definition, elements and theories of origin of State (Social Contract and Evolutionary)
- Meaning and features of Civil Society
- Indian Political Thought: Raja Ram Mohan Roy, Swami Vivekanand, Gandhi, Ambedkar

Unit IV:

Concept of Government and Its Organs

- Government: Definition and its characteristics
- Types and meaning of Legislature: Composition, Function and Role of the Parliament (Lok Sabha and Rajya Sabha)
- The Powers, Position and Role of the President, Prime Minister and the Cabinet
- The Powers, Position and Role of the Governor and the Chief Minister; Composition and the role of Supreme Court, Judicial Review and Judicial Activism

Unit V:

Salient features of Indian Constitution

- Preamble, Conventions, Sovereignty of the Constitution and the Rule of Law
- Parliamentary Democracy, Federalism, Secularism and Socialism
- Fundamental Rights, Directive Principles of State Policies and Fundamental Duties
- Election Commission and Electoral Reforms

BASIC READINGS:

- O.P. Gauba, Political Theory, Macmillan, (latest edition).
- D.D. Basu, Introduction to the Constitution of India, (Latest Edition).
- N.G. Jayal & Pratap Bhanu Mehta, The Oxford Companion of Politics in India, 2000.
- W.H. Morris-Jones, The Government and Politics of India.
- Swami Jitamanand, Holistic Science and Vedam, Bhartiya Vidyabhawan

- V. Shivramakrishnan (Ed.), Cultural Heritage of India, Bhartiya Vidyabhawan, Mumbai Fifth Edition, 2014.
- Yoga sutra of Patanjali, Ramakrishnan Mission, Kolkata.
- Panini Shiksha, Motilal Banarsidas
- VN Jh, Language, Thought and Reality
- Krishna Chaitanya. Arts of India, Abhinav Publications, 1987.
- SC Chaterjee and DM Datta, An Introduction to Indian Philosophy, university of Calcutta, 1984
- A L Basham, The Wonder That was India

COURSE OUTCOMES

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

CO1. know the rich Indian traditions and the Indian constitution.

CO2. Appraise the utility and significance of tradition and its applicability in present times.

CO3. Employ the knowledge of the constitutional norms as laid in the constitution and abide by the practices stated therein.

CO4. Create a better society and living standards for themselves as well as for others.

CO5. Recognize the basic concepts of ethics and morality pertaining to Indian culture and tradition.

CO6. Connect traditional Indian philosophy with their everyday conduct and practices.

Syllabi

of

Mandatory Course (MC)

B.Tech VI Semester

(Computer Science & Engineering)

Under Flexible Curriculum

Department of Computer Science & Engineering and Information Technology

DISASTER MANAGEMENT
100007

100007	Disaster Management (MC)	Theory	Midterm	Quiz/Assignment	Total	L	T	P	C
		70	20	10	100	3	-	-	03

COURSE OBJECTIVES

- To understand basic concepts in Disaster Management
- To understand Definitions and Terminologies used in Disaster Management
- To understand Types and Categories of Disasters
- To understand the Challenges posed by Disaster
- To understand Impact of Disasters key skills

Unit-I

Introduction to disaster management, concepts and definitions: disaster, vulnerability, risk severity, frequency and details, capacity impact, prevention, mitigation.

Unit-II

Disasters – Disasters classification, demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends, hazard and vulnerability profile of India.

Unit-III

Disaster Impacts – Disaster impact (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues, impact of natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides etc.), impact of manmade disasters (industrial pollution, artificial flooding in urban areas, urban disasters, transportation accidents etc.).

Unit-IV

Disaster Risk Reduction (DRR) - Disaster management cycle- its phases; prevention, mitigation, preparedness, relief and recovery; structural and non- structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response. Roles and responsibilities of government, community,

local institutions, NGOs and other stakeholders: Policies and legislation for disaster management. DRR programmes in India and the activities of National Disaster Management Authority.

Unit-V

Disasters, Environment and Development – Factors affecting vulnerability such as impact of development projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
- Srivastava H.H. & Gupta G.D., Management of Natural Disasters in developing countries, Daya Publishers Delhi, 2006, 201 pages.

REFERENCE BOOKS:

- http://ndma.gov.in (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in / (National Disaster Management in India)
- Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
- National Disaster Management Policy, 2009, GOI.
- Inter Agency Standing Committee (IASC) (Feb. 2007), IASC Guidelines on Mental Health and Psychosocial Support in Emergency Setting. Geneva: IASC

COURSE OUTCOMES

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

CO1. Propose disaster prevention and mitigation approaches.

CO2. Classify global and national disasters, their trends and profiles.

CO3. Appreciate the impacts of various disasters.

CO4. Apply Disaster Risk Reduction in management.

CO5. Find the linkage between disasters, environment and development.

ANNEXURE-IV

Syllabi
of
Departmental Electives (DEs) Courses
B.Tech VI Semester
(Computer Science & Engineering)
Under Flexible Curriculum

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005
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List of Departmental Elective (DE) Courses

B.Tech (Computer Science & Engineering)

	VI Semester			
Code Category	DE-1		DE-2	
	Subject Code	Subject Name	Subject Code	Subject Name
Track 1	Network Security			
	150603 A	Network & Web Security	150604A	Ethical Hacking
Track 2	Distributed Computing			
	150603 B	Parallel Processing	150604 B	Distributed Systems
Track 3	Image Processing			
	150603 C	Image Processing	150604 C	Pattern Recognition

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Department of Computer Science & Engineering and Information Technology

NETWORK & WEB SECURITY
150603 A (DE-1)

L	T	P	C
4	-	-	4

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.

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.

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.

Department of Computer Science & Engineering and Information Technology

PARALLEL PROCESSING
150603 B (DE-1)

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

- To describe different parallel processing architectures based on relationships between processing elements, instruction sequence, memory and interconnected network.
- To identify design and develop algorithms which require parallelization as part of system design or performance enhancement.
- To evaluate the performance of parallel algorithms designed based on shared and distributed memory models as well as against serial based algorithm designs.

Unit-I

Introduction to Parallel Processing: Multiprogramming and Time Sharing, Parallelism in Uniprocessor system, Parallel computer structure, Architectural classification schemes and Parallel processing applications.

Unit-II

Principles of Pipelining: Pipelining principle of linear pipelining, Performance measures, General Pipelines, reservation tables, Instruction and Arithmetic pipelines, Instruction Prefect, Branch handling, Data Buffering, Internal Forwarding and Register tagging, Hazard detection and resolution, Job Sequencing and Collision prevention.

Unit-III

Vector Processing: Vector processing requirements, Characteristics of vector processing multiple vector task dispatching, pipeline vector processing methods, vector super computers, recent vector processors, Architecture of CRAY, Pipeline chaining and vector loops, Architecture of CYBER, Configurability.

Unit-IV

Array Processing: SIMD organization, Interconnection networks, Parallel algorithm for array processor-Matrix Multiplication Parallel sorting on Array Processor, SIMD Fast Fourier transform, Connection issues for SIMD Processing.

Unit-V

Multiprocessor Architecture, Programming & Control: Loosely and Tightly Coupled Architectures. Functional Structures, Types Interconnection networks, Parallel memory organizations.

Process Synchronization mechanism: Semaphores, Critical Section and monitors, System deadlocks and protection schemes, Multiprocessor scheduling strategies, Parallel algorithms.

RECOMMENDED BOOKS

- Computer Architecture and Parallel Processing, K. Hwang and Briggs, Tata McGraw Hill.
- Advanced Computer Architecture, K. Hwang, Tata McGraw Hill.
- Computer Architecture and Organization, J.P. Hayes, Tata McGraw Hill.

COURSE OUTCOMES

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

CO1. define the fundamental concepts of parallelism.

CO2. illustrate the performance of different computing structures.

CO3. develop the ability for improving performance in parallel architecture.

CO4. analyze the parallel algorithms for real world problems solving.

CO5. assess the communication and the computing possibilities of parallel system architecture.

CO6. design contemporary parallel algorithms.

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Department of Computer Science & Engineering and Information Technology

IMAGE PROCESSING
150603 C (DE-1)

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

- To understand the fundamentals of Image acquisition, image processing in spatial and frequency domain.
- To understand image transforms and image enhancement techniques use to improve images.
- To know about the image restoration techniques, image registration and segmentation used in digital image processing.

Unit- I

Introduction and Fundamentals: Introduction to Image Processing Systems, Digital Image Fundamentals: Components of Digital Image Processing system, Image model, Imaging geometry, Sampling and quantization of images, Classification of digital images, Zooming and shrinking, Relationship between pixels, basics of convolution.

Unit- II

Image Enhancement in spatial domain: Introduction, Basic gray level function, piecewise linear transformation, Contrast stretching, Histogram specification, Histogram Equalization, Local enhancement using arithmetic and logical operation- Image subtraction, Image averaging Image smoothing: Smoothing Spatial Filters, Smoothing Linear Filters, Image sharpening.

Unit- III

Image Enhancement in Frequency domain: Introduction to Fourier Transform, Filters: low pass and High pass, Gaussian filters, Homomorphic filtering.

Image Restoration- Model of Image Degradation/Restoration process, Noise models, Noise reduction in spatial domain and frequency domain, Inverse filtering, mean filters, Least Mean Square(Wiener) filtering, FIR Wiener Filter.

Unit -IV

Morphological Image Processing: Logic operation involving binary images, Dilation and Erosion, Opening and Closing, Morphological Algorithms: Boundary extraction, Region filling, Extraction of connected components, Convex Hull, Thinning, and Thickening.

Unit -V

Image registration: Introduction, Geometric transformation, Plane to plane transformation, mapping. **Image Segmentation:** Introduction, Region extraction, pixel based approach, Multi level thresholding, Local thresholding, Region based approach, Region growing, Splitting and merging, Edge and Line detection, Corner detection, Detection of discontinuities, Edge linking and boundary detection.

RECOMMENDED BOOKS

- Digital Image Processing, Rafael C Gonzalez, Richard E Woods, Pearson Education.
- Fundamentals of Digital Image Processing, K. Jain, Pearson Education.
- Digital Image Processing, S. Esakkirajan, S. Jayaraman, T. Veerakumar, Tata McGraw-Hill Education.

COURSE OUTCOMES

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

CO1. define different modalities and current techniques in image processing.

CO2. classify spatial and frequency domain techniques used in image processing.

CO3. apply image processing techniques to enhance visual images.

CO4. analyse the constraints in image processing when dealing with real problems.

CO5. evaluate various Enhancement, restoration and retrieval techniques of image processing.

CO6. design a system using the mathematical models and principles of digital image processing for real world problems.

Department of Computer Science & Engineering and Information Technology

ETHICAL HACKING
150604 A (DE-2)

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

- To introduce the basic concepts and principles in ethical hacking.
- This includes the major techniques involved and system vulnerabilities issues for testing.
- To demonstrate vulnerabilities related to computer system to develop an understanding of Programming Survival Skills, Basic Linux Exploits and solution for these issues.

Unit-I

Introduction to Ethical Disclosure: Ethics of Hacking, Ethical Hacking and the legal system, Proper and Ethical Disclosure.

Unit-II

Penetration Testing and Tools: Using Metasploit, Using Back Track Live CD Linux Distribution.

Unit-III

Exploits: Programming Survival Skills, Basic Linux Exploits, Advanced Linux Exploits, Shell code Strategies, Writing Linux Shellcode, Basic windows Exploits.

Unit-IV

Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering, and Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege, Intelligent Fuzzing with Sulley, From Vulnerability to Exploit.

Unit-V

Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware. **Denial-of Service Attacks:** Types of Attacks (Smurf Attack, Buffer Overflow Attack, Ping of Death Attack, Teardrop Attack, SYN Attack, SYN Flooding), DDoS Attack

(Distributed DoS Attack.), Session Hijacking, Spoofing v Hijacking, TCP/IP hijacking, CAPTCHA Protection.

RECOMMENDED BOOKS

- Gray Hat Hacking: The Ethical Hackers' Handbook, Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Tata McGraw Hill.
- Hacking: The Art of Exploitation, Jon Erickson, No Starch Press.

COURSE OUTCOMES

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

CO1. demonstrate various penetration testing tools like Metasploit, Backtrack etc.

CO2. explain ethics behind hacking and vulnerability disclosure.

CO3. apply the reverse engineering and client-side browser exploits.

CO4. identify the core concepts related to malware, hardware and software vulnerabilities and their causes.

CO5. analyze the vulnerabilities related to computer system and networks using state of the art tools and technologies.

CO6. develop programming survival skills, basic Linux exploits, advanced Linux exploits, shell code strategies.

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Department of Computer Science & Engineering and Information Technology

DISTRIBUTED SYSTEMS
150604 B (DE-2)

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

- To provide students with contemporary knowledge, analyze and design distributed applications.
- To provide master skills to measure the performance of distributed algorithms
- To gain experience in the design and testing of a large software system, and to be able to communicate that design to others.

Unit-I

Introduction to Distributed Systems: Architecture for Distributed System, Goals of Distributed system, Hardware and Software concepts, Distributed Computing Model, Advantages & Disadvantage distributed system, Issues in designing Distributed System.

Unit-II

Distributed Shared Memory: Basic Concept of Distributed Share Memory (DSM), DSM Architecture & its Types, Design & Implementations issues In DSM System, Structure of Share Memory Space, Consistency Model, and Thrashing.

Unit-III

Distributed File System: Desirable features of good Distributed File System, File Model, File Service Architecture, File Accessing Model, File Sharing Semantics, File Catching Scheme, File Application & Fault tolerance. Naming - Features, System Oriented Names, Object Locating Mechanism, Human Oriented Name.

Unit-IV

Inter Process Communication and Synchronization: API for Internet Protocol, Data Representation & Marshaling, Group Communication, Client Server Communication, RPC- Implementing RPC Mechanism, Stub Generation, RPC Messages. Synchronization: - Clock Synchronization, Mutual Exclusion, Election Algorithms - Bully & Ring Algorithms.

Unit-V

Distributed Scheduling and Deadlock Distributed Scheduling- Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types of Load Distributing Algorithms, Task Migration and its issues. Deadlock- Issues in deadlock detection & Resolutions, Deadlock Handling Strategy, Distributed Deadlock Algorithms. Case Study of Distributed System: - Amoeba, Mach, Chorus.

RECOMMENDED BOOKS

- Distributed Operating System Concept & Design, Sinha, PHI.
- Distributed System Concepts and Design, Coulouris & Dollimore, Pearson.
- Distributed Operating System, Andrew S. Tanenbaum, Pearson.

COURSE OUTCOMES

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

CO1. define the basic elements and concepts related to distributed system technologies.

CO2. demonstrate knowledge of the core architectural aspects of distributed systems.

CO3. identify how the resources in a distributed system are managed by Algorithm.

CO4. examine the concept of distributed shared memory, file system and, inter process communication.

CO5. compare various distributed system algorithms for solving real world problems.

CO6. discuss large-scale distributed applications.

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PATTERN RECOGNITION
150604 C (DE-2)

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

- To understand the fundamentals of Pattern Recognition techniques.
- To understand the principles of Classification approaches to Pattern Recognition.
- To understand the Neural Network approach to Pattern Recognition.

Unit-I

Pattern Classifier: Overview of pattern recognition, Discriminant functions, Supervised learning ,Parametric estimation, Maximum likelihood estimation, Bayesian parameter estimation, Perceptron algorithm, LMSE algorithm, Problems with Bayes approach, Pattern classification by distance functions, Minimum distance pattern classifier.

Unit-II

Unsupervised Classification: Clustering for unsupervised learning and classification, Clustering concept, C-means algorithm, Hierarchical clustering procedures, Graph theoretic approach to pattern clustering, Validity of clustering solutions.

Unit-III

Structural Pattern Recognition: Elements of formal grammars, String generation as pattern description, Recognition of syntactic description, Parsing, Stochastic grammars and applications, Graph based structural representation.

Unit-IV

Feature Extraction And Selection: Entropy minimization, Karhunen Loeve transformation, Feature selection through functions approximation, Binary feature selection.

Unit-V

Recent Advances: Neural network structures for Pattern Recognition, Neural network based Pattern associators, Unsupervised learning in neural Pattern Recognition, Self-organizing networks, Fuzzy logic, Fuzzy pattern classifiers, Pattern classification using

Genetic Algorithms.

RECOMMENDED BOOKS

- Pattern Recognition Statistical, Structural and Neural Approaches, Robert J. Schalkoff, John Wiley & Sons.
- Pattern Recognition Principles, Tou and Gonzales, Wesley Publication Company.
- Pattern Classification and Scene Analysis, R.O. Duda and P. E. Har , Wiley.
- Pattern Recognition Engineering, Morton Nadier and Eric Smith, John Wiley & Sons.

COURSE OUTCOMES

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

CO1. define the basic elements and concepts related to distributed system technologies.

CO2. demonstrate knowledge of the core architectural aspects of distributed systems.

CO3. identify how the resources in a distributed system are managed by Algorithm.

CO4. examine the concept of distributed shared memory, file system and, inter process communication.

CO5. compare various distributed system algorithms for solving real world problems.

CO6. discuss large-scale distributed applications.

Syllabi

of

Open Category (OC) Courses

B.Tech VI Semester

(Computer Science & Engineering)

Under Flexible Curriculum

List of Open Category Courses

VI Semester				
S. NO.	**Code Category**	**Subject Code**	**Subject Name**	**Course Prerequisite**
1.	OC-1	150605 A	R Programming	• Basic of programming.
		150605 B	Social Networking	• Basic knowledge of graph theory. • Basic knowledge of various networks and its components.
		150605 C	Soft Computing	• Basic knowledge of set theory, calculus and probability theory.

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R PROGRAMMING
150605 A (OC-1)

L	T	P	C
2	1	-	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.

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 commands in performing operations over data.

CO4. analyze the data set using constructs of R.

CO5. choose appropriate packages for dealing various tasks.

CO6. predict results from the datasets using R commands.

Department of Computer Science & Engineering and Information Technology

SOCIAL NETWORKING
150605 B (OC-1)

L	T	P	C
2	1	-	3

COURSE OBJECTIVES

- To know basic notation and terminology used in network science.
- To be able to visualize, summarize and compare networks.
- To develop practical skills of network analysis and be capable of analyzing real work networks.

Unit- I

Introduction: Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis, Electronic sources for network analysis: Electronic discussion networks, Blogs and Online communities, Web-based networks, Applications of Social Network Analysis.

Unit- II

Modeling, Aggregating and Knowledge Representation: Ontology and their role in the Semantic Web: Ontology, based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework, Web Ontology Language, Modeling and aggregating social network data: State of the art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, aggregating and reasoning with social network data, advanced representations.

Unit- III

Extraction and Mining Communities in Web Social Networks: Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Decentralized

online social networks, Multi, Relational characterization of dynamic social network communities.

Unit- IV

Predicting Human Behavior and Privacy Issues: Understanding and predicting human behavior for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, Trust models based on subjective logic, Trust network analysis, Trust transitivity analysis, Combining trust and reputation, Trust derivation based on trust comparisons, Attack spectrum and countermeasures.

Unit- V

Visualization and Applications of Social Networks: Graph theory, Centrality, Clustering, Node, Edge Diagrams, Matrix representation, Visualizing online social networks, Visualizing social networks with matrix based representations, Matrix and Node, Link Diagrams, Hybrid representations, Applications, Cover networks, Community welfare, Collaboration networks, Co-Citation networks.

RECOMMENDED BOOKS

- Networks, Crowds, and Markets: Reasoning about a Highly Connected World, David Easley and John Kleinberg, Cambridge University Press.
- Statistical Analysis of Network Data with R (Use R!), Eric Kolaczyk, Gabor Csardi, Springer.
- Social Network Analysis: Methods and Applications, Stanley Wasserman and Katherine Faust, Cambridge University Press.

COURSE OUTCOMES

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

CO1. classify the alternatives for technologies to carry out social network analysis

CO2. demonstrate an understanding of the theory of social networks.

CO3. apply network analysis software to characterize social network structure in different forms.

CO4. analyze the impact of network structure on patterns through network statistics.

CO5. create social network analysis to understand socially meaningful outcomes in political action and online interaction

CO6. develop any application for designing social network.

Department of Computer Science & Engineering and Information Technology

SOFT COMPUTING
150605 C (OC-1)

L	T	P	C
2	1	-	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. Counterpropagation Networks, Adaptive Resonance Theory Network.

Unit-III

Fuzzy Set Theory: Fuzzy Sets, Fuzzy Membership Functions, Operations onFuzzy 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 Models, **Other Variants:** Sugeno Fuzzy Models, Tekamoto Fuzzy Models.

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, Genetic Programming, 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.

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 networks.

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.

List of Additional Courses to opt (Maximum Two) for the award of Honours during V Semester

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ANNEXURE V (a)

List of Additional Courses to opt (Maximum Two) for the award of Honours during V Semester

(Through SWAYAM/NPTEL under the mentorship of departmental faculty)

S. No.	Code	Course Name	Course Coordinator	Offering Institute	Weeks	Mentor
1.	noc19-cs40	Programming, Data Structures And Algorithms Using Python	Prof. Madhavan Mukund	CMI	8 weeks	Dr. Sanjiv Sharma
2.	noc19-cs55	Reinforcement Learning	Prof. Balaraman Ravindran	IIT Madras	12 Weeks	Prof. Punit K. Johari
3.	noc19-cs60	Data Science for Engineers	Prof. Ragunathan Rengasamy and Prof. Shankar Narasimhan	IIT Madras	8 Weeks	Prof. Amit K. Manjhwar
4.	noc19-cs72	Hardware modeling using verilog	Prof. Indranil Sengupta	IITKGP	8 Weeks	Prof. Vikas Sejwar
5.	noc19-cs73	Synthesis of Digital Systems	Prof. Preeti Ranjan Panda	IITD	12 Weeks	Prof. Neha Bharadwaj
6.	noc19-cs77	Spatial Informatics	Prof. Soumya K Ghosh	IITKGP	8 weeks	Prof. Khushboo Agarwal
7.	noc19-cs81	Introduction To Haskell Programming	Prof. Madhavan Mukund Prof. S. P Suresh	CMI	8 weeks	Prof. Rajni Rajan Makwana
8.	noc19-cs82	Practical Machine Learning with Tensorflow	Prof. Ashish Tendulkar Prof. B. Ravindran	IITM & Google	8 weeks	Prof. Rajeev K. Singh
9.	noc19-cs78	Fuzzy Systems and Applications	Prof. Nishchal K Verma	IITK	12 weeks	Prof. Jaimala Jha
10.	noc19-cs79	Modern Algebra	Prof. Manindra Agrawal	IITK	8 weeks	Prof. Abhilash Sonker

List of Additional Courses to opt (Maximum Two)

for the award of

Minor Specialization during V Semester

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ANNEXURE V (b)

List of Additional Courses opt (Maximum Two) for the award of Minor Specialization during V Semester

(Through SWAYAM/NPTEL under the mentorship of departmental faculty)

S. No.	Code	Subject Name	Course Coordinator	Offering Institute	Weeks	Mentor
1.	noc19-cs46	Data Base Management System	Prof. Partha Pratim Das	IITKGP	8 weeks	Prof. Punit K. Johari
2.	noc19-cs40	Programming, Data Structures And Algorithms Using Python	Prof. Madhavan Mukund	CMI	8 weeks	Prof. Rajni Rajan Makwana
3.	noc19-cs51	Operating System Fundamentals	Prof. Santanu Chattopadhyay	IITKGP	12 Weeks	Prof. Neha Bharadwaj
4.	noc19-cs69	Software Engineering	Prof. Rajib Mall	IITKGP	12 Weeks	Prof. Rajiv K. Singh
5.	noc19-cs80	Theory of Computation	Prof. Raghunath Tewari	IITK	8 weeks	Prof. Abhilash Sonker
6.	noc19-cs85	Programming In Java	Prof. Debasis Samanta	IIT Kharagpur	12 weeks	Prof. Mahesh Parmar
7.	noc19-cs49	Discrete Mathematics	Prof. Sajith Gopalan, Prof. Benny George K	IITG	12 Weeks	Prof. Khushboo Agarwal

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For batch admitted in Academic Session 2017-18

ANNEXURE-VII

Semester-Wise Scheme & Guidelines for Flexible Curriculum

Abbreviations used

L	Lecture
T	Tutorial
P	Practical
HSMC	Humanities and Social Sciences including Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
DC	Departmental Core
DE	Departmental Elective
OC	Open Category
DLC	Departmental Laboratory Courses
MC	Mandatory Course
MOOC	Massive Open Online Courses

Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical(Lab)/week	1 credit

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Credit Requirements & Guidelines for MOOCs *(For batch admitted in Academic Session 2017-18)*

- For the award of Under Graduate (UG) degree in Engineering/Technology (without Honours / Minor Specialization), it is required to earn **170 Credits**. For the B. Architecture degree the total credit requirement is **260 credits**.
- **Additional Credit requirement** for getting an **Honours** or **Minor Specialization in** other interdisciplinary areas / fields of Engineering, Technology, Applied Science, Management etc., is **20 additional Credits for Engineering & 24 Credits for B. Architecture.**
- Up to 34 Credits out of total 170 for Engineering/Technology students & 52 credits out of total 260 credits for B. Architecture students can be earned through SWAYAM /NPTEL / MOOC platform based learning for the award of UG degree in Engineering/Technology & Architecture respectively (without Honours / Minor Specialization).
- To obtain **"Honours or Minor Specialization"**, 20 Credits additionally can be completed through SWAYAM /NPTEL / MOOC platform based learning. In this manner, students aspiring for minor specialization or Honours during the tenure of B. Tech Programme **can** opt for a total of **54 (34+20) Credits** and the students of the B. Architecture Programme can earn up to **72 (52+20)credits through SWAYAM /NPTEL / MOOC platform based learning.**
- The guidelines regarding **"credit transfer from MOOCs"** by **All India Council of Technical Education (AICTE) and the affiliating university, i.e. RGPV Bhopal,** as issued from time to time will be binding on the institute.
- **The list of courses which the students can opt from the SWAYAM /NPTEL / MOOC platform against DE & OC courses in the scheme will be displayed on the website well in advance, (in November & June) so that students can select the courses of their choice. Each such Course must be of minimum 2 credits.**
- **For the courses opted under MOOC, the equivalent credit weightage will be given to the students, for the credits earned in online examination on SWAYAM/NPTEL platform and other similar platforms as approved by the authorized bodies (BoS, AC etc.) , in the credit plan of the program w.e.f. 2017-18 admitted batch onwards.**
- For matching the credit requirement with the curricular/scheme requirements, more than one MOOC course can also be selected against an Elective Course provided that the collective credits are equal to or more than the credit requirement. Also, each such selected course must be of minimum 2 credits.
- **The semester wise credit distribution from I-VIII semester for the 2017-18 admitted batch under the flexible scheme is 30, 30, 24, 25, 18, 16, 17, 10 respectively.**

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Proposed Structure of Undergraduate Engineering program

S. No.	Category	Suggested Breakup of Credits (Total 160) (as proposed by AICTE)	Component wise credit allotment (To be calculated by the concerned Department)
1	Humanities and Social Sciences including Management Courses (HSMC)	12**	14
2	Basic Science Courses (BSC)	25**	28
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc. (ESC)	24**	31
4	Departmental Core Courses (DC)	48**	47
5	Departmental Elective Courses relevant to specialization/branch (DE)	18**	10
6	Open Category- Electives from other technical and /or emerging subjects (OC)	18**	12
7	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions. (DLC/SWAYAM/NPTEL/MOOC-Practical Slot)	15**	21
8	Mandatory Course (MC) and Professional Development	-	7
	Total	160**	170

***Minor variation is allowed as per need of the respective disciplines. Please consult the AICTE model curriculum as a standard reference, if needed.*

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Scheme of Examination (B.Tech.)

GROUP A: I Semester & GROUP B: II Semester *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	100201	BSC-1	Engineering Physics	70	20	10	30	20	150	4	1	2	6
2.	100202	HSMC-1	Energy, Environment, Ecology & Society	70	20	10	-	-	100	4	1	-	5
3.	100203	ESC-1	Basic Computer Engineering	70	20	10	30	20	150	4	1	2	6
4.	100204	ESC-2	Basic Mechanical Engineering	70	20	10	30	20	150	4	1	2	6
5.	100205	ESC-3	Basic Civil Engineering & Mechanics	70	20	10	30	20	150	4	1	2	6
6.	100206	HSMC-2	Language Lab. & Seminars	-	-	-	30	20	50	-		2	1
Total				350	100	50	150	100	750	20	5	10	30
Induction Programme of first three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations													

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)
01Theory Period=1 Credit; 02 Practical Periods =1 Credit

12/6/13
DEAN (ACADEMICS)
M.I.T.S
GWALIOR

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Scheme of Examination (B.Tech.)

GROUP A: II Semester& GROUP B: I Semester *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	100101	BSC-2	Engineering Chemistry	70	20	10	30	20	150	4	1	2	6
2.	100102	BSC-3	Engineering Mathematics-I	70	20	10	-	-	100	4	1	-	5
3.	100103	HSMC-3	Technical English	70	20	10	30	20	150	4	1	2	6
4.	100104	ESC-4	Basic Electrical & Electronics Engineering	70	20	10	30	20	150	4	1	2	6
5.	100105	ESC-5	Engineering Graphics	70	20	10	30	20	150	4	1	2	6
6.	100106	ESC-6	Manufacturing Practices	-	-	-	30	20	50	-	-	2	1
Total				**350**	**100**	**50**	**150**	**100**	**750**	**20**	**5**	**10**	**30**
Summer Internship Project –I (Institute Level) (Qualifier): Minimum two-week duration													

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)
01Theory Period=1 Credit; 02 Practical Periods =1 Credit

12/6/18
DEAN (ACADEMICS)
M.I.T.S
GWALIOR

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Scheme of Examination (B.Tech.)

III Semester (Computer Science & Engineering) *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	100001	BSC-4	Mathematics-II	70	20	10	-	-	100	3	1	-	4
2.	150301	DC-1	Digital Electronics	70	20	10	-	-	100	3	1	-	4
3.	150302	DC-2	Data Structure	70	20	10	30	20	150	3	-	2	4
4.	150303	DC-3	Computer Graphics	70	20	10	30	20	150	3	-	2	4
5.	150304	DC-4	Object Oriented Programming & Methodology	70	20	10	30	20	150	3	-	2	4
6.	150305	DLC-1*	Hardware Lab	-	-	-	30	20	50	-	-	2	1
7.	150306	SEMINAR/ SELF STUDY	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)#	-	-	-	-	25	25	-	-	2	1
8.	150307	DLC-2	Summer Internship Project –I (Institute Level) (Evaluation)	-	-	-	25	~~25~~ MKG	25			4	2
Total				350	100	50	~~170~~ 145	~~130~~ 105	750	15	2	14	24
9.	100002 ^{S}	MC-1	Biology for Engineers (Audit Course) (MC)	70	20	10	-	-	100	3		-	-
NSS/NCC				Qualifier									

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

^{S} Course will run for Group A/B in III/IV semester respectively (Passing is optional, however a separate mark sheet will be issued to those who qualify)

*Virtual Lab to be conducted along with the traditional lab

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

Scheme of Examination (B.Tech.)

IV Semester (Computer Science & Engineering) *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Term work / Lab Work & Sessional		L	T	P	
1.	100003	BSC-5	Mathematics- III	70	20	10	-	-	100	2	2	-	4
2.	150401	DC-5	Design & Analysis of Algorithms	70	20	10	30	20	150	2	1	2	4
3.	150402	DC-6	Database Management System	70	20	10	30	20	150	2	1	2	4
4.	150403	DC-7	Operating System	70	20	10	-	-	100	3	1	-	4
5.	150404	DC-8	Computer System Organization	70	20	10	-	-	100	3	1	-	4
6.	100004	MC-5	Cyber Security[$]	70	20	10	-	-	100	2	1	-	3
7.	150405	DLC-3	Programming Lab (DLC-2)	-	-	-	30	20	50	-	-	4	2
Total				420	120	60	90	60	750	14	7	8	25
NSS/NCC				Qualifier									
Summer Internship Project-II (SoftSkills Based) for two weeks duration: Evaluation in V Semester													

[$] This course will run for Group A/B in IV/III semester respectively.

*Virtual Lab to be conducted along with the traditional lab

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for Mr

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Scheme of Examination (B.Tech.)

V Semester (Computer Science & Engineering) *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	100005*	HSMC- 4	Ethics, Economics, Entrepreneurship & Management	70	20	10	-	-	100	2	-	-	2
2.	150501	BSC - 6	Discrete Structures	70	20	10	-	-	100	2	1	-	3
3.	150502	DC-09	Software Engineering	70	20	10	30	20	150	2	-	2	3
4.	150503	DC-10	Theory of Computation	70	20	10	30	20	150	2	-	2	3
5.	150504	DC-11	Microprocessor & Interfacing	70	20	10	30	20	150	2	-	2	3
6.	150505	DLC-4	Minor Project-I**	-	-	-	30	20	50	-	-	2	1
7.	150506	DLC-5	Summer Internship Project-II (Evaluation)	-	-	-	25	-	25	-	-	4	2
8.	150507	SEMINAR/ SELF STUDY	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)#	-	-	-	~~25~~	~~+0 25~~	25	-	-	2	1
Total				350	100	50	~~140~~ 145	~~140~~ 105	750	10	1	14	18
9.	100006$	MC - 3	Indian Constitution & Traditional Knowledge (Audit Course)	70	20	10			100	3		-	-
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 Courses for obtaining Honours or minor Specialization by desirous students			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. ((Passing is optional, however a separate mark sheet will be issued to those who 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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(ACADEMICS)

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Scheme of Examination (B.Tech.)

VI Semester (Computer Science & Engineering) ***for batch admitted in Academic Session 2017-18***

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	150601	DC-12	Compiler Design	70	20	10	30	20	150	2	-	2	3
2.	150602#	DC-13	Computer Networks	70	20	10	-	-	100	2	1	-	3
3.	150603	DE-1*	DE	70	20	10	-	-	100	2	-	-	2
4.	150604	DE-2*	DE	70	20	10	-	-	100	2	-	-	2
5.	150605	OC-1*	OC	70	20	10	-	-	100	2	-	-	2
6.	100007	MC-4	Disaster Management (MC)	70	20	10	-	-	100	2	-	-	2
7.	150606	DLC-6	Minor Project-II	-	-	-	50	50	100	-	-	4	2
Total				420	120	60	80	70	750	12	1	6	16
Summer Internship-III (On Job Training) for Four weeks duration: Evaluation in VII Semester													
Additional Courses for obtaining Honours or minor Specialization by desirous students			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.

* At least one of these courses must be run through SWAYAM/NPTEL/ MOOC

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

Scheme of Examination (B.Tech.)

VII Semester (Computer Science & Engineering) *for batch admitted in Academic Session 2017-18*

S. No.	Subject Code	Category	Subject Name & Title	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz/ Assignment	End Sem.	Term Work / Lab Work & Sessional		L	T	P	
1.	150701	DE-3	DE	70	20	10	-	-	100	2	-	-	2
2.	150702	DE-4*	DE	70	20	10	-	-	100	2	-	-	2
3.	150703	OC-2	OC	70	20	10	-	-	100	2	1	-	3
4.	150704	OC-3	OC	70	20	10	-	-	100	3	-	-	3
5.	100008	MC-5	Intellectual Property Rights (IPR)	70	20	10	-	-	100	2	-	-	2
6.	150705	DLC-7	Departmental Lab	-	-	-	50	50	100	-	-	4	2
7.	150706	DLC-8	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	50	50	100	-	-	4	2
8.	150707	DLC-9	Creative Problem Solving (Evaluation)	-	-	-	25	25	50	-	-	2	1
Total				350	100	50	125	125	750	11	1	10	17
Additional Course for Honours or minor Specialization			Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization										

* This course must be run through SWAYAM/NPTEL/ MOOC

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VIII Scheme of Examination (B.Tech.)

~~VII~~ Semester (Computer Science & Engineering) *for batch admitted in Academic Session 2017-18*

S.N.	Subject Code	Category	Subject Name & Title	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz/ Assignment	End Sem.	Term Work / Lab Work & Sessional		L	T	P	
1.	150801**	DE-5*	DE	70	20	10	-	-	100	2	-	-	2
2.	150802	OC-4*	OC	70	20	10	-	-	100	2	-	-	2
3.	150803	OC-5*	OC	70	20	10	-	-	100	2	-	-	2
4.	150804	DLC-10	Internship/Project	-	-	-	250	150	400	-	-	6	3
5.	150805	DLC-11	Professional Development#	-	-	-	-	50	50	-	-	2	1
Total				210	60	30	250	200	750	6	-	8	10
Additional Courses for obtaining Honours or minor Specialization by desirous students			Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization										

*All of these courses will run through SWAYAM/NPTEL/ MOOC

Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG program (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs and technical events)

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