**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**
**B.E. Four Year Degree Course**
**(Revised Curriculum as per AICTE Model Curriculum)**
**Scheme & Syllabus for Computer Engineering**

**Third Semester:-**

| SN | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Mathematics – III | 4 | - | - | 30 | 70 | 100 | 4 | BSC |
| 2 | Digital Circuits and Fundamentals of Microprocessor | 3 | 1 | - | 30 | 70 | 100 | 4 | ESC |
| 3 | Object Oriented Programming | 3 | 1 | - | 30 | 70 | 100 | 4 | PCC-CS |
| 4 | Theory of Computation | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 5 | Introduction to Computer Networks | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 6 | Universal Human Values | 2 | - | - | 15 | 35 | 50 | 2 | HSMC |
| 7 | Digital Circuits and Fundamentals of Microprocessor Lab | - | - | 2 | 25 | 25 | 50 | 1 | ESC |
| 8 | Object Oriented Programming (Lab) | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 9 | Computer Workshop-I(Lab) | - | - | 2 | 25 | 25 | 50 | 1 | LC |
| 10 | Environmental Science | 2 | - | - | - | - | - | Audit | HSMC |
| | **Total** | **20** | **02** | **06** | **240** | **460** | **700** | **23** | |

**L: Lectures T: Tutorials P: Practical**
**PCC-CS**-Professional Core Courses **PEC-CS**-Professional Elective Courses
**LC**- Laboratory Course BSC- Basics Science Courses **ESC**-Engineering Science Courses
**OEC-CS**-Open Elective Courses **MC**- Mandatory Course
**PROJ-CS**- Project
**HSMC**- Humanities and Social Sciences including Management Courses

Dr. S. V. Sonekar
Chairman

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Mathematics – III*** Subject Code : **BECME301T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 4 Hrs (Theory) | 4 | 30 | 70 | 100 |

**Aim: To understand the concepts of mathematics to solve the real life problems.**

**Prerequisite(s): Higher Secondary Mathematics.**

**Course Objectives:**

| | |
|---|---|
| **1** | A primary objective is to provide a bridge for the student from lower-division mathematics courses to upper-division mathematics. |
| **2** | Explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results. |
| **3** | Propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to these questions. |

**Course Outcomes:**

After completing the course, students will be able to

| | |
|---|---|
| **CO1** | Solve mathematical model with Laplace Transform and error functions and their applications. |
| **CO2** | Make use of Fourier transforms and Z - transforms to analyze wave forms of periodic functions & non periodic functions |
| **CO3** | Solve problems in engineering domain related to Linear Algebra using matrices. |

| | |
|---|---|
| **CO4** | Develop problem solving techniques needed to accurately calculate probabilities and describe the properties of discrete and continuous distribution functions. |
| **CO5** | Compute correlations; Apply the tests of goodness of fit. |

**Unit 1: Integral Transforms** **(10 Hrs)**

**Laplace Transform:** Definition, Properties of Laplace transform (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform by partial fraction method, Convolution theorem (Statement only), Simple applications of Laplace transform to solve ordinary differential equations.

**Fourier Transform:** Definition and Properties (excluding FFT), Applications of Fourier transform to solve integral equations.

**Unit 2: Z-Transform** **(09 Hrs)**

Definition and convergence of Z-transform, Properties (Statement only) and examples, Inverse Z-transform by partial fraction method, Convolution of two sequences, Power series method, Solution of difference equations with constant coefficients by Z-transform method.

**Unit 3: Matrices** **(09 Hrs)**

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest Eigen value and its corresponding Eigen vector by iteration method.

**Unit 4: Mathematical Expectation and Probability Distributions** **(10 Hrs)**

Review of discrete and continuous random variables, Mathematical expectation, Variance, Standard deviation, Moments, Moment generating function, Binomial distribution, Poisson's distribution, Normal distribution, Exponential distribution.

**Unit 5: Statistical Techniques** **(10 Hrs)**

**Statistics:** Introduction to correlation and regression, Multiple correlation and its properties, Multiple regression analysis, Regression equation of three variables.

**Measures of central tendency:** Mean, Median, Quartile, Decile, Percentile, Mode, Mean deviation, Standard deviation.

**Skewness:** Test and uses of skewness and types of distributions, Measure of skewness, Karl Pearson's coefficient of skewness, Measure of skewness based on moments.

**Text/ Reference Books:**


1. *Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.*
2. *Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.*
3. *Advanced Engineering Mathematics (S. Chand), H. K. Dass.*
4. *Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan.*
5. *Advanced Mathematics for Engineers, Chandrika Prasad.*
6. *A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M. Goyal.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Digital Circuits and Fundamentals of Microprocessor*** Subject Code : **BECME302T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| (3+1) Hrs (L+T) | 4 | 30 | 70 | 100 |

**Aim: To understand the concepts of digital circuits and microprocessor.**

**Prerequisite(s): Nil**

**Course Objectives:**

| | |
|---|---|
| **1** | To understand the basic digital gates used in digital system and develop logical circuits using Boolean gates, construction of various logic circuits using basic gates. |
| **2** | To understand the sequential logic design |
| **3** | Identify the logic families, memory devices & PLDs |
| **4** | To understand the 8085 microprocessor |

**Course Outcomes:**

At the end of this course Student are able to:

| | |
|---|---|
| **CO1** | Understand the concepts of realization of Boolean functions using various combinational logic design |
| **CO2** | Analyze & design digital combinational logic circuits |
| **CO3** | Illustrate memory elements & design used in sequential logic design |
| **CO4** | Classify different logic families, memory devices and PLDs |
| **CO5** | Describe the internal working of 8085microprocessor and AL programming concepts in 8085 microprocessor with examples |

**Unit I: Combinational Circuits** **[08 Hours]**

Number system, Boolean algebra, Standard representations for logic functions, K map representation of logic functions (SOP & POS forms), minimization of logical functions for min-

terms and max-terms (upto 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters.

**Unit II :Logic Circuit Design** **[07 Hours]**

Adders and their use as substractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Static and dynamic hazards for combinational logic.

Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers, Encoders & Decoders.

**Unit III: Sequential Components and their Applications** **[07 Hours]**

Sequential Logic Design 1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops.

Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew.

**Unit IV: Programmable Logic Devices** **[07 Hours]**

Classification and characteristics of memories: RAM, ROM, EPROM, EEPROM, SRAM, DRAM, expanding memory size, Synchronous DRAM (SDRAM), Double Data Rate SDRAM, Synchronous SRAM, DDR and QDR SRAM, Content Addressable Memory Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs.

**Unit V: Fundamental of Microprocessor** **[07 Hours]**

Introduction to microprocessor, Architecture of 8085 microprocessor, Addressing modes, 8085 instruction set, Interrupts, Concept of assembly language programming.

**Text Books:**


1. *Morris Mano : " An approach to digital Design", Pearson Publications.*
2. *Ramesh Gaonkar : " Microprocessor Architecture, Programming and Applications with the 8085", Penram International Publications.*
3. *W. Fletcher : "Engg. Approach to Digital Design", PHI Publications.*
4. *A. Anand Kumar*: "*Fundamentals of Digital Circuits*", *PHI Publications.*


**Reference Books**


1. *Wakerly Pearon : "Digital Design: Principles and Practices", Pearon Education*

*Publications.*

*2. Mark Bach : "Complete Digital Design", Tata MCGraw Hill Publications*

*3. R.P. Jain : "Modern digital electronics" , TMH Publications.Reference*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Object Oriented Programming*** Subject Code : **BECME303T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| (3+1) Hrs (L+T) | 4 | 30 | 70 | 100 |

**Aim: To realize the concepts of Object Oriented Programming**

**Prerequisite(s): C Programming, Object Oriented Concepts**

**Course Objectives:**

| | |
|---|---|
| **1** | To provide understanding of basics of object oriented programming |
| **2** | To enable students to understand features of object oriented programming language |
| **3** | To develop program using object oriented programming language |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Realize the difference between the top-down and bottom-up approach along with thinking in terms of objects. |
| **CO2** | Explain programming fundamentals, including statement and control flow and recursion. |
| **CO3** | Analyze the given problem keeping in mind object oriented approach |
| **CO4** | Apply the object-oriented concepts during the development of solution |
| **CO5** | Illustrate the use of static and run time binding, error handling mechanism |

**UNIT I:** **[07 Hours]**

Introduction: Taxonomy and history of Computer Programming Program Execution basics. Problem solving and programming strategies, programming paradigms. Algorithm and flowchart design, Principles of Structured programming. C Language Fundamentals: Loop control statements, Arrays One dimensional & Two-dimensional array. Functions – Definition, call, prototypes, block structure, external variables, Recursion.

**UNIT II :** **[ 07 Hours]**

Pointers in C – Address and indirection operators, Pointer arithmetic – Functions and pointers – Arrays and pointers – Strings and pointers – Multi-dimensional arrays and pointers – Pointer arrays – Pointers to functions –Dynamic memory management. Structure in C : Structures – Variables, Accessing members, Assignment and nesting – Pointers to Structures – Structures and functions – Structures and arrays – Structures containing pointers – Unions

**UNIT III :** **[ 08 Hours]**

Principles of Object Oriented Programming: Object Oriented Programming Paradigm, Basic Concepts of Object Oriented Programming, Benefits of Object Oriented Programming, Object Oriented Languages, Applications of Object Oriented Programming, C++ Basics : Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables, Operators in C++,Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.

**UNIT IV :** **[ 07 Hours]**

Functions in C++ :.The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, , Friend Functions. Classes & Objects: Specifying a class, Member Functions, Arrays within a class, Static Member Functions, Arrays of Objects. Constructors & Destructors: Constructors Parameterized Constructors, Copy Constructors, Dynamic Constructors, and Destructors.

**UNIT V :** **[ 07 Hours]**

Polymorphism: Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions. Function Overloading, Virtual Functions. Inheritance: Derived Classes,

Single, multilevel, multiple inheritance, Abstract Classes, Virtual and pure virtual functions Pointers in C++: Pointers to Objects, this pointer, Pointer to Derived Classes, Exception handling

**Text Books :-**


1. *Let us C ,Yashavant Kanetkar,– BPB Publications. 2002*
2. *Object-oriented programming with C++ by E.Balagurusamy, 2nd Edition, TMH.*


**Reference Books:-**


1. *The C Programming Language : Dennis Ritchie & Brain Kernighan [Pearson]*
2. *Practical "C" Programming: Steve Oualline, O'Reilly Publications*
3. *Object Oriented Programming using C++, Robert Lafore, Galgotia publication 2010.*
4. *How to Program C++, Sixth Edition, by Deitel&Deitel, Prentice Hall, 2005,*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : **Theory of Computation** Subject Code : **BECSE304T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

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**Aim: To understand the formal language processing and its application.**

**Prerequisite(s): Set theory**

**Course Objectives:**

| | |
|---|---|
| **1** | Theoretical explanation of computation resources. |
| **2** | Understanding formal language processing. |
| **3** | Construct the model or machine for solving different problems. |
| **4** | Utilize different levels of computation |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Explain fundamental properties of formal languages and formal grammars, deterministic and nondeterministic finite automata and types of languages and types of finite automata. |
| **CO2** | Compare deterministic and nondeterministic finite automata and deterministic finite automata and Explain fundamental construction of Mealy and Moore Machine. |
| **CO3** | Prove the equivalence of languages described by finite state machines and regular expressions and able to construct regular grammar from finite automata and vice versa. |
| **CO4** | Apply logic using context-free languages, context-free grammars. |

| | |
|---|---|
| **CO5** | Construct push-down automata, Turing machines and identify decidability and recursive enumerability. |

**Unit I:** **[7 Hours]**

Introduction to Theory of Automaton, Strings, Alphabet, language, Chomsky hierarchy of languages, Finite state machine definitions, Finite automation model acceptance of strings and language, Non deterministic finite automaton, Deterministic finite automaton.

**Unit II:** **[ 7 Hours]**

Equivalence between NFA and DFA. Conversion of NFA into DFA, NFA with e-moves and e-closure with examples, Conversion of NFA with e moves to without e-moves Minimization of FSM, Equivalence between two FSM's, Mealy Machine and Moore Machine and its conversion.

**Unit III:** **[7 Hours]**

Introduction to Regular languages and Regular expression, Regular set, Regular Expression and Regular languages sample examples, Regular expression examples, Equivalence and Inter Conversion between Regular Expression and FA, Conversion from RE to RG

**Unit IV:** **[ 7 Hours]**

Introduction to Context Free Grammar (CFG) and Derivation Trees, Left Derivation Tree and Right Derivation Tree, CFG minimization (Reduction of CFG), Chomsky normal form(CNF), Greibach normal form(GNF)

**Unit V:** **[ 8 Hours]**

Introduction to Push Down Automaton (PDA) Definition and working principle, Implementation of Push Down Automaton. Introduction to Turing machines, Definition, Model of TM, Types of TM, Designing of TM. Decidability and Undecidability of problems, Properties of recursive & recursively enumerable languages, Post correspondence problem, Ackerman function.

**Text books:**


1. *Introduction to Theory of Computation 2nd Edition, by Sipser, Cengage publications*
2. *Introduction to Automata Theory, Languages and Computation by J. E. Hopcraft,R. Motwani, J. D Ullman, second Edition, Pearson Education, Aisa*
3. *An Introduction to Formal Languages and Automata by Peter Linz*
4. *Introduction to Langauges and the theory of Automata by John Martin, Third Edition(TMH)*

**Reference books:**


1. *Theory of Computer Science, Automata, Languages and Computation by K. L. P. Mishra and N. Chandrasekaran, Third Edition, PHI Learning.*
2. *Elements of Theory of Computation by Lewis H.P and Papadimition C.H.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Introduction to Computer Networks*** Subject Code : **BECME305T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

**Aim: To provide the students with the knowledge and skills of layered models in various categories of network.**

**Prerequisite(s): Concepts of Computer Engineering**

**Course Objectives:**

| | |
|---|---|
| 1 | To obtain a theoretical understanding of various aspects of Data Communication & Computer Network and explore the functions of layered architecture. |
| 2 | To explain the concept of layered architecture when two entities need to communicate with each other. |
| 3 | To enable the students to understand cryptography concepts related to network security |

**Course Outcomes:**

At the end of this course Student are able to:

| | |
|---|---|
| **CO1** | Describe the basics of network and its hardware components |
| **CO2** | Explain the different network models |
| **CO3** | Interpret the various functions and protocols of network models. |
| **CO4** | Distinguish different transmission media with its connectors. |
| **CO5** | Summarize the concepts of network security and privacy. |

**Unit I:** **[07 Hours]**

Introduction to Data Communication and Computer Networks: Definition, Characteristics, Components, Data Representation, Types of Data flow, Need of Computer Networks, advantages and disadvantages, Goals and Application of Computer Network, Network Hardware Components, Computer Network Criteria, Physical structure(types of connection, physical topology), Types of network: (LAN,MAN,WAN,PAN,CAN), Classification of Local Area network.

**Unit II:** **[06 Hours]**

Layered Model: Protocol Hierarchies, Network Model, Design issues for the Layers, Interfaces and Services, Service primitives, Connection Oriented and Connectionless types of services, OSI Reference Model & architecture, TCP/IP reference model, types of addressing.

**Unit III:** **[07 Hours]**

Physical Layer: Types of signals, Transmission Mode, Transmission Impairment, Data rate Limits, Performance, Digital to Digital Conversion Line coding techniques, Transmission Media, Switching techniques. Data Link Layer: Introduction to MAC and LLC sub layers, Framing methods, error detection and correction methods, LLC sub layer Protocols for Noise and Noiseless channels, MAC layer multiple access protocols (CSMA,CSMA/CD,CSMA/CA), channelization(FDMA, TDMA, CDMA), Introduction to Virtual LAN.

**Unit IV:** **[08 Hours]**

Network Layer: IPv4 addressing method, Routing algorithm(Static, Dynamic, Hierarchical), Address Mapping protocols(ARP,RARP, DHCP), ICMP protocol, Subnet & Subnet Masking techniques for classful addressing methods, Transport Layer: Elements of Transport Protocols, Addressing technique, Connection Oriented Service, TCP protocol and header format, TCP checksum calculation, TCP transmission policy, UDP protocol and header format, UDP checksum calculation, SCTP protocol, QoS parameters, Congestion control methods, Traffic shaping algorithms. Session and Presentation layer: Session layer design issues, responsibilities of Presentation layer

**Unit V:** **[08 Hours]**

Application Layer and Network Security: Responsibilities of Application Layer, Application Layer Services (DNS, E-mail, MIME, SMTP, FTP, TFTP),Architecture of WWW and HTTP,

Introduction to Cryptography, Security Services, Introduction to Symmetric and Asymmetric Key Cryptography, Digital Signature.

**Text Books:**


1. *Data Communications and Networking, Fourth Edition, Behrouz A Forouzan, (McGraw Hill)*
2. *Computer Networks, Vol.4, Andrew S. Tanenbaum. PHI*


**Reference Books :**


1. *Data and Computer Communication, 2nd Edition. by William Stallings.*
2. *A Course in Computer Networks, 3rd Edition by Dr. Sanjay Sharma, Katson Books*
3. *Computer Networks Principles, technologies and Protocols for Network Design, Natalia Olifer, Wiley India Student edition.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Universal Human Values*** Subject Code : **BECME306T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs | 2 | 15 | 35 | 50 |

**Aim: To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature**

**Prerequisite(s):Values education from school.**

**Course Objectives:-** The objective of the course is four fold:

| | |
|---|---|
| **1** | Development of a holistic perspective based on self-exploration, about themselves (human being), family, society and nature/existence. |
| **2** | Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence |
| **3** | Strengthening of self-reflection. |
| **4** | Development of commitment and courage to act. |

**Course Outcomes:**

By the end of the course students shall be able to

| | |
|---|---|
| **CO1** | Expected to become more aware of themselves, and their surroundings (family, society, nature) |
| **CO2** | Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. |
| **CO3** | Handle better critical ability. |
| **CO4** | Become sensitive to their commitment towards what they have understood (human values, human relationship and human society). |

**Unit 1** **[06 Hours]**

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

**Unit 2** **[06 Hours]**

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body.

**Unit 3** **[06 Hours]**

Values in relationship, the five dimensions of human endeavour, the holistic perception of harmony in existence.

**Unit 4** **[06 Hours]**

Basics for ethical human conduct, defects in ethical human conduct, human rights violations and social disparities, value based life.

**Reference Books**


1. *Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,ExcelBooks, NewDelhi,2010*
2. *Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.*
3. *Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.*
4. *Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004*
5. *Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Digital Circuits and Fundamentals of Microprocessor(Lab)*** Subject Code : **BECME302P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

- ***Minimum eight to ten practical based on Digital Circuits and Fundamentals of Microprocessor syllabus***

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Object Oriented Programming (Lab)*** Subject Code : **BECME303P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

***Practical based on syllabus using C and C++ programming language(Any 8 to 10 practicals)***

**Practical - 1:** Program to demonstrate use of loops & recursion

**Practical - 2:** Program to demonstrate arrays

**Practical - 3:** Program to demonstrate pointers

**Practical - 4:** Program to demonstrate structures and pointers

**Practical - 5:** Program to implement concept of class and object

**Practical - 6:** Program to implement constructor & destructor

**Practical - 7:** Program to implement inheritance

**Practical - 8:** Program to implement polymorphism

**Practical - 9:** Program to implement abstract class

**Practical - 10:** Program to implement copy constructor & assignment operator

**Practical - 11:** Program to implement run time binding (Virtual function)

**Practical – 12:** Program to implement friend class and friend function

**Practical - 13 :** Program to implement exception handling

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Computer Workshop -I (Lab)*** Subject Code : **BECME309P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

**Syllabus:**

**File Handling in C-** Creation of a new file, Opening an existing file, Reading data from a file, writing data in a file, Closing a file. Performing various file manipulation operations.

**Introduction to PHP-** Introduction to the open source Web scripting language PHP. Build dynamic Web applications. Semantics and syntax of the PHP language, including discussion on the practical problems that PHP solves.

**Introduction to Python Language-**Variables, strings, and Numbers, Lists and Tuples, Introducing Functions, If Statements While Loops and Input, Dictionaries

**Practicals should be performed based on above syllabus but not restricted to following list.. Sample List is provided.**

1. C Program to Delete a Specific Line From a Text File and Find the Number of Lines in a Text File
2. C Program to Delete a file and Copy contents of File to another file.
3. C Program to Merge Two Files
4. Write PHP scripts to handle HTML forms.
5. Write regular expressions including modifiers, operators, and metacharacters.

6. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
7. Python Program to Add Two Numbers.
8. Python Program to Find the Square Root.
9. Python Program to Calculate the Area of a Triangle.
10. Python Program to Solve Quadratic Equation.
11. Python Program to Swap Two Variables.
12. Python Program to Generate a Random Number.

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3rd (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Environmental Science (Audit Course)*** Subject Code : **BECME310T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Theory) | Nil | Nil | Nil | Nil |

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**Unit-I Air pollution and its control techniques: [06 Hours]**

Contaminant behavior in the environment, Air pollution due to SOx, NOx, photochemical smog, Indoor air pollution

Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle.

Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control Air pollution, ambient air quality and continuous air quality monitoring, Control measures at source, Kyoto Protocol, Carbon Credits.

**Unit-II Water pollution and its control techniques: [06 Hours]**

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, micro plastics

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal and its utility.

Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills

**Unit-III Other Environmental Pollution& Waste Management: [06 Hours]**

Soil pollution: Soil around us, Soil water characteristics, soil pollution. Causes, effects &

control: noise pollution, nuclear & radiation hazards, marine pollution (Oil spills & Ocean Acidification)

Solid waste management: Composting, vermiculture, landfills, hazardous waste treatment, bioremediation technologies, conventional techniques (land farming, constructed wetlands), and phytoremediation.

Degradation of xenobiotics in environment: Petroleum hydrocarbons, pesticides, heavy metals

Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.

**Unit-IV Social Issues and the Environmental Laws** **[06 Hours]**

Concept of Sustainable development Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental Laws (brief idea only) Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act Issues involved in enforcement of environmental legislation. Different government initiatives (brief idea only)- National ambient air quality standard 2009, Swachh Bharat Abhiyan, National afforestation program and Act- 2016, National River conservation plan and National Ganga River basin authority, Formation of National Green Tribunal

**Activity**

1. Field Trip & Report Writing
2. Case-study & Report Writing

**Reference Books:**


1. *Benny Joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited*
2. *B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut*
3. *P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann*
4. *D. D. Mishra, S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.*
5. *Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin*

*Heidelberg*

6. *Indian Environmental Law: Key Concepts and Principles edited by Shibani Ghosh, Publisher, Orient BlackSwan, 2019. ISBN, 9352875796.*
7. *P. Thangavel & Sridevi, Environemental Sustainability: Role of Green technologies, Springer publications*

Dr. S. V. Sonekar
Chairman

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

**Fourth Semester:-**

| SN | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Discrete Mathematics and Graph Theory | 3 | 1 | - | 30 | 70 | 100 | 4 | PCC-CS |
| 2 | Web Technology | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 3 | Operating System | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 4 | Data Structures | 3 | 1 | - | 30 | 70 | 100 | 4 | PCC-CS |
| 5 | Computer Architecture and Organization | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 6 | System Programming | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 7 | Web Technology-Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 8 | Operating System- Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 9 | Data Structure-Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 10 | Consumer Affairs | 2 | - | - | - | - | - | Audit | MC |
| 11 | Internship (Min. 4 Weeks) | - | - | 2 | 50 | - | 50 | 1 | PROJ-CS |
| | **Total** | **20** | **02** | **08** | **305** | **495** | **800** | **24** | |

**L: Lectures T: Tutorial P: Practical**
**PCC-CS**-Professional Core Courses **PEC-CS**-Professional Elective Courses
**LC**- Laboratory Course **BSC**- Basics Science Courses **ESC**: Engineering Science Courses
**OEC-CS**-Open Elective Courses **MC**- Mandatory Course
**PROJ-CS**- Project
**HSMC**- Humanities and Social Sciences including Management Courses

Dr. S. V. Sonekar
Chairman

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Discrete Mathematics and Graph Theory*** Subject Code : **BECME401T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| (3 +1)Hrs (L+T) | 4 | 30 | 70 | 100 |

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**Aim: To understand the basic concepts of discrete mathematics, logic, algorithms, and computational complexity.**

**Prerequisite(s): High School Mathematics**

**Course Objectives:**

| | |
|---|---|
| **1** | A primary objective is to provide a bridge for the student from lower-division mathematics courses to upper-division mathematics. |
| **2** | Obtain skills and logical perspectives in introductory (core) courses that prepare them for subsequent courses. |
| **3** | Develop proficiency with the techniques of mathematics and/or computer science, the ability to evaluate logical arguments, and the ability to apply mathematical methodologies to solving real world problems. |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction. |
| **CO2** | How mathematical models for engineering are designed, analyzed and implemented in industry and organizations. |

| | |
|---|---|
| **CO3** | Mathematically identify basic data types and structures (such as numbers, sets, graphs, and trees) used in computer algorithms and systems; distinguish rigorous definitions and conclusions from merely plausible ones. |
| **CO4** | Analyze real world scenarios to recognize when Logic, sets, functions are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches. |
| **CO5** | Apply knowledge of mathematics, physics and modern computing tools to scientific and engineering problems and in life-long learning. |

**Unit 1: Set Theory, Relations and Functions** **(08 Hrs)**

**Sets:** Review of propositions and logical operations, Principle of mathematical induction, Review of sets, Types and operations on sets.

**Relations:** Ordered pairs and n-tuples, Types of relations, Composite relation, Transitive closure of a relation, Partially ordered set, Hasse diagrams.

**Functions**: Definition, Composition of functions, Types of functions, Characteristics function and its properties.

**Unit 2: Fuzzy Set and Fuzzy Logic** **(06 Hrs)**

Fuzzy sets and systems, Crisp set, Operations and combinations on Fuzzy sets, Relation between Crisp set and Fuzzy set, Fuzzy relations, Overview of Fuzzy logic and classical logic.

**Unit 3: Group Theory and Ring Theory** **(06 Hrs)**

Binary operation, Algebraic structure, Groupoid, Semigroup, Monoid, Group, Subgroup, Normal subgroup (Only definitions and examples), Ring, Commutative ring, Ring with unity, Zero divisor, Integral domain, Field (Only definitions and simple examples).

**Unit 4: Graph Theory** **(08 Hrs)**

Basic concepts of graph theory, Digraphs, Basic definitions, Matrix representation of graphs, Subgraphs and quotient graphs, Isomorphic graphs, Paths and circuits, Reachability and connectedness, Node base, Euler's path & Hamilton's path, Tree, Binary tree, Undirected tree,

Spanning tree, Weighted graphs (Only definitions and examples), Minimal spanning tree by Prim's algorithm & Kruskal's algorithm, Representation of algebraic expressions by Venn diagram and binary tree.

**Unit 5: Combinatorics** **(06 Hrs)**

Permutations and combinations, Pigeonhole principle with simple applications, Recurrence relations (Concept and definition only), Generating functions, Solution of recurrence relations using generating functions.

**Text/ Reference Books**


1. *Discrete Mathematical Structures (PHI), B. Kolman, R. Busby, S. Ross.*
2. *Discrete Mathematical Structures with Applications to Computer Science (TMH), Tremblay and Manohar.*
3. *Fuzzy Sets Uncertainty and Information, George, J. Klir, Tina A. Folger.*
4. *Discrete Mathematics for Computer Scientists & Mathematicians, J. Mott, A. Kandel, T. Baker.*
5. *Discrete Mathematics, S. Lipschutz.*
6. *Neural network and Fuzzy systems (PHI), Bart Kosko.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Web Technology*** Subject Code : **BECME402T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

---

**Aim: To learn advance technology to develop website which is more dynamic to use or create**

**Prerequisite(s): 1.You must have knowledge of Computer Accessing**

**2. You must aware of Internet Accessing.**

**Course Objectives:**

| | |
|---|---|
| **1** | Create web pages and identify its elements and attributes |
| **2** | Understand the structure of servlet. |
| **3** | Build dynamic web pages using JavaScript (Client side programming). |
| **4** | To understand the concept of static and dynamic web applications |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Design web page using HTML tag, HTML forms, frame & frame sets |
| **CO2** | Describe and create the web page layout using CSS |
| **CO3** | Distinguish in HTML and XML & design dynamic websites |
| **CO4** | Summarize validation ,controls and graphics |
| **CO5** | Apply the concept for deployment of websites and its security issues. |

**Unit I:** **[ 5 Hours]**

Introduction to HTML: The development process, Html tags and simple HTML forms, frames and frame sets tags, web site structure.

**Unit II:** **[ 8 Hours]**

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2

**Unit III:** **[07 Hours]**

XML - technologies, attributes, tree, XML validation – DTD, CSS, Schema, XML parser, database, Namespace

**Unit IV:** **[08 Hours]**

Validation: Understanding Validation, The validation controls Rich Controls: The calendar, AdRotator, Pages with Multiple view, User Controls and Graphics: User Controls, Dynamic Graphics

**Unit V:** **[08 Hours]**

Styles, Themes and Master Pages: Styles, Themes, Master Page Basics. ADO.NET and Data Binding: Configuring your Database, ADO.NET basics, Direct Data Access. Single Value data binding, Repeated Value Data Binding. Website Security: ASP.NET security Model, Forms Authentication, Windows Authentication.

**Text books:**

1. *ASP.NET: The Complete Reference Book by Matthew Macdonald*
2. *Visual Basic .net Comprehensive Concepts and Techniques by Shelly, cashman, Quasney*

**Reference books:**

1. *Programming in Visual Basic. NET by Julia Case Bradley, Anita C. Millspaugh , McGraw Hill, latest edition*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Operating System*** Subject Code : **BECME403T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

**Aim: Aim: To Know the role of operating system and its functions & operations performed.**

**Prerequisite(s):**

1. **Students must have the basic knowledge of Computer and its components.**
2. **They must aware with the basics of file system.**

**Course Objectives:**

| | |
|---|---|
| **1** | Introduce terminologies used in OS and File system concepts |
| **2** | Illustrate process scheduling, synchronization and Deadlock concept |
| **3** | Introduce Memory and Virtual memory management, and storage techniques |
| **4** | Understand the concept of System protection and security. |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Describe the concept of operating system and file system |
| **CO2** | Explain process management and evaluate process scheduling algorithms. |
| **CO3** | Describe process synchronization and apply the knowledge to solve problem |
| **CO4** | Describe and compare methods for handling deadlocks and secondary storage structures. |
| **CO5** | Describe and solve the problems of memory management along with security |

**Unit I: INTRODUCTION** **[08 Hours]**

What is operating system, Types of operating system, Operating system services, System calls, Types of system calls, System programs, operating system structure, Virtual machines, Operating system design and implementation. FILE SYSTEM: File concepts, File system structure, Access methods, Directory structure, Allocation method, Free-space management, recovery.

**Unit II: PROCESS MANAGEMENT & SCHEDULING** **[06 Hours]**

PROCESS MANAGEMENT: Process concepts, process scheduling, Types of Scheduler, operation on processes, inter-process communication, Context Switch. PROCESS SCHEDULING: Basic concepts, scheduling criteria, scheduling algorithm, multiprocessor scheduling algorithm.

**Unit III: PROCESS SYNCHRONIZATION & THREADING** **[08 Hours]**

PROCESS SYNCHRONIZATION: Critical section problem, Peterson's solution, synchronization hardware, semaphore, classic problems of synchronization, monitors. THREADING: Multithreaded programming: overview, multithreading models, Threading issues.

**Unit IV: DEADLOCKS** **[06 Hours]**

DEADLOCKS: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock. SECONDARY STORAGE STRUCTURE: Overview of mass storage structure, disk structure, disk scheduling, disk management.

**Unit V: MEMORY MANAGEMENT & SYSTEM PROTECTION** **[08 Hours]**

MEMORY MANAGEMENT: Background, swapping, contiguous memory allocation, paging, structure of page table, segmentation. VIRTUAL MEMORY MANAGEMENT: Background, demand paging, page replacement, allocation of frames, thrashing. SYSTEM PROTECTION: Goals of protection, principles of protection, domain of protection, Access Matrix implementation, Revocation of access Right.

**Text books:**


1. *Operating system Principles -7th Edition-Abraham Silberschaz, Peter Baer Galvin , Greg Gagne Publisher -Willey*


**Reference books:**


1. *Operating system Third Edition, Achyut S. Godbole, Atul Kahate,Tata M GrawHill.*

*2. Operating system concepts & design -2nd Edition ,Milan Milenkovic Tata MGraw Hill.*

*3. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Data Structures*** Subject Code : **BECME404T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| (3+1)Hrs (L+T) | 4 | 30 | 70 | 100 |

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**Aim: To provide knowledge about the available data structures and its application in programming.**

**Prerequisite(s): Programming Language 'C', Applied Mathematics**

**Course Objectives:**

| | |
|---|---|
| 1 | To impart the basic concepts in data structures and algorithms. |
| 2 | To emphasize the application of data structures in developing and implementing efficient programs and algorithms using searching and sorting |
| 3 | To understand the basic concepts of stack, queue, Linked list, trees and graphs |
| 4 | To enable them to write algorithms for solving problems with the help of fundamental data structures. |

**Course Outcomes:**

At the end of this course Student are able to:

| | |
|---|---|
| **CO1** | Understand the basic concept of data structures and time complexity. |
| **CO2** | Solve the problems and demonstrate using searching and sorting algorithms using programming language. |
| **CO3** | For given problem of stack and queues implement it and analyze the same to determine the time and computation complexity. |
| **CO4** | Classify & demonstrate the use of different data structures like linked list, trees & graphs along with related algorithms. |

| CO5 | Infer the use of symbol tables for hashing and collision resolution. |
|---|---|

**UNIT I :** **[08 Hours]**

Introduction: - Concept of Data structures, Time and space analysis of algorithms, Big oh and theta notations and omega notations, Average, best and worst case analysis, Searching and sorting techniques- Linear search, Binary search, Indexed search, Insertion sort, selection sort, Bubble Sort, radix Sort, Merge Sort, Hashing, Collision resolution policies.

**UNIT II :** **[07 Hours]**

Linked Lists : Simply linked list, Implementation of linked list using static and dynamic memory allocation, operations on linked list, polynomial representations and manipulations are using linked list, circular linked list, doubly linked list, Generalized list, sparse matrix, polynomial

**UNIT III :** **[07 Hours]**

Stack and Queue Stack and queue - Array representation of stacks, Queues and Dequeue, Circular queue, Polish notation, Implementation of stack using arrays, Application of stack & queue: Conversion from Infix to Postfix ,Evaluation of postfix expressions, Priority Queues

**UNIT IV :** **[06 Hours]**

Trees: Basic Terminology, Basic trees, Binary tree representations, threaded storage representation, binary tree traversals, binary search trees, Application of trees. Preliminary treatment of AVL Trees, B-Trees.

**UNIT V :** **[08 Hours]**

Graphs: Definition & terminology, Graph representation: matrix representation of Graph, List of structure, other representation of graphs, Breadth First Search, Depth First Search, Spanning trees, Shortest path algorithm, topological sorting, Critical path. Symbol Tables: static tree tables, dynamic tree tables, hash tables, hash functions,

**Text Books :-**


1. *Fundamentals of Data Structure by Horowitz and Sahani (CBS Publications)*
2. *Data Structures using C by Tanenbaum, Pearson Education*
3. *Data structure and Algorithm by Lafore(BPB Publication)*


**Reference Books:-**


1. *Data Structure and Programme Design in C by Kruse, Leung and Tondo,(PHI)*
2. *Schaum's outline: Date Structures by Seymour Lipschutz (Tata Mc Graw Hill)*

3. *An Introduction to DS with applications by Trembley and sorenson(Mc Graw Hill)*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Computer Architecture and Organization*** Subject Code : **BECME405T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

**Aim: To study fundamentals of Computer system**

**Prerequisite(s): Basic knowledge of computer**

**Digital Electronics, Concepts in Computer Engineering**

**Course Objectives:**

| | |
|---|---|
| **1** | To understand basic components and its interaction in computer system. |
| **2** | To understand computer processor organization and measures to improve its performance. |
| **3** | To understand computer memory hierarchy and computer I/O device interfacing. |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Understand computer system and its fundamental architecture. |
| **CO2** | Solve various computer arithmetic problems. |
| **CO3** | Understand functionalities and organization of processor and measures to improve its performance. |
| **CO4** | Understand I/O device interfacing and computer memory hierarchy. |
| **CO5** | Understand various methods in parallel organization of processor |

**Unit I: Basic structure of computers** **[08 Hours]**

A Brief History of computers - Designing for Performance - Von Neumann Architecture - Computer Components - Interconnection Structures - Bus Interconnection - Addressing modes - Instruction Set Architecture (Instruction set based classification of processor i.e. RISC, CISC, RISC vs CISC Comparison).

**Unit II: Arithmetic Unit** **[06 Hours]**

Addition & subtraction of signed numbers - Binary Multiplication: Booths algorithm - Unsigned Integer multiplication and division algorithm - Floating point operations.

**Unit III: Processing unit** **[08 Hours]**

Machine Instruction characteristics - types of operands - types of operations – Instruction formats – Instruction types - Processor organization - Register Organization - Instruction cycles – Instruction Pipelining - Control unit - Multiple bus organization - Hardwired control - Micro programmed control - Hazards.

**Unit IV: I/O Organization and Memory Hierarchy** **[08 Hours]**

Input/output Systems - Programmed I/O - Interrupt Driven I/O - Direct Memory Access (DMA)- Memory Systems: locality of reference principle - Memory Hierarchy - Cache memory - Main Memory - Virtual memory - Secondary storage.

**Unit V: Parallel Organizations** **[06 Hours]**

Superscalar Processors - Multiple Processor Organizations - Symmetric Multiprocessors - Non-uniform Memory Access - Vector Computations - Bus allocation Schemes.

**Text books:**


1. *C. Hamacher, Z. Vranesic, and S. Zaky, "Computer Organization", McGraw Hill, Fifth Edition, 2011*
2. *W. Stallings, "Computer Organization and Architecture: Designing for performance", Ninth Edition, Pearson education, 2013.*


**Reference books:**


1. *D. Paterson, J. Hennesy, "Computer Organization and Design: The Hardware Software Interface", Fourth edition, Elsevier 2011.*
2. *J. P. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988*
3. *Hwang and Briggs," Computer Architecture and parallel processing", McGraw Hill, 1985.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***System Programming*** Subject Code : **BECME406T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 3 Hrs (Theory) | 3 | 30 | 70 | 100 |

**Aim: To understand the design and implementation issues of System programs that play an important role in program development.**

**Prerequisite(s): Basics of Data structure and Operating systems**

**Course Objectives:**

| | |
|---|---|
| **1** | Distinguish between Operating Systems software and Application Systems software |
| **2** | Understand macros and its features |
| **3** | Classify linker, loader and compiler its passes |
| **4** | Describe Unix device driver |

**Course Outcomes:**

At the end of this course student are able to:

| | |
|---|---|
| **CO1** | Distinguish among different system programs and how assembler works. Tell the implementation of two pass assembler. |
| **CO2** | Relate among different features of Macro's and to simplify the process of macro implementation. |
| **CO3** | Demonstrate the working of loader and to compare and contrast among different loading schemes. |
| **CO4** | Demonstrate the working of compiler by categorizing it into different phases. |
| **CO5** | To demonstrate driver installation routines and to compare device drivers for different operating systems. |

**Unit I:** **[06 Hours]**

IBM 360/370 & Assembler – Introduction to System Programming & its components, M/c Architecture, Instruction Formats, Data Formats Data Formats & Register Formats, Concept of assembler, design of single pass and two pass assembler.

**Unit II:** **[06Hours]**

Macro processor – Concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.

**Unit III:** **[10 Hours]**

Linkers and Loaders: Basic Loader functions, Loader schemes, "Complier and go" Loaders, general Loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, other loader schemes Binders, linking loaders, Overlays, Dynamic Binders, Design of an absolute Loaders, Design of a Direct – Linking loaders.

**Unit IV:** **[06 Hours]**

Compiler – Phases of Compilers, Overview of Databases and Algorithms required for all phases. Role of lexical analyzer, recognition of tokens, Study of LEX & YACC.

**Unit V:** **[08 Hours]**

Unix Device Drivers – Definition, Anatomy and Types, Device programming, Installation, Incorporation of driver routines, Basic device operation, Implementation with Line Printer, Comparative study between device drivers for UNIX & Windows. Case study of Intel®64 and IA-32 Processors Basic architecture

**Text books:**


*1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.*

*2. System Programming by Leland Beck, Pearson Ed.*

*3. D. M. Dhamdhere : "Systems programming and operating system", Tata McGraw Hill*

*4. Unix device drives by George Pajani, Pearson Education. Page 3 of 15 R.T.M.N.U Nagpur*


**Reference Books: -**


1. *Device Drives for Windows by Norton, Add Wesley.*
2. *Intel®64 and IA-32 Architectures Software Developer's Manual Volume1: Basic Architecture.*

3. *The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286,80386,80486, Pentium and Pentium PRO Processor by Barry B. Brey, 4th Edition, Prentice-Hall.*

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Web Technology (Lab)*** Subject Code : **BECME402P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

- **Practical List**

Group 1. HTML Tags - Develop and demonstrate a HTML document that illustrates
- A The use of Formatting Text.
- B Headings tags(H1,H2,H3,H4,H5,H6)
- C Font Details (Font Size, Style, Type, Color)
- D Setting Color(BG Color)

Group 2. Table & Lists - Develop and demonstrate a HTML document that illustrates
- A Unordered List(UL)
- B Ordered List(OL) and Definition list (DL)
- C Table Alignment (Cell Spacing, Cell Padding ,Height ,Width, Border, Rowspan , colspan)
- D Setting Different Table Attributes(Color, Image)

Group 3. Image & Link - Develop and demonstrate a HTML document that illustrates
- A Image as a background
- B Hyperlink using an image
- C Hyperlink with another web page(A, Base, Href)
- D Link to email address, FTP Websites

Group 4. Forms and Frames
- A Develop and demonstrate a HTML document that illustrates
- B Create "Website Login Form" which consists of following details UserName , Password Address, Ph. no, Sex, Hobbies, Date Of Birth ,Country , along with submit and Reset Button.
- C Create a Web page having Main Frame along with three Sub Frames(Windows)
- D Create a Frame which will consider as a Main Frame along with other Sub Frame. when the particular link gets selected from the main frame it will displayed the output on target frame.
- E Create a login form as above which will use the post method by sending data on another form.

Group 5. Multimedia
- A Develop a web page to play audio file using <a> Tag.

B Develop a web page to play video file using <Embed> Tag.

Group 6. DHTML

A Create a CSS document on Internal style sheet
B Create a CSS document on External style sheet
C Create a CSS document on Inline style sheet
D Create a CSS document on placing Images at different position

- **From above practical list perform at least two practical from each group.**

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Operating System(Lab)*** Subject Code : **BECME403P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

- ***Minimum eight to ten practical based on Operating System Syllabus***

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**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Data Structures(Lab)*** Subject Code : **BECME404P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 25 | 25 | 50 |

- ***Minimum eight to ten practical based on above Data Structures syllabus using programming language with mini project***

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**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Consumer Affairs*** Subject Code : **BECME410T**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Theory) | Nil | Nil | Nil | Nil |

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**Aim: The understanding of the marketplace and how to function in it as wise and thoughtful consumers.**

**Prerequisite(s): Basics knowledge of consumer and market.**

**Course Objectives:**

| | |
|---|---|
| **1** | To identify the concepts of consumer and market |
| **2** | To understand the different consumer acts & policies |
| **3** | To categorize the consumer redressal mechanism in different application |
| **4** | To understand the consumer movements |

**Course Outcomes:**

By the end of the course, the student will be able to –

| | |
|---|---|
| **CO1** | Understand the basic concept and importance of Consumer Education |
| **CO2** | Grasp the concepts related to Consumer Education and Protection |
| **CO3** | Identify the regulations and redressal mechanism system |
| **CO4** | Aware of consumer movements |

**Unit 1** **[06 Hours]**

Concept of consumers and markets, concept of retail price, whole sale price, maximum retail price, local taxes, fair price and packaging.

**Unit 2** **[06 Hours]**

Consumer protection act 1986, objectives and provisions, Grievances redress mechanism under consumer protection act 1986, procedure for filing and hearing a complaint, remedies, frivolous

and vexatious complaints, offences and penalties.

**Unit 3** **[06 Hours]**

Industry regulations and consumer complaint redressal mechanism, Banking – RBI and banking ombudsman, Insurance – IRDA and insurance ombudsman, Telecommunication – TRAI, Food products – FSSAI, Advertising – ASCI

**Unit 4** **[06 Hours]**

Evolution of consumer movements in India, their role in consumer protection, national consumer citizen charter

**Reference Books**


1. *Consumer Protection: Law and Practice, V. K. Agarwal, Bharat Law House Pvt. Ltd., 2021*
2. *Consumer Affairs, Sri Ram Khanna, Savita Hanspal, Sheetal Kapoor, H. K. Awasthi, Orient Blackswan, 2007*
3. *Textbook on Consumer Protection Law, Dr. H.K. Saharay, Universal Law, Publications, 2017*
4. *Consumer Protection and Redressal Mechanism, Atul Sharma and Arti Sharma, Global Vison Publication, 2019*

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 4th (C.B.C.S.)**

**BRANCH: COMPUTER ENGINEERING**

Subject : ***Internships*** Subject Code : **BECME411P**

| Load | Credits | College Assessment Marks | University Evaluation | Total Marks |
|---|---|---|---|---|
| 2 Hrs (Practical) | 1 | 50 | Nil | 50 |

**Activity: Field learning, Case study,**

**Students have to do internships to get exposure to latest technologies used by industries.**

**Minimum 04 weeks internship is desirable.**

Dr. S. V. Sonekar
Chairman.

# Computer Engineering

**Fifth Semester**:-

| S. N. | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Database Management System | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 2 | Computer Graphics | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 3 | Compiler Design | 4 | - | - | 30 | 70 | 100 | 4 | PCC-CS |
| 4 | Advance Java Programming | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 5 | Elective-I | 3 | - | - | 30 | 70 | 100 | 3 | PEC-CS |
| 6 | Database Management System - Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 7 | Computer Graphics –Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 8 | Compiler Design -Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 9 | Humanities - II Functional English | 2 | - | - | 25 | 25 | 50 | 1 | HSMC |
| 10 | Essence of Indian Knowledge Tradition | 3 | - | - | 50 | - | 50 | Audit | MC |
| | **Total** | **21** | **00** | **06** | | | **750** | **20** | |

**Elective-I:** 1. Microcontrollers & Applications,
2. Artificial Intelligence,
3. Software Engineering

**Sixth Semester**:-

| S. N. | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Design and Analysis of Algorithms | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 2 | Advanced Computer Network | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 3 | Elective-II | 3 | - | - | 30 | 70 | 100 | 3 | PEC-CS |
| 4 | Elective-III | 3 | - | - | 30 | 70 | 100 | 3 | PEC-CS |
| 5 | Open Elective-I | 3 | | | 30 | 70 | 100 | 3 | OEC-CS |
| 6 | Design and Analysis of Algorithms- Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 7 | Advanced Computer Network -Lab | - | - | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 8 | Computer Workshop Lab -II | - | - | 2 | 25 | 25 | 50 | 1 | LC |
| 9 | Mini Project | - | - | 6 | 50 | 50 | 100 | 3 | PROJ-CS |
| 10 | Seminar / Presentations on Current trends | 2 | - | - | 50 | - | 50 | Audit | |
| | **Total** | **17** | **00** | **12** | | | **800** | **21** | |

**Elective-II: -** 1. Human Computer Interaction
2. Internet of Things
3. Robotics

**Elective-III: -**1. Advanced Operating System
2. Machine Learning
3. Advanced Algorithms

**Seventh Semester**:-

| S. N. | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Distributed System & Parallel Computing | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 2 | Cryptography & Network Security | 3 | - | - | 30 | 70 | 100 | 3 | PCC-CS |
| 3 | Elective – IV | 2 | - | - | 30 | 70 | 100 | 2 | PEC-CS |
| 4 | Elective – V | 2 | - | - | 30 | 70 | 100 | 2 | PEC-CS |
| 5 | Open Elective-II | 3 | - | - | 30 | 70 | 100 | 3 | OEC-CS |
| 6 | Distributed System & Parallel Computing-Lab | | | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 7 | Cryptography & Network Security-Lab | | | 2 | 25 | 25 | 50 | 1 | PCC-CS |
| 8 | Project and Seminar | - | - | 12 | 75 | 75 | 150 | 6 | PROJ-CS |
| 9 | Report Writing Activity | 2 | - | - | 50 | - | 50 | Audit | - |
| | **Total** | **16** | **00** | **16** | | | **800** | **21** | |

**Elective IV: -** 1. Data Analytics & Business Intelligence
2. Cloud Computing & Virtualization
3. Fundamentals of Virtual & Augmented Reality

**Elective V: -** 1. Ad Hoc and Sensor Networks
2. Real Time Operating System
3. Introduction to Software Testing

**Eighth Semester**:-

| S. N. | Subject | Teaching Scheme | | | Evaluation Scheme | | | Credits | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | CA | UE | Total | | |
| 1 | Elective-VI | 2 | - | - | 30 | 70 | 100 | 2 | PEC-CS |
| 2 | Open Elective-III | 3 | - | - | 30 | 70 | 100 | 3 | OEC-CS |
| 3 | Open Elective-IV | 3 | - | - | 30 | 70 | 100 | 3 | OEC-CS |
| 4 | Project | - | - | 12 | 100 | 100 | 200 | 6 | PROJ-CS |
| 5 | Preparation of Training and Placement | 2 | - | - | 50 | | 50 | Audit | |
| | **Total** | **10** | **00** | **12** | | | **550** | **14** | |

**Elective-VI:** 1. Genetic Algorithms
2. Kernel Programming

3. Natural Language Programming

**Note: List of Open Electives will be provided separately containing 10-15 subjects. Students are expected to complete 04 open elective subjects having 12 credits in total.**