R.T.M. Nagpur University, Nagpur
Four Year B.Tech. Course
(Revised curriculum as per AICTE Model Curriculum)
B.Tech. V Semester (Computer Technology) Scheme

Subject code	Sub ject	Teaching Scheme			Evaluation Scheme			Credits	Category
		L	T	P	CA	UE	Total		
BTCT501T	Design and Analysis of Algorithms (TH)	3	0	0	30	70	100	3	PCC
BTCT501P	Design and Analysis of Algorithms Lab (PR)	0	0	2	25	25	50	1	PCC
BTCT502T	Database Management System(TH)	3	0	0	30	70	100	3	PCC
BTCT502P	Database Management System(PR)	0	0	2	25	25	50	1	PCC
BTCT503T	Software Engineering and Project Management (TH)	3	0	0	30	70	100	3	PCC
BTCT504T	Effective Technical Communication (TH)	2	0	0	15	35	50	2	HSMC
BTCT505P	Artificial Intelligence (TH)	3	0	0	30	70	100	3	PCC
BTCT506T	Elective - I	3	0	0	30	70	100	3	PEC
BTCT507T	Professional Ethics (Audit Course)	2	0	0	0	0	0	0	Audit
Total		19	0	4	215	435	650	19	

Elective - I BTCT506T
BTCT506T-1 TCP/IP
BTCT506T-2 Computer Graphics
BTCT506T-3 System Software and Device Driver

PCC-CS Professional Core Courses **ESC** – Engineering Science Courses **LC** – Laboratory Course **OEC-CS** Open Elective Courses **MC** – Mandatory Course **PROJ-CS** Project (Min. one month internship is derirable) **BSC** – Basic Science Courses **PEC-CS** Professional Elective Courses **HSMC**- Humanities and Social Sciences including Management Courses

(Dr. A.M. Thakare)

Dr. S.V. Sonekar
Chairman

(Dr. M.V. Bramhe)

N.M. Thakare

Sonekar S. Golait

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B. Tech. Fifth Semester CT
Design and Analysis of Algorithms

Total Credits: 3	Subject Code: BTCT501T
Teaching Scheme : Lectures: 3 Hours/Week Tutorials: 0 Hours/Week Practical: 2 Hours/Week	Examination Scheme : Duration of University Exam: 03 Hrs. College Assessment : 30 Marks University Assessment:70 Marks

Course Objectives:

1. Analyze the time complexity of recursive function
2. Analyze the asymptotic performance of algorithms.
3. Apply important algorithmic design paradigms and methods of analysis.

Course Outcomes:(Please follow Bloom's Taxonomy words in Course outcome)

After completing the course, students will be able to

CO1. Argue the correctness of algorithms using inductive proofs and Analyze worst-case running times of algorithms using asymptotic analysis

CO2. Explain and apply Divide-and-Conquer and Greedy algorithmic design paradigms

CO3. Explain and apply Dynamic-Programming algorithmic design paradigms

CO4. Explain and apply Backtracking Database Management System(PR)algorithmic design paradigms

CO5. Describe the classes P, NP, and NP Complete and prove NP-Completeness of certain problem.

Unit I (8 Hrs)

Algorithm, Properties of Algorithm, Summation of arithmetic and geometric series, Recurrence relations, Solutions of recurrence relations using following techniques: Characteristic equation, Recursion tree method and Master method. Asymptotic notations of analysis of algorithms, Time complexity of program segments, Best case and worst case analysis of Insertion sort.

Unit II (8 Hrs)

Divide and Conquer strategy: Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

Greedy Approach: Fractional Knapsack Problem, Huffman coding algorithm, Traveling Salesman Problem, Activity Selection Problem, Job sequencing with deadlines problem, Minimum cost spanning trees, Single source shortest path.

Unit III (9 Hrs)

Dynamic Programming strategy: Longest Common Subsequence, Single source shortest paths, Traveling salesman problem, All pairs shortest path, Matrix Chain Multiplication, Multistage graphs, Optimal binary search trees, 0/1 Knapsack problem.

Unit IV (6 Hrs)

Backtracking strategy: n-Queen's problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

Unit V (5 Hrs)

NP-hard and NP-complete problems: Non-deterministic algorithms, NP-hard and NP-complete, decision and optimization problems, Clique, Polynomial Reduction, Cook's theorem, graph based problems on NP Principle.

Text Books:

1. Introduction to Algorithms By Thomas H. Cormen et.al. Prentice Hall of India.

Reference Books:

1. Design & Analysis of Algorithms By Parag Himanshu Dave, HimanshuBhalchandra Dave, second Edition, Pearson Publication.

2. Computer Algorithms- Inroduction to Design and Analysis By Sara Baase, Allen Van Gelder, Third Edition, Pearson Publication.

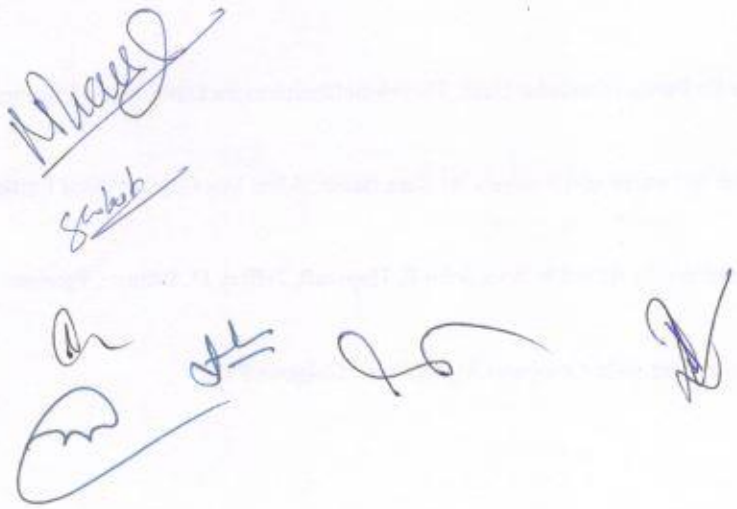
3. The Design and Analysis of Algorithms By Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman, Pearson Publication.

4. Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Computer Algorithms', Galgotia Pubs.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B. Tech. Fifth Semester CT
Design and Analysis of Algorithms (PR)

Total Credits: 1	Subject Code: BTCT501P
Teaching Scheme : Lectures: 0 Hours/Week Tutorials: 0 Hours/Week Practical: 2 Hours/Week	Examination Scheme : Duration of University Exam: College Assessment : 25 Marks University Assessment: 25 Marks

Minimum ten experiments should be conducted based on the Theory Syllabus



Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Database Management System

Total Credits: 3	Subject Code: BTCT502T
Teaching Scheme : Lectures: 3 Hours/Week Tutorials: 0 Hours/Week Practical: 2 Hours/Week	Examination Scheme : Duration of University Exam : 03 Hrs. College Assessment : 30 Marks University Assessment:70 Marks

Course Objectives:

1. To present an introduction to database management systems,.
2. To emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
3. To Implement relational databases using a RDBMS

Course Outcomes:(Please follow Bloom's Taxonomy words in Course outcome)

After completing the course, students will be able to

CO1. Explain the basic concepts of Database management system and database architecture and illustrate the concepts of Relational algebra.

CO2. functional dependencies , apply concepts of normalization and construct ER Diagrams.

CO3. Compare various indexing techniques and to illustrate the concepts of PL/SQL programming.

CO4. Select Query Optimization techniques and to evaluate the performance of Query and transaction Processing.

CO5. Define and illustrate the concepts of advanced database techniques.

Unit I (8 Hrs)

Introduction: Database system architecture, Database applications, Data Abstraction, Data Independence, Data Definition and models, Relational query languages: Relational algebra, tuple and domain relational calculus, SQL and QBE.

Unit II (7 Hrs)

SQL: Data definition, basic SQL query structure, set operations, nested subqueries, aggregation, null values, database modification, join expressions, views. Concepts of PL/SQL,Triggers and Assertions.

Unit III (7 Hrs)

Database Design: E-R model, E-R diagram, reduction to relational schema, E-R design issues, database integrity, specifying integrity constraints in SQL, triggers.Functional Dependency theory, decomposition using functional dependency and normal forms.

Unit IV (8 Hrs)

Query processing and optimization Evaluation of relational algebra expressions, query equivalence, join strategies, query optimization algorithms. Storage strategies Indices, B-trees, hashing. Transaction processing Recovery and concurrency control, locking and timestamp based schedulers, multiversion and optimistic Concurrency Control schemes.

Unit V (6 Hrs)

Advanced topics Object-oriented and object relational databases, logical databases, web databases, distributed databases, data warehousing and data mining **(6 Hrs)**

Text Books:

1. H Garcia-Molina, JD Ullman and Widom, Database Systems: The Complete Book,2nd Ed., Prentice-Hall, 2008.

2. A Silberschatz, H Korth and S Sudarshan, Database System Concepts, 6th Ed., McGraw-Hill, 2010.

Reference Books:

1. R Elmasri, S Navathe, Fundamentals of Database Systems, 6th edition, Addison-Wesley, 2010.

2. R Ramakrishnan, J Gehrke, Database Management Systems, 3rd Ed., McGraw-Hill, 2002.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B. Tech. Fifth Semester CT
Database Management System (PR)

Total Credits: 1	Subject Code: BTCT502P
Teaching Scheme : Lectures: 0 Hours/Week Tutorials: 0 Hours/Week Practical: 2 Hours/Week	Examination Scheme : Duration of University Exam : . College Assessment : 25 Marks University Assessment: 25 Marks

Minimum ten experiments should be conducted based on the Theory Syllabus

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Software Engineering and Project Management (TH)

Total Credits: 03	Subject Code: BTCT503T
Teaching Scheme : Lectures: 3 Hours/Week Tutorials: 0 Hours/Week Practical: 0 Hours/Week	Examination Scheme : Duration of University Exam: 03 Hrs. College Assessment : 30 Marks University Assessment:70 Marks

Course Objectives:

1. To provide an understanding of the working knowledge of the techniques for analysis, design, testing, estimating and quality management of large software development projects.

2. To develop an understanding of the working methods and procedures for software development that can scale up for large systems and that can be used consistently to produce high quality software at low cost with a small cycle time.

Course Outcomes: (Please follow Bloom's Taxonomy words in Course outcome)

After completing the course, students will be able to

1. Explain evolution and impact of Software Engineering and to demonstrate and compare different software development process models.

2. Explain Agile process model, System Engineering and to list and explain different steps in Requirement Engineering Process.

3. Understand, analyze and apply different analysis and design models in software development process.

4. To explain and compare different software testing strategies, types and their significance and to understand and apply the concept of Software Quality Assurance and estimation.

5. To estimate the quality metrics for process and product and to list and analyze different software risk management strategies, software quality management process and to understand Software Configuration Management.

Unit I (06 Hrs)

Introduction: Software Characteristics, Software Engineering,A Layered Technology, Software Process Framework, Software Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, , The Unified Process Model

Unit II (06 Hrs)

Agile Process Models, System engineering and modeling Requirements Engineering: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

Unit III (08 Hrs)

Software Analysis & Design : Modeling Approaches, Data Modeling, Object, Oriented Modeling, Scenario Based Modeling, Flow Oriented Modeling, Class based Modeling, Behavioral Model. Design Engineering Concepts, Design Model, Pattern Based Software design, Design Concepts: Abstraction Architecture, pattern modularity, information hiding, design classes, refactoring.

Unit IV (08 Hrs)

Software Testing : Testing Fundamentals , Black Box Testing, White Box Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging.

Product metrics: Software quality, Quality Concepts, Software Quality Assurance , Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance.

Unit V (08 Hrs)

Metrics for process & Product: – Software measurement, Metrics for software quality, Project scheduling.

Risk management – Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management, Software Reliability, Change Management, and Software Configuration Management

Text Books:

1.Software Engineering: A Practitioner's Approach (Sixth Edition),Roger Pressman (TMH)

2.Software Engineering (Ninth Edition), Ian Summerville (Pearson Education)

3. Software Engineering : Theory and Practice (Fourth Edition) – Pfleeger (Pearson Education)

Reference Books:

1. Software Engineering Schaum's Series (TMH)
2. Software Engineering for Students –(Fourth Edition) – Bell (Pearson Education)
3. The Unified modeling language

Faculty of Engineering and Technology
Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
B.Tech. Vth sem (CT)
Effective Technical Communication (Theory)

CREDITS: 02

Teaching Scheme: 2 Hours/Week (Theory) + 1 Hour/Week (Tutorial)

Examination Scheme: University Assessment: 35 Marks College Assessment: 15 Marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.) to pursue master's degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Course Outcomes: After completing the course, students will

1. Acquire knowledge of structure of language.
2. be able to face competitive exams and the interview process and can become employable.
3. Develop business writing skills.
4. become familiar with technology enabled communication and can develop technical and scientific writing skills.

Unit I. Functional Grammar: (7Hrs)
Common errors, Transformation of Sentences- Change the Voice, Change the Narration, Simple, Compound Complex sentences, Use of Phrases, Idioms & Proverbs.

Unit II. English for Competitive Exams & Interview Techniques: (5 Hrs)

Word building, **English** words /phrases derived from other languages, Prefixes and Suffixes, Synonyms/Antonyms, Technical Jargons, Verbal Analogies, Give one word for, Types & Techniques of Interview.

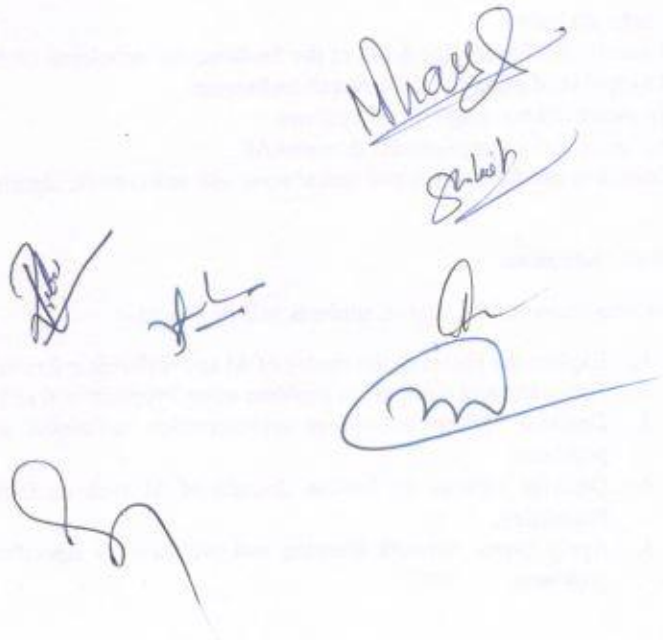
Unit III. Formal Correspondence (5 Hrs)

Business Letters, (Enquiry, Quotation, Order, Complaint), Job applications and Resume Writing, e-mail etiquette, Writing Memorandum, Circulars, notices, Analytical comprehension

Unit IV. Technical & Scientific Writing: (7 Hrs)
Features of Technical Writing, Technical Report writing (Accident, Feasibility, Trouble, Progress), Writing Scientific Projects, Writing Manuals, Writing Project Proposals, Writing Research papers.

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. Technical Communication-Principles and Practice by Meenakshi Raman & Sharma, Oxford UniversityPress, 201,
3. Functional English for Technical Students by Dr. Pratibha Mahato and Dr. Dora Thompson, Himalaya Publishing House
4. How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences by Krathwohl & R David
5. Technical Writing- Process and Product by Sharon J. Gerson & Steven M. Gerson, 3rd edition, PearsonEducation Asia, 2000
6. Developing Communication skills by Krishna Mohan & Meera Banerjee



Artificial Intelligence (TH)	
Total Credits: 3	Subject Code: BTCT505T
Teaching Scheme : Lectures: 3 Hours/Week Tutorials: 0 Hours/Week Practical: 0 Hours/Week	Examination Scheme : Duration of University Exam : 3 hrs. College Assessment : 30Marks University Assessment: 70Marks

Course Objectives:

To make students
1. To understand necessary depth of the fundamental techniques of Artificial Intelligence.
2. To capable of using heuristic search techniques.
3. To aware of knowledge based systems.
4. To learn various applications domains AI.
5. To able to use fuzzy logic and neural networks.

Course Outcomes:

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

1. Explain the basics of the theory of AI and different informed and uninformed search algorithms.
2. Formulate and solve given problem using Propositional and First order logic.
3. Describe various knowledge representation techniques and to apply reasoning for non-monotonic AI problems.
4. Describe various application domains of AI such as Expert system, Game Playing, Natural Language Processing.
5. Apply neural network learning for solving AI problems.

UNIT I **(8 Hrs)**

Introduction to AI: Definition of AI, Early work in AI, Importance of AI and related fields, Task domains of AI systems.
Basics of problem solving: Defining the problem on a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs.

UNIT II **(8 Hrs)**

Heuristic search techniques: Generate and test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis.
Knowledge Representation: Representation and mapping, Approaches and Issues. Introduction to proposition logic, Knowledge representation using predicate logic, Unification and resolution. Representing knowledge using rules, procedural Vs declarative knowledge, forward Vs backward reasoning.

UNIT III **(8 Hrs)**

Knowledge representation: Network representation schemes - Semantic networks, Structured representation schemes – Frames, Scripts.
Statistical reasoning: Probability and Bayes' theorem, Certainty factors and rule based systems, Baysian networks, Introduction to fuzzy logic.

Annaji Kuthe   Dr N. M. Thakare   (Ashesh Sharma)   Dr Latesh Malik   Dr. Ravindra Jogekar

UNIT IV **(6 Hrs)**

Expert systems: Characteristic features of expert system, Architecture of expert system, Expert system shell.
Game playing: Minimax search procedure, adding alpha-beta cutoffs.

UNIT V **(6 Hrs)**

Artificial Neural Network: History of ANN, Working of Neuron, Basic components of ANN, Mc-Culloh-pit's Model, ANN Architecture - Perceptron, Feed forward Networks, Backprpogation.
Genetic Algorithm - Motivation, GA cycle, Genetic operators, Simple Genetic algorithm.

TEXT BOOK:

1. E. Rich & K. Knight, S. B. Nair "Aritificial Intellegence", Tata McGraw Hill Publications, 2008.
2. D. W. Patterson, "Introduction to Artificial Intelligence and Expert System", PHI Pub., 1997.
3. K. Uma Rao, "Aritificial Intelligence and Neural Networks" Pearson Education, 2011.
4. David E. Goldberg, "Genetic Algorithms in search, optimization and machine learning",Pearson Education, 2002.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Elective – I : TCP/IP (Th)

Total Credits: 3	Subject Code: BTCT506T
Teaching Scheme : Lectures: 3Hours/Week Tutorials: 0 Hours/Week Practical: 0 Hours/Week	Examination Scheme : Duration of University Exam : 3 hrs. College Assessment : 30Marks University Assessment: 70Marks

Course Objectives:

1. Define fundamental concepts of TCP/IP architecture and protocols
2. Basic Concept on the network layer, transport layer, and application layer of the suite
3. Basic Concept of Network management and internet Security.

Course Outcomes:(Please follow Bloom's Taxonomy words in Course outcome)

After completing the course, students will be able to

1. Identify protocols and standards in the Internet.
2. Concept of basic addressing and setup, connectivity and communications, name resolution, and fundamental network services.
3. Learn real-time IP-based protocols and services including Voice over IP (VoIP) and Instant Messaging (IM) applications,
4. Basic concept of Network configuration with other services like mail services.
5. Basic Concept of Network Management Protocols and internet security.

Unit I (6 Hrs)
Introduction and Overview: Comparison of OSI Model and TCP/IP model. Networking Technologies: LANS, WANS, Connecting Devices. Internetworking concept and Architectural model. Internet Backbones, NAP, ISP's, RFC's, Internet Standards.

Unit II (8 Hrs)
Internet Addresses: IP address classes, subnet mask, CIDR, ARP,RARP, Internet Protocol, Routing IP Datagrams, ICMP and IGMP, Introduction to IPv6 and ICMPv6

Unit III (8 Hrs)
UDP, TCP, Sockets and socket Programming, Routing in Internet, Routing protocols- RIP, OSPF and BGP. Introduction to Multicasting and Multicast routing.

Unit IV (6 Hrs)
Host Configuration: BOOTP, DHCP; Services: Domain Name System, FTP, TFTP and **Electronic Mail**: SMTP, MIME, IMAP, POP.

Unit V (6 Hrs)
Network Management: SNMP, WWW: HTTP, Mobile IP. **Multimedia** : RTP, RTCP. **Middle wares** : RPC, RMI.
Internet Security:IPSec, PGP, Firewalls, SSL

Text Books:

1. Internetworking and TCP/IP: Principles, Protocols and Architectures, Douglas Comer, Pearson Education.
2. TCP/IP Protocol suite, Behrouz A. Forouzan, Third Edition, TMH.
3. Computer Networking – A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Pearson Education, Asia.
4. Computer Networks: A systems approach by Larry L. Peterson and Bruce S. Davie, 3rd Edition, Morgan Kaufmann Publishers

Reference Books:

1. Stevens W. R. TCP/IP Illustrated, volume 1,2,3, Pearson education.
2. "Hands-On Networking with Internet Technologies"• by Douglas E. Comer, Pearson Education, Asia, 2002.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Elective – I : Computer Graphics (Th)

Total Credits: 3	Subject Code: 8 BTCT506T
Teaching Scheme : Lectures: 3Hours/Week Tutorials: 0 Hours/Week Practical: 0 Hours/Week	Examination Scheme : Duration of University Exam : 3 hrs College Assessment : 30Marks University Assessment: 70Marks

Course Objectives:
On successful completion of the course, students will be able to:
1.Understand the core concepts of computer graphics, Graphics devices.
2.Understand and implement various Scan conversion techniques.
3.Understand and apply the windowing, clipping and various transformations principles.

Course Outcomes:(Please follow Bloom's Taxonomy words in Course outcome)
After completing the course, students will be able to
1. Explain the basic concepts of computer graphics, identify the importance of computer graphics and its wide spread applications.
2. Categorize and apply basic raster graphics algorithms for drawing 2D primitives and various polygon filling algorithms.
3. Categorize and apply 2D Clipping algorithms for regular and irregular windows ; Compare various types of curves.
4. Compare, contrast and apply various 2D Transformations.
5. Explain 3D System Basics, compare and contrast various 3D Transformations and various hidden surface removal algorithms.

Unit I : (6 Hrs)
Introduction to Graphics : Introduction to Computer Graphics & its application, Origin of Computer Graphics, Graphics Areas, Graphics Pipeline, Graphics APIs, Hardcopy Technologies, Display Technologies – Raster scan Display System, Video Controller – Vector scan display system, Random Scan Display Processor, Input Devices for Operator Interaction.

Unit II : (9 Hrs)
Line generation Algorithms: DDA, Bresenham's Algorithm, Bresenham's Circle Generation algorithm,Polygon filling methods: Scan Conversion Algorithms: Simple Ordered edge list, Edge Fill, Fence fill and Edge Flag Algorithm. ,Seed fill Algorithms: Simple and Scan Line Seed Fill Algorithm.

Unit III : (7 Hrs)
Windowing & Clipping: The viewing transformations. Line Clipping: Sutherland-Cohen algo, Midpoint Subdivision algo, Cyrus Beck algo. Polygon Clipping: Sutherland-Hodgman algo.Curves: Bezier & B-spline Curves.

Unit IV : (6 Hrs)
Transformation 2-Dimension Transformation: Basic Transformation: Scaling, Rotation, Translation, Matrix representation, Homogeneous Coordinates & Composite transformations, rotation about an arbitrary point, other transformation: Reflection Shear.

Unit V : (8 Hrs)
3-Dimension Transformation – 3D geometry, 3D primitives, Scaling, Translating, Rotation about an arbitrary axis,Parallel and Perspective projections, Hidden line/surface Removal Algorithms. painter's algorithm, Z -buffers, Warnock's algorithm.

Text Books:
1. Rogers; Procedural Elements of Computer Graphics; 3rd Edition; McGraw Hill, 2001.
2. Newman and Sproull; Principles of Interactive Computer Graphics; McGraw Hill, 1989.
3. Ivan Harringhton; Computer Graphics - A Programming Approach; McGraw Hill Publications, 1987

Reference Books:
1 Hearn and Baker; Computer Graphics; 2nd Edition; PHI, India, 1994
2. James D. Foley, Andries Van Dam, Feiner Steven K. and Hughes John F. – Computer Graphics: Principles & Practise, Adddison Wesley Publishing House

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Elective – I: System Software and Device Driver (Th)

Total Credits: 3	Subject Code: 8 BTCT506T
Teaching Scheme : Lectures: 3Hours/Week Tutorials: 0 Hours/Week Practical: 0 Hours/Week	Examination Scheme : Duration of University Exam: 3 hrs. College Assessment : 30Marks University Assessment: 70Marks

Course Objectives:
1. Learn basic concepts of operating systems and system software's.
2. Design of operating systems and system software's.

Course Outcomes:(Please follow Bloom's Taxonomy words in Course outcome)
After completing the course, students will be able to
1. Explain the basics concept of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
2. Design and describe the various concepts of assemblers, the various phases of compiler and compare its working with assembler.
3. Explain and describe the various concepts of macro -processors.
4. Explain the basic concepts of linker and loader, create an executable program from an object Unit created by assembler and compiler.
5. Explain various Device drivers, its types and installation.

Unit I Introduction to System Software and IBM 360 Machine: (8 Hrs.)
Evolution of components of programming system, Operating System, Overview, Functions and Facilities o, Goals of System software, Views of System Software, Virtual machine. General machine structure IBM 360/370, Machine Language Assembly language.

Unit II Assembler: (8 Hrs.)
Design of Pass-I and Pass-II Assemblers, Table Processing, Searching and Sorting, Problems based on symbol table, Base table and Literal table generation, Machine code generation and Searching and sorting. Phases of Compiler, Compiler writing tools, Lex and YACC.

Unit III Macro Language and Macro Processor: (7 Hrs.)
Macro instruction, Features of Macro facility, Implementation of 1-Pass, 2-Pass Macro processor, Macro calls within macro, macro definition within macros.

Unit IV : (8 Hrs)
Different Loading Schemes, Binders, Overlays, Linking loaders, Design of absolute loaders, Design of Direct Linking loaders.

Unit V UNIX Device Drivers: (5 Hrs.)

Introduction to Device drivers, Types of Device Drivers, Design issues in Device Drivers, Driver installation with example, character driver-A/D Converter, Block Driver-RAM Disk driver, Terminal Driver-The COM1 port driver .

Text Books:

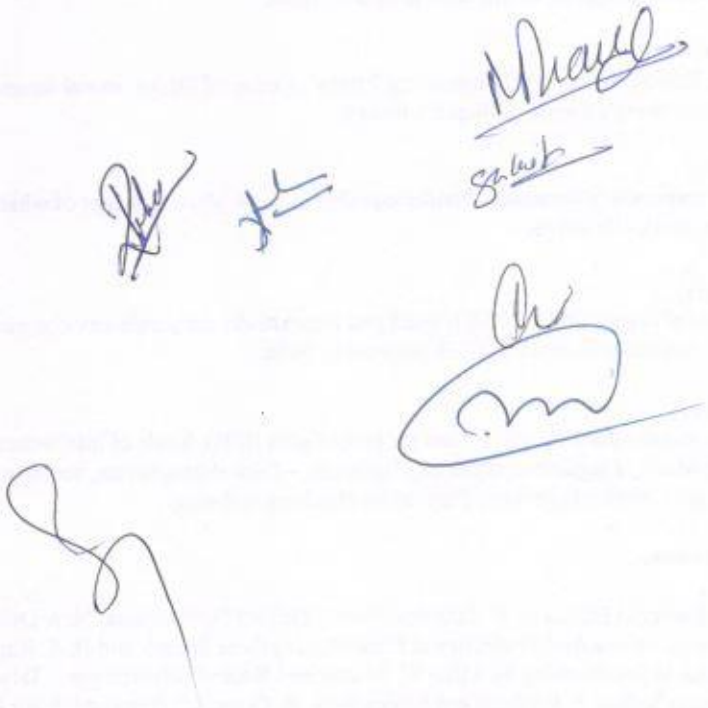
1. J. J. Donovan; System Programming; TMH, 2012

2.D.M. Dhamdhere; System Programming; THM; 2011

3. George Pajari; Eritting Unix Device Drivers; Pearson Education; 2011

Reference Books:

1. Leland Beck, D. Manjula; System Software; An Introduction to Programming; Pearson Education; 2013
2. Alfred Aho, J. Ullman; Principles of Compiler Design; Narosa Pub. 2010



Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Fifth/Sixth Semester CT
Subject: Professional Ethics (Theory)
Audit Course

Teaching Scheme
Lectures:2 Hours/Week

Course Objective: The objective of this course is to inculcate the sense of professional and social responsibilities along with moral and ethical values among learners and to make them realize the significance of ethics and Intellectual Property Rights in professional environment so as to make them a global citizen

Course Outcomes: After completing the course, the students will be able to

CO1: Realize their roles of applying ethical principles and morals at professional levels
CO2: understand their constructive roles in understanding corporate culture and maintaining work-life balance.
CO3: become responsible and contributing members of society

CO4: acquire knowledge of Intellectual property rights.

Unit I (6hrs)
Engineering Ethics, Senses of 'Engineering Ethics', Codes of Ethics, moral issues, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory

Unit II (6hrs)
Meaning of corporate governance, gender equality at work place, concept of whistle blower, respect for environment, work-life balance.

Unit III (6hrs)
Corporate social responsibility(CSR)- need and importance, corporate environment responsibility(CER) need and importance, real life examples of CSR projects in India.

UNIT IV(6hrs)
Introduction and the need of intellectual property rights (IPR), kinds of intellectual property rights - Patents, Copy rights, Trade Mark, Plagiarism, types of plagiarism – Global plagiarism, verbatim plagiarism, paraphrasing plagiarism, patch work plagiarism, Plagiarism checking software .

Reference Books:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S. Chand Publications
3. Ethics in Engineering by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
4. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
5. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013
6. Dr. Vaibhav Ramesh Bhalerao , Dr. Mayur Subhash Punde, Dr. Shrikant Waghulkar, Thakur Publications, 2021
7. Corporate Social Responsibility in India, Sanjay K Agrawal, Sage Publications Pvt. Ltd; 2008
8. Fundamentals of Intellectual Property for Engineers, Kompal Bansal, BS publications, 2014

Dr. S. V. Sonekar
Chairman

R.T.M. Nagpur University, Nagpur
Four Year B.Tech Course
(Revised curriculum as per AICTE Model Curriculum)
B.Tech. VI Semester (Computer Technology) Scheme

Subject Code	Subject	Teaching Scheme			Evaluation Scheme			Credits	Category
		L	T	P	CA	UE	Total		
1 BTCT601T	Compiler Design(TH)	3	0	0	30	70	100	3	PCC
2 BTCT601P	Compiler Design (PR)	0	0	2	25	25	50	1	PCC
3 BTCT602T	Data Warehousing and Mining(TH)	3	0	0	30	70	100	3	PCC
4 BTCT602P	Data Warehousing and Mining(PR)	0	0	2	25	25	50	1	PCC
5 BTCT603T	Elective II	3	0	0	30	70	100	3	PEC
6 BTCT604T	Elective III	3	0	0	30	70	100	3	PEC
7 BTCT605T	Open Elective – I	3	0	0	30	70	100	3	OEC
8 BTCT606T	Economics of IT industry	2	0	0	15	35	50	2	HSMC
9 BTCT607P	Mini Project	0	0	4	25	25	50	2	Project
10 BTCT608T	Organizational Behaviour (Audit Course)	2	0	0	0	0	0	0	Audit
Total		**19**	**00**	**08**	**240**	**460**	**700**	**21**	

Elective -II BTCT603T	**Elective -III BTCT604T**	**Open Elective -I BTCT605T**
BTCT603T-1 High Performance Computer Architecture	**BTCT604T-1** Embedded System	**BTCT605T-1** Digital Image Processing
BTCT603T-2 Software Testing and Quality Assurance	**BTCT604T-2** Mobile Application and Development	**BTCT605T-2** Advanced Web Technologies
BTCT603T-3 Advance Microprocessor	**BTCT604T-3** Cloud Computing	**BTCT605T-3** Multimedia and

Mrs. Rubana Khan

(Dr. A M Thakare)

N.M. Thakare

and Interfacing		Animation

PCC-CS Professional Core Courses **ESC** – Engineering Science Courses **LC** – Laboratory Course **OEC-CS** Open Elective Courses **MC** – Mandatory Course **PROJ-CS** Project (Min. one month internship is derirable) **BSC** – Basic Science Courses **PEC-CS** Professional Elective Courses **HSMC**- Humanities and Social Sciences including Management Courses

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Compiler Design (Theory)

Total Credits: 03	Subject Code: BTCT601T
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:

1. To make students to understand basics of Compilation Process.
2. To make students to understand thoroughly the concepts of various phases of Lexical Analysis, Syntax Analysis, Syntax Directed Translation Scheme.
3. To make students to understand Code generation and code Optimization techniques

Course Outcomes:

After completing the course, students will be able to

1. Explain basic fundamentals of the translators and role of the lexical analysis.
2. Describe principles of Parsing and will be able design various Top-Down and Bottom-Up Parsers
3. Explain various forms of intermediate code and will be able to demonstrate use of SDTS to translate elementary programming constructs.
4. Describe various optimization techniques and will be able to develop simple code generators.
5. Explain storage allocation methods, error recovery techniques and will be able to apply various error recovery techniques in parsers.

Unit I **(06 Hrs)**

Translators, Compilers, Interpreters, Just in Time Compilers, Cross Compilers, Bootstrapping, Structure of a typical compiler, overview of lexical analysis, syntax analysis, code optimization and code generation, design of lexical analyzer.

Unit II **(08 Hrs)**

Parsers, Shift-Reduce Parser, Top-down parser, Predictive Parsers, Bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, LR parsers.

Unit III **(08 Hrs)**

Syntax directed schemes, intermediate code, Prase trees, Syntax trees, three address code, Quadruples, Triples, Indirect Triple, using syntax directed translation schemes to translate assignment statements, Boolean expressions, if then else structures

Unit IV **(08 Hrs)**

Sources of Optimization, Loop Optimization, DAG representation of basic blocks, Global data flow analysis, Dominators, Loop invariant computations, Induction variable elimination, Loop unrolling, Loop jamming., simple code generator, Register allocation and assignment

Unit V **(06 Hrs)**

Storage allocation and run time storage administration, symbol table management, types of Errors,Lexical phase Errors, Syntactic phase Errors, error recovery in LR parsing, error recovery in LL parsing,

Text Books:

1. Alfred V.Aho, Jeffrey Ullman :Principals of Compiler Design, ,Narosa Publications.
2. O.G. Kakde : Compiler Design , Laxmi Publication , 4th Edition.

Reference Books:

1. Fischer and LeBlanc: Crafting a compiler:, Addison Wesley

Compiler Design (Practical)

Total Credits: 01	**Subject Code: BTCT601P**
Teaching Scheme: **Lectures: 00 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 02 Hours/Week**	**Examination Scheme:** **College Assessment: 25 Marks** **University Assessment:25 Marks**

Minimum ten experiments should be conducted based on the theory syllabus.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Data Warehousing and Mining (Theory)

Total Credits: 03	Subject Code: BTCT602T
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:

To make students

1. To understand the basic concepts of Data Warehouse and Data Mining techniques.
2. Capable to create a data warehouse and to process raw data .
3. Able to apply basic classification, clustering on a set of data.
4. Able to identify frequent data items and to apply association rule on a set of data.
5. To learn recent trends of data mining such as web mining.

Course Outcomes:

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

1. Understand the data warehousing components and design a data warehouse for any organization.
2. Learn data mining concepts and working.
3. Explore functionality of the various data mining techniques.
4. Discuss the data-mining tasks like classification, clustering, association mining and extract knowledge using data mining techniques.
5. Apply data mining techniques in trending domain such as web mining and Solve real-world problems in business and scientific information using data mining.

UNIT I **(09 Hrs)**

Introduction: Characteristics, Operational database systems and data warehouse (OLTP & OLAP), Multidimensional data models, Data warehouse architecture, OLAP Operations, Design and construction of data warehouses.

UNIT II **(06 Hrs)**

Fundamentals of data mining:Data mining functionalities, Classification of data mining systems, Data mining task primitives, Major issues and challenges in data mining, Data preprocessing- need for processing, data cleaning, integration, transformation, data reduction, data mining application areas.

UNIT III **(09 Hrs)**

Classification: Introduction, Decision tree, Building decision tree- tree induction algorithm, Split algorithm based on information theory, Split algorithm based on gini index, Decision tree rules, Naive based methods.
Clustering: Cluster analysis, Desired features, Types of data in cluster analysis, Computing distance. Categorizations of major clustering methods – Partitioning methods (K-means, EM), Hierarchical methods (agglomerative, divisive).

UNIT IV **(06 Hrs)**

Mining frequent patterns and Association Rules: Market basket analysis, Frequent item sets and association rules, Apriori algorithm, FP growth algorithm, Improving efficiency of Apriori and FP growth algorithms.

UNIT V **(06 Hrs)**

Web Data Mining: Introduction, Graph properties of web, Web content mining, Web structure mining, Web usage mining, Text mining, Visual web data mining, Temporal and Spatial data mining.

TEXT BOOK:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
2. A. K. Pujari, "Data Mining Techniques", Second Edition, University press, 2013.
3. Jason Bell, "Machine Learning for Big Data: Hands-on for Developers and Technical Professionals, Wiley India Publications, 2013.

Data Warehousing and Mining (Practical)

Total Credits: 01	**Subject Code: BTCT602P**
Teaching Scheme: **Lectures: 00 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 02 Hours/Week**	**Examination Scheme:** **College Assessment: 25 Marks** **University Assessment:25 Marks**

Minimum ten experiments should be conducted based on the theory syllabus.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective II: High Performance Computer Architecture (Theory)

Total Credits: 03	Subject Code: BTCT603T-1
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:
1. To make students familiar with fundamental of computer organization and performance laws
2. To discuss the concept and issues in instruction level Parallelism
3. To discuss multiprocessor architecture and synchronization issue in multiprocessor

Course Outcomes: After completing the course, students will be able to
1. Compare Multi vector and SIMD Computers, PRAM and VLSI Models
2. Explain Basic concepts, instruction and arithmetic pipelines, and hazards in a pipeline:
3. Illustrate Concepts and Challenges, Basic Compiler Techniques for Exposing ILP
4. Explain Virtual memory organization, mapping and management
5. Compare Parallel and Scalable Architecture, Multiprocessors and Multicomputer:

Unit I **(08 Hrs)**

Theory of Parallelism: Parallel Computer Models, The State of Computing, Multiprocessors and Multicomputers, Multi vector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks, Principles of Scalable Performance: Performance Metrics and Measures, Speedup and Performance Laws.

Unit II **(08 Hrs)**

Pipelining, Basic concepts, instruction and arithmetic pipelines, and hazards in a pipeline: structural, data and control hazards, overview of hazard resolution technique, Dynamic instruction scheduling, branch prediction techniques, Exception handling, Pipeline optimization techniques, Compiler techniques for improving performance.

Unit III **(08 Hrs)**

Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Costs with Prediction , Overcoming Data Hazards with Dynamic Scheduling ,Dynamic Scheduling: Algorithm, Data level and Thread Level Parallelism.

Unit IV **(06 Hrs)**

Memory Hierarchies: Basic concept of hierarchical memory organization, Hierarchical memory technology, main memory, Inclusion, Coherence and locality properties, Cache memory design and implementation, Techniques for reducing cache misses, Virtual memory organization, mapping and management techniques, memory replacement policies, RAID.

Unit V **(06 Hrs)**

Parallel and Scalable Architecture: Multiprocessors and Multicomputer: Multiprocessor System Interconnect, Cache Coherence and Synchronization Mechanism, Multi vector and SIMD Computers: Vector Processing Principles, Multi vector-Multiprocessor, Compound Vector Processing.

Text Books:

1. John. Hennessy & David A . Patterson, "Computer Architecture A quantitative approach", 5 th Edition, Morgan Kaufmann Publications.
2. Kai Hwang and A. Briggs , "Computer Architecture and parallel Processing " , International Edition McGraw-Hill.

Reference Book

1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture: Parallelism, Scalability and Programmability" 2 nd Edition, TMH Publications
2. David A. Kular and Jasvinder Pal Singh," Parallel Computer Architecture", Morgan Kaufmann Publications.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective II: Software Testing and Quality Assurance(Theory)

Total Credits: 03	Subject Code: BTCT603T-2
Teaching Scheme : Lectures: 03 Hours/Week Tutorials: 00 Hours/Week Practical: 00 Hours/Week	Examination Scheme : Duration of University Exam : 03 Hrs. College Assessment : 30 Marks University Assessment:70 Marks

Course Objectives:

1. To learn the criteria for test cases.
2. To learn the design of test cases.
3. To understand test management and test automation techniques.
4. To apply test metrics and measurements.

Course Outcomes: After completing the course, students will be able to

1. Explain test cases, Verification, Validation, Bugs and TQM.
2. Design and apply test cases suitable for a software development.
3. Explain and apply different levels of testing.
4. Explain and apply automation testing.
5. Explain and apply object oriented testing.

Unit I **(08 Hrs)**

Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing All Paths

Introduction: Purpose ,Productivity and Quality in Software ,Testing Vs Debugging , Model for Testing , Bugs ,Types of Bugs ,Testing and Design Style.

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design.

Unit II **(07 Hrs)**

Test case Design Strategies , Using Black Box Approach to Test Case Design , Boundary Value Analysis , Equivalence Class Partitioning , State based testing , Cause-effect graphing -Compatibility testing , user documentation testing , domain testing , Random Testing -Requirements based testing

Using White Box Approach to Test design , Test Adequacy Criteria , static testing vs. structural testing , code functional testing , Coverage and Control Flow Graphs , Covering Code Logic , Paths , code complexity testing , Additional White box testing approaches- Evaluating Test Adequacy Criteria.

Unit III **(07 Hrs)**

The need for Levels of Testing , Unit Test , Unit Test Planning , Designing the Unit Tests , The Test Harness , Running the Unit tests and Recording results , Integration tests , Designing Integration Tests , Integration Test Planning , Scenario testing , Defect bash elimination System Testing , Acceptance testing , Performance testing , Regression Testing , Internationalization testing , Ad-hoc testing , Alpha, Beta Tests , Testing OO systems , Usability and Accessibility testing , Configuration testing , Compatibility testing , Testing the documentation - Website testing.

(Ashish Sharma) Dr Dalel Malik Dr M.M. Thakare Annaji Kuthe

Unit IV **(07 Hrs)**

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory TestingAutomated Test Data Generation:Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan. Software test automation , skills needed for automation , scope of automation , design and architecture for automation , requirements for a test tool , challenges in automation , Test metrics and measurements , project, progress and productivity metrics.

Unit V **(07 Hrs)**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: Web testing , User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.
Metrics , Structural Metric , Path Products and Path Expressions. Syntax Testing , Formats , Test Cases .
Logic Based Testing , Decision Tables , Transition Testing , States, State Graph, State Testing.

Text Books:

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing , Principles and Practices, Pearson Education, 2006.
2. Ron Patton, Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007.
3. Ilene Burnstein, Practical Software Testing, Springer International Edition, 2003.

Reference Books:

1. Edward Kit, Software Testing in the Real World , Improving the Process, Pearson Education, 1995.
2. Boris Beizer, Software Testing Techniques , 2nd Edition, Van Nostrand Reinhold, New York, 1990.
3. Aditya P. Mathur, Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective II: Advance Microprocessor & Interfacing(Theory)

Total Credits: 03	Subject Code: BTCT603T-3
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:

1. To study architecture of microprocessor & to understand the concept of memory organization.
2. To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc.
3. To create an exposure to basic peripherals, its programming and interfacing techniques
4. To understand the concept of Interrupts and interfacing details of 8086.
5. To impart the basic concepts of serial communication in 8086.

Course Outcomes: After completing the course, students will be able to

1. Describe internal organization of 8086/8088 microprocessors. Demonstrate the concept of interrupts and its use
2. Understand assembly language programming using concepts like assembler directives, procedures, macros, software interrupts. Describe the concept of addressing modes
3. Demonstrate Interfacing of 8086 with Keyboard/ Display, ADC/DAC,8255 PPI,Programmable Keyboard/Display controller 8279.
4. Demonstrate Interfacing of 8086 with Programmable interval timer/counter 8254, 8259 PIC.Demonstrate the concept of Serial data communication using USART 8251
5. Describe 8087 Numeric coprocessor & its use in practical application.Describe the concept of DMA & Pentium.

Unit I **(08 Hrs)**

8086 /8088 architecture: 8086 /8088 architecture- functional diagram, pin diagram,features and operating modes, minimum mode and maximum mode, memory segmentation, programming model, Memory addresses, physical memory organization & interfacing, Interrupts of 8086.

Unit II **(06 Hrs)**

Clock generator 8284,Instruction set and assembly language programming of 8086: Instruction formats. Addressing modes, instruction set, assembler directives. Simple programs involving logical, branch and call instructions.Sorting, evaluating arithmetic expressions, string manipulations instructions.

Unit III **(08 Hrs)**

8086 & Peripheral Interfacing I: Assembly language programming of 8086,Interrupt structure, I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Organization, Working modes, command words & interfacing.

Unit IV **(08 Hrs)**

8086 & Peripheral Interfacing II : Programmable interval timer/counter 8254; Architecture, working modes, interfacing 8259 PIC, Organization, control words, interfacing, cascading of 8259's. Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.

Unit V **(06 Hrs)**

Numeric Co-processor & DMA Controller: 8086 maximum mode pin diagram, Closely coupled & loosely coupled multiprocessor system, 8087 Numeric coprocessor, architecture, interfacing with 8086, instruction set. DMAC 8237, Architecture, interfacing & programming, Introduction to Pentium.

Text Books:

1. D.V.Hall, Microprocessors and Interfacing. TMGH
2.Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH

Reference Books:

1.Intel Reference Manuals, Microprocessors : Intel
2.8086 MICROPROCESSOR AND APPLICATIONS 3ED (PB 2022) by A.Nagoorkani

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective III: Embedded System(Theory)

Total Credits: 03	Subject Code: BTCT604T-1
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:

1. To make students to conceptualize the basics of embedded systems
2. To make students to conceptualize the basics of organizational and architectural issues of a microcontroller.
3. To make students to learn programming techniques used in microcontroller.
4. To make students to understand fundamentals of real time operating system
5. To make to design embedded system

Course Outcomes: After completing the course, students will be able to

1. Define and explain the basic fundamental, problems and challenges and application areas in embedded system.
2 Illustrate the fundamental of 8051 Microcontroller ,
4. Illustrate the communication with 8051 Microcontroller and analyze through programming.
4. Illustrate the basic concepts with working environment of Real Time Operating System
5. Design embedded system and apply in case study .

Unit I **(06 Hrs)**

Introduction to Embedded Systems: Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC.

Unit II

(06 Hrs)

The Microcontroller Architecture: Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts.

Unit III **(10 Hrs)**

Assembly Language Programming of 8051: Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR.

Unit IV **(10 Hrs)**

Embedded / Real Time Operating System: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.

Unit V **(04 Hrs)**

Embedded System - Design case studies: Digital clock, Battery operated smart card reader, Automated meter reading system, Digital camera.

Text Books:

1. The 8051 microcontroller & Embedded systems, M. A. Mazidi, J. G. Mazidi, R. D. McKinlay, Pearson
2. The 8051 microcontroller & Embedded systems, Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning
3. Embedded / real – time systems: concepts, design & programming, Black Book, Dr. K. V. K. K. Prasad, Dreamtech press
4. Introduction to embedded systems, Shibu K. V., McGraw Hill

Reference Books:

1. Embedded systems an integrated approach, Laya B. Das, Pearson.
2. Embedded system design A Unified hardware/software Introduction, Frank Vahid, Tony Givargis, Wiely
3. Raj Kamal, Embedded Systems Architecture, Programming and design, Tata MCgraw-Hill Publication.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective III: Mobile Application and Development(Theory)

Total Credits: 03	Subject Code: BTCT604T-2
Teaching Scheme : Lectures: 03 Hours/Week Tutorials: 00 Hours/Week Practical: 00 Hours/Week	Examination Scheme : Duration of University Exam : 03 Hrs. College Assessment : 30 Marks University Assessment:70 Marks

Course Objectives:

To make students
1. To understand android SDK.
2. To aware basic understanding of Android application development.
3. To inculcate working knowledge of Android Studio development tool.

Course Outcomes:

At the end of this course, students will be able to:
1. Identify various concepts of mobile programming that make it unique from programming for other platforms.
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution.

UNIT - I **(08 Hrs)**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT - II **(08 Hrs)**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT - III **(08 Hrs)**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT - IV **(06 Hrs)**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT - V **(06 Hrs)**

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education.
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd.
3. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd.
4. Android Application Development All in one for Dummies by Barry Burd.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Elective III: Cloud Computing(Theory)

Total Credits: 03	Subject Code: BTCT604T-3
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:

1. To make students familiar with the concepts, characteristics, delivery models and benefits of cloud computing.
2. To make the student aware of the key security and compliance challenges of cloud computing
3. To make students understand about key technical and organizational challenges and the different characteristics of public, private and hybrid cloud deployment models.

Course Outcomes : After completing the course, students will be able to

1. The concepts, characteristics, delivery models and benefits of cloud computing.
2. Illustrate and explain in detail the cloud computing architecture and classify various types of clouds.
3. Explain big data analysis, Hadoop and MapReduce and introduction to tools.
4. Illustrate various security concepts in cloud computing and need of security measures.
5. Discuss and implement Cloud based Application using C# and windows azure

Unit I **(08 Hrs)**

Introduction to Cloud Computing, Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages of Cloud Computing, Pros and Cons of Cloud Computing, Benefits of CloudComputing, Cloud computing vs. Cluster computing vs. Grid computing. Legal issues when using cloud models, challenges in cloud computing.

Unit II **(08 Hrs)**

Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.

Unit III **(06 Hrs)**

Big Data Analysis, Hadoop and Map Reduce: Introduction, Clustering Big Data, Classification of Big Data, Hadoop MapReduce Job Execution, Hadoop scheduling, Hadoop cluster setup, configuration of Hadoop, starting and stopping Hadoop cluster.

Unit IV **(06 Hrs)**

Security in Cloud: Cloud Security Challenges, Infrastructure Security, Network level security, Host level security, Application level security, data privacy, data security, application security, virtual machine security, Identity Access Management, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

Unit V **(08 Hrs)**

Application Development using C#: Understand object oriented concepts in C#.NET, Creation of UI and event handling, web page creation using ASP.NET, ADO.NET architecture, implementation of data seta, using ADO.NET in console application, using ADO.NET in web application.

Creating Cloud Application using Azure: Creating simple cloud application, Azure fabrics,Azure service, and storage types and deployment of application to the production environment.

Text Books:

1. Mcohen K. Hurley, "Google Compute Engine", O'Reilly Edition, 2014 .
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wile, 2011.
3. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing, A Hands-on Approach", Universities Press, 2013.
4. R. J. Dudley, N. A. Duchene, "Microsoft Azure: Enterprise Application Development", Packt Publication, 2010.

Reference Books:

1. B. M. Harwani, "Cloud Computing using Windows Azure ", Arizona Business Alliance Publication, 2014.
2. J. W. Rittinghouse, J. F. Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2009.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Open Elective I: Digital Image Processing(Theory)

Total Credits: 03	Subject Code: BTCT605T-1
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:
1. To understand the basic fundamentals of image.
2. To understand and describe various techniques for image enhancement and restoration.
3. To understand and describe various techniques for image segmentation and compression.

Course Outcomes: After completing the course, students will be able to
1. Explain the basic fundamentals of Image and compare different 2 D transforms.
2. Design and implement various image enhancement techniques.
3. Design and implement various image restoration techniques.
4. Design and implement various image segmentation techniques.
5. Design and implement various image compression techniques.

UNIT I: **(06 Hrs)**

Digital image fundamentals: Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms -DFT, DCT, KLT, SVD.

UNIT II: **(09 Hrs)**

Image enhancement: Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image fundamentals -RGB, HSI models, Color image enhancement.

UNIT III: **(07 Hrs)**

Image restoration: Image Restoration -degradation model, unconstrained restoration -Lagrange multiplier and constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV: **(06 Hrs)**

Image segmentation: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Segmentation by morphological watersheds, basic concepts, Dam construction, and Watershed segmentation algorithm.

UNIT V: **(08 Hrs)**

Image compression: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Text Books:
1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, PearsonEducation, Third Edition, 2008.

2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

Reference Books:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D. E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka etaI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Open Elective I: Advanced Web Technologies(Theory)

Total Credits: 03	Subject Code: BTCT605T-2
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:
1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

Course Outcomes: After completing the course, students will be able to
1. Gain knowledge of client-side scripting, validation of forms and AJAX programming
2. Understand server-side scripting with PHP language
3. Understand what is XML and how to parse and use XML Data with Java
4. Introduce Server-side programming with Java Servlets and JSP
5. Introduce Scripting Language PHP

Unit I **(07 Hrs)**

HTML Common tags- List, Tables, images, forms, Frames; **Cascading Style sheets**; **XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

Unit II **(07 Hrs)**

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

Unit III **(07 Hrs)**

Introduction to Servlets: Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

Unit IV **(07 Hrs)**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP

Unit V **(08 Hrs)**

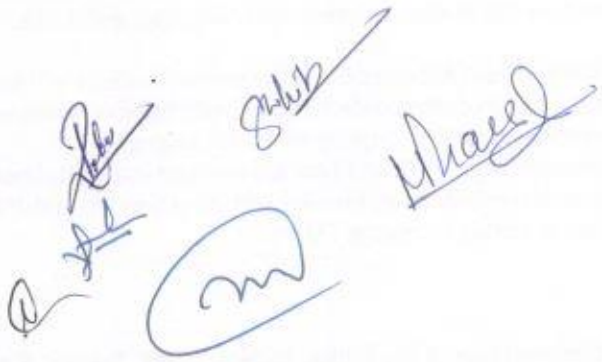
Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

Reference Books:

1. Web Programming, building internet applications, Chris Bates 2" edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX. R18 B.TECH CSE III YEAR
5. Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.



Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Open Elective I: Multimedia and Animation(Theory)

Total Credits: 03	Subject Code: BTCT605T-3
Teaching Scheme : **Lectures: 03 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 03 Hrs.** **College Assessment : 30 Marks** **University Assessment:70 Marks**

Course Objectives:
1. To introduce the principles and current technologies of multimedia systems.
2. Issues in effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image and video will be addressed.
3.The students will gain hands-on experience in those areas by implementing some components of a multimedia streaming system as their term project.
4.Latest Web technologies and some advanced topics in current multimedia research will also be discussed.

Course Outcomes: After completing the course, students will be able to
1.To acquire fundamentals principles of multimedia, including digitization and data compression for non-textual information
2. To understand issues in representing, processing, and transmitting multimedia data
3. To understand core multimedia technologies and standards
4. To gain hands-on experience in image, sound and video editing and in some aspects of multimedia authoring (incorporating images, sound, video, and animation)
5.To design, capture, store and integrate sound, images and video to deliver multimodal information.

Unit I **(08 Hrs)**

Limitations of Traditional Input Device, Multimedia Elements. Multimedia Application. Multimedia System Architecture, Evolving Tech. for Multimedia, Defining Objects for Multimedia Systems, Multimedia Data Interface Standard. Magnetic Media Technology, Hard disk Technology, RAID, Criteria for Selection of RAID, Use of Magnetic Storage in Multimedia, Optical Media, Magneto Optical.

Unit II **(07 Hrs)**

Evaluating the Compression System, How much, Compression, How Good is Picture, How fast Does it Compress or Decompress, What H/W & S/W Does it take, Redundancy & Usability. Types of compression, Need of Data Compression ,Color Gray Scale and Still Video Image , Color Characteristics, Color Model,Simple Compression Technique, Interpolative, Predictive, Transfer Coding, Discrete Transfer, Statistical (Huffman, arithmetic)JPEG Compression, Requirement Addressing JPEG, Definition of JPEG Standard, Overview of JPEG Components, JPEG methodology, The discrete cosine Transfer , Quantization, Zigzag Sequence.

Unit III **(07 Hrs)**

Introduction to Standardization of Algorithm •File Formats •History of RIF, TIFF TIFF Specification , TIFF structure , TIFF tag ,TIFF Implementation issues , TIFF classes RIFF Chunks with two sub chunks , List chunk , RIFF waveform Audio File format , RIFF MIDI file Format, RIFF DIB's,•Introduction to RIFF, AVI RIFF AVI File format, Index Chunk and Boundary condition handling for AVI files., AVI Indeo File Format. JPEG-objectives, Architecture, JPEG-DCT encoding Quantization. •JPEG-stastical coding, predictive lossless coding, JPEG performance •MPEG-objectives, Architecture, BIT stream syntax performance •MPEG2 & MPEG4.

Unit IV **(07 Hrs)**

Multi Media Authoring System and its type. Hypermedia Application Design consideration. User Interface Design. Information Access. Object Display / Playback Issues. Components of Distributed Multimedia Systems 5.2 Distributed Client Server Operation 5.3 Multimedia Object Server 5.4 Multi Server Network topologies 5.5. Distributed Multimedia Databases.

Unit V **(07 Hrs)**

Introduction to Multimedia tool – Flash. Creating & Modifying elements 6.3 Line tool, fill/attributes, different shapes, text tools & pen tool. Selecting lines fill with arrow tool, selecting shapes, using lasso tool performing basic editing tools, selecting & deselecting elements, modifying created objects.

Text Books:

1.Prabhat k. Andheigh, Kiran Thakrar, John F, Multimedia Systems Design, Prentice Hall of India
2.Koegel Buford , Multimedia Systems Design, Pearson Education
3. Katherine Ulrich ,Micromedia Flash for Windows and Macintosh, Pearson Education

Reference Books:

1.Free Halshal, Multimedia Communication , Pearson Education
2. . R. Steimnetz, K. Nahrstedt, Multimedia Computing, Communication and Application , Pearson Education
3. .D. Gibson, Multimedia Communication Directions and Innovations,Academic Press, Hardcourt India
4.J.F. Kurose, K. W. Rose, Computer Networking, Pearson Education

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Economics of IT industry(Theory)

Total Credits: 02	Subject Code: BTCT606T
Teaching Scheme : **Lectures: 02 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**	**Examination Scheme :** **Duration of University Exam : 02 Hrs.** **College Assessment : 15 Marks** **University Assessment:35 Marks**

Course Outcomes: After completing the course, students will be able to

1. Distinguish between Micro and Macro economics
2. Relate economics concept with IT industry
3. Identify key trends in IT industry
4. Understand the key economic drivers of IT industry.

Unit 1

Difference between Micro and Macroeconomics, law of demand and supply, concept and types of elasticity of demand, deflation and recession.

Unit 2

Role of Information and technology industry in economic growth of the country, labour intensive verses capital intensive industry, the concept of digital economy and digital age, digital divide, various phases of business cycle.

Unit 3

Merger and acquisition, types of merger, advantages of merger, hostile takeover, concept of top line and bottom line growth, Contribution of E-Commerce in economic growth, information technology and environment- the challenge of E - waste.

Unit 4

Venture and angel funding as sources of finance, organic verses inorganic growth model, 5 level capability maturity model of IT industry, Concept of agile organization

List of Reference Books

1. Modern economic theory by K.K.Dewett,
2. Information and economic development by Yutuka Khurana, IGI Global publisher.
3. The economics of information technology by Paul Jowett, Margaret Rothwell. St Martin Press New York.
4. Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

Faculty of Science and Technology
R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Mini Project(Practical)

Total Credits: 02	Subject Code: BTCT607P
Teaching Scheme : Lectures: 00 Hours/Week Tutorials: 00 Hours/Week Practical: 04 Hours/Week	Examination Scheme : College Assessment : 25 Marks University Assessment:25 Marks

R.T.M Nagpur University, Nagpur
Syllabus for B.Tech. Sixth Semester CT
Organizational Behaviour(TH) Audit Course
Subject Code: BTCT608T

Total Credits: 00
Teaching Scheme : **Lectures: 02 Hours/Week** **Tutorials: 00 Hours/Week** **Practical: 00 Hours/Week**

Objective: The objective of the course is to create awareness among learners about the various essential aspects of organizational processes and structure and motivation in organization.

Course outcomes: By the end of the course, students will be able to

1. understand the concept and importance of organizational behaviour.
2. acquire the knowledge of interpersonal behaviour and transaction analysis
3. know different traits and theories of personality
4. analyze the importance of motivation in organization and types of leadership

Unit 1. Introduction to organizational behaviour.
Concept of organization behaviour, Importance of organization behaviour, Key elements of organization behaviour, scope of organizational behaviour.

Unit 2: Introduction to interpersonal behaviour.
Nature and meaning of interpersonal behaviour, concept of transaction analysis, benefits and uses of transaction analysis, Johari window model.

Unit 3: Introduction to personality
Definition and meaning of personality, importance of personality, theories of personality, personality traits.

Unit 4: Introduction to Motivation and leadership.
Concept and importance of motivation, Maslow's two factor theory of motivation. Significance of motivation in organization. Types of leadership styles.

List of books

1. Organizational behaviour by MN Mishra, published by S.Chand.
2. The human side of organization by Michale Drafke, published by Pearson education.
3. Management and Organizational behaviour by Laurie.J. Mullins, published by Pearson education.
4. Organizational behaviour by K. Aaswathappa, Published by Himalaya publications.