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FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE  
SEMESTER: SIXTH  
BRANCH: COMPUTER ENGINEERING
Syllabus of FIFTH SEMESTER

B.E. (Computer Engineering)

R. T. M. Nagpur University Nagpur
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R.T.M.N.U Nagpur
Syllabus of B. E 5th Semester Computer Engineering

BECME501T Theory of Computation

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Syllabus:

Unit I:
Strings, Alphabet, Language operations, Finite state machine definitions, Finite automation model, Acceptance of strings and language, Non deterministic finite automation, Deterministic finite automation, Equivalence between NFA and DFA, Conversion of NFA into DFA, Minimization of FSM, Equivalence between two FSM’s Moore and Mealy machines.

Unit II:
Regular sets, Regular expressions, Identity rules, Manipulation rules, Manipulation of regular expressions, Equivalence between RE and FA, Inter conversion, Pumping lemma, Closure properties of regular sets, Chomsky hierarchy of languages, Regular grammars, Right linear and left linear grammars, Equivalence between regular linear programming and FA, Inter conversion between RE and RG.

Unit III:
Context free grammar, Derivation trees, Chomsky normal form, Greibach normal form, Push down automata, Definition, Model acceptance of CFL, Equivalence of CFL and PDA, Inter conversion, Closure properties of CFL(Proofs omitted), Pumping Lemma of CFL, Introduction of DCFL and DPDA.

Unit IV:
Turing Machine: Definition, Model of TM, Design of TM, Universal Turing Machine, Computable function, Recursive enumerable language, Types of TM’s, Linear bounded automata and Context sensitive language, Counter machine.

Unit V:
Decidability and Undecidability of problems, Properties of recursive & recursively enumerable languages, Halting problems, Post correspondence problem, Ackerman function, and Church’s hypothesis.

Unit VI:
Recursive Function: Basic functions and operations on them, Bounded Minimalization, Primitive recursive function, \( \mu \)-recursive function, Primitive recursive predicates, Mod and Div functions, Unbounded Minimization, Equivalence of Turing Computable function and \( \mu \)-recursive function.

Text Books:
2. An Introduction to Formal Languages and Automata by Peter Linz
3. Introduction to Languages and the theory of Automata by John Martin, Third Edition(TMH)

**Reference Books:**
2. Elements of Theory of Computation by Lewis H.P and Papadimitiion C.H.
### BECME502T Computer Architecture Organization

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Syllabus:

**Unit I: Computer Evaluation and Arithmetic**

A Brief History of computers, Designing for Performance, Von Neumann Architecture, Computer Components, Interconnection Structures, Bus Interconnection, Scalar Data Types, Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2’s Complement method for multiplication, Booths Algorithm, Hardware Implementation, Division, Restoring and Non Restoring algorithms, Floating point representations, IEEE standards, Floating point arithmetic.

**Unit II: Processor Design**

Machine Instruction characteristics, types of operands, types of operations, Addressing, Instruction formats, Processor organization, Register Organization, Instruction cycles, Instruction pipelining, ALU – Combinational ALUs and Sequential ALUs, RISC Architecture.

**Unit III: Control Design**

Single Bus Organization, Control Unit Operations: Instruction sequencing, Micro operations and Register Transfer. Hardwired Control : Design methods – State table and classical method, Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts, Microinstructions and micro-program sequencing

**Unit IV: Memory Organization**


**Unit V: I/O Organization**


**Unit VI: Parallel Organizations**

Superscalar Processors, Multiple Processor Organizations, Symmetric Multiprocessors, Clusters, Non-uniform Memory Access, Vector Computations, Bus allocation Schemes. RISC: Instruction execution characteristics, use of large register file, compiler based register optimization, RISC architecture, pipelining. RISC vs. CISC
Text Books:


Reference Books:

BECME503T  TCP/IP and Internet

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Syllabus:

Unit 1:

**Introduction & Overview:** Comparison of OSI & TCP/IP model, Internetworking concepts & architecture model, NAP, ISP, RFC, Internet standards, Internet Backbone, Underlying Technologies: Wired LAN, Wireless LAN’S, Point-to-point WAN’S, Switched WAN’S.

Unit 2:

**Internet Protocols:** IPv4 Address: Classful, Classless, CIDR, Special address, NAT, Delivery & forwarding of IP Packets, IP Datagram, Fragmentation, ARP, RARP. IPv6 Address: Addressing, Packet Format, Transition from IPv4 to IPv6.

Unit 3:

**Internet Control Message Protocols:** ICMPv4, ICMPv6. **Routing Protocols:** RIP, OSPF & BGP.

Unit 4:

**Mobile IP:** Addressing, agents, phases, problems in Mobile IP, Multicasting & multicast routing protocols: IGMP, MOSPF, DVMRP and CBT.

Unit 5:

**Transport Layer Protocol Services:** UDP: Services, Congestion control, Encapsulation & De-capsulation, Multicasting & De-multicasting, and Application. TCP: Services, Features, Segment Format, TCP Connection State Transition Diagram, Windows in TCP, Flow control, Error control, Congestion Control, TCP timer’s option, SCTP. Socket concepts and Socket programming.

Unit 6:

**Auto Configuration & Applications:** DHCP, DNS, Telnet, SSH, FTP, TFTP, HTTP and Electronic Mail: SMTP, POP3, MIME, and IMAP.

**Text Book:**


**Reference Books:**

1. Internetworking with TCP/IP principles, Protocol & Architecture by Douglas E. Comer, PHI Publication
3. Design and Analysis of Communication Networks By V. Ahuja , McGraw Hill Publication
### Syllabus of B. E 5<sup>th</sup> Semester Computer Engineering

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**BECME503P  TCP/IP and Internet Lab**

Syllabus:

Practicals Based on Syllabus of **BECME503T**
Syllabus of B. E 5th Semester Computer Engineering

BECME504T Computer Graphics

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Syllabus:

**Unit I:**
Geometry and line generation: points, lines, planes, pixels and frames buffers, types of display devices and its architecture DDA and Bresenham’s algorithms for line generation, Bresenham’s algorithm for circle, ellipse generation, aliasing, anti-aliasing and its techniques.

**Unit II:**
Graphics primitives: Display files, algorithms for polygon generation, polygon filling algorithms: Simple ordered Edge list, Edge fill, Fence fill, Edge flag, Seed fill, Scan line Seed fill, NDC (normalized device co-ordinates).

**Unit III:**
Segment tables: operations on segments, data structures for segments and display files, Windowing and clipping: window, viewport, viewing transformations, clipping line: Cohen-Sutherland, Cyrus-Beck, Mid-point subdivision and Polygon clipping (Sutherland-Hodgeman)

**Unit IV:**

**Unit V:**

**Unit VI:**

**Text Books:**
1. Procedural elements for computer graphics by David F. Rogers, Mc-Graw Hill.
4. Computer graphics principles and practice by Foley, Vandam, Feiner & Huges Addison Wesley
### BECME504P Computer Graphics Lab

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**Syllabus:**

Practical based on Syllabus of BECME504T
**BECME505T**

**Industrial Economics and Entrepreneurship Development**

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Syllabus:

**Unit I:**
Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

**Unit II:**

**Unit III:**
The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Capital formation, Inflation, Recession and stagnation, Inclusive growth, Public-Private partnership for development, Multiplier effect, Accelerator effect.

**Unit IV:**

**Unit V:**

**Unit VI:**
Sickness in small business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, safeguard measures against variation in currency value, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

**TEXT BOOKS**
1. Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.
8. Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:
2. Microeconomics. By, Robert Pindyk
Syllabus of B. E 5th Semester Computer Engineering

BECME506P  Computer Lab -III

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Syllabus
Practicals should be performed based on Core and Advance Java. Sample List is provided.

1. A) Write a program to sort 'n' numbers pass through command line. Use user defined array to store command line argument and print sorted data.
2. B) Write a program to multiply two matrices which are auto-initialized in class, print the resultant matrix in matrix form.
3. A) Write a program to perform multiplication of TWO Matrices using interactive input.
4. B) Write a Program to calculate the trace of a matrix using interactive input.
5. A) Create a class Stack and implement all stack related operations such as push (), pop (), peek (), change().
6. B) Write a program to implement all operations related with circular queue.
7. Design a class College with data members name, year, branches and method cprint(). Derive a class Employee from College having data members e_id,e_name,e_add and basic_pay, and methods getData(), eprint() and calSalary() to calculate salary of employee. Design an Employee Array to demonstrate the use of above classes for 5 employees.
8. Write a program to implement Abstract class Shape with one abstract method area() and one non static method show(). Create class Triangle, Rectangle and Circle extending abstract class Shape to calculate its area.
9. Design an interface Shape with abstract methods area() and volume(). Create class Cube and Sphere implementing interface Shape to calculate area and volume of cube and sphere.
10. Create package Comp containing Complex class having proper Complex Constructor. Create another package ComplexCal with CompC class extending the features of Complex class which contain suitable methods for performing addition and substraction of TWO Complex Objects. Similarly create Dist package with Distance class having proper constructor. Create another package DistanceCal with DistD class extending the features of Distance class to perform addition and substraction of TWO Complex objects. Design class CompDistDemo to demonstrate the use of all above classes and packages.
11. Write a Database application that allows user to Insert, Update, Delete values in a Table and manages appropriate exception Handling when wrong values are entered.
12. Design class StringT with methods getString() & putString(). Derive class String manipulator with methods countchar, countvowel & Encrypt. Encrypt will apply Caesar cipher using circular shift. Demonstrate all above classes & object in class stringDemo.
13. Write an Applet program to draw a ball at the center of Applet window of size 40*40 and configure the color of the ball through the parameters passed from the HTML file.
14. Write a program that implements a simple client/server application. The client sends data to a server the server receives the data, uses it to produce a result and then sends the result back to the client. The client
displays the result on the console. For ex the data send from the client is a numbers and the result produce by the server is the addition of that number.

13. Develop an application of online songs library through which user can make search of a song by different category like movie name, singer name, actor, actress, year etc… Make suitable assumption in design with brief description. Develop using JSP.

14. Create a Java Bean to store information about person. The details of person (person name, person age, person height, etc.) are stored in person database table. After the person is authenticated, his/her personal details are transferred from the database table (person) to Java Bean (Person) and the details are displayed in proper format using this Person Java Bean. The Java Bean is stored in session scope. Use MVC architecture for this purpose.

15. Develop an application using JSP and JDBC to receive user name and password from client and validate it using the data from the data base.
Syllabus of SIXTH SEMESTER

B.E. (Computer Engineering)

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Syllabus of B.E 6th Semester Computer Engineering

BECME601T  System Software

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Syllabus:

UNIT I: System Software and Assemblers:
Definition, Components of system software, Evolution of system software, Language translators, Machine Structure, Machine Language, And Assembly Language instructions, Assemblers, Structure of an assembler, Design of two pass assembler and Single Pass assembler Table of incomplete instruction, back patching. Data structures used for design of assembler, Design and Implementation of two pass assembler, Error handling and Symbol Table management, Handling constants, literals, labels and Procedures, One pass assembler design and comparison with two pass assembler design, Cross assembler.

UNIT II: Macro processor
Macro language and macro processor, macro instructions, features of macro facility, macro instruction arguments, conditional macro expansion, macro call within macros, macros instructions defining macros, Implementation.

UNIT III: 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: Compiler:

UNIT V: Unix Device Drivers:
Definition, Anatomy and types, Device Programming, Installation and Incorporation of driver routines, Basic device driver operation, Implementation with Line printer, Comparative study between device drivers for Unix and Windows.

UNIT VI: Case study of Intel®64 and IA-32 Processors
Basic architecture, notational conventions, brief history of Intel® 64 and IA-32 Architecture, Intel NetBurst® Micro-architecture, specific advances. Basic execution environment: Modes of operation, overview of the basic execution environment, memory organization, basic program execution registers, instruction pointer, operand-size and address-size attributes, operand addressing.

Text Books:-
2. System Programming by Leland Beck, Pearson Ed.
4. Unix device drives by George Pajani, Pearson Education.
Reference Books:

1. Device Drives for Windows by Norton, Add Wesley.
Syllabus:

**Unit I:**

**Unit II:**
Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, External Sorting, lower bound proof, elementary and advanced data structures with operations on them and their time complexity.

**Unit III:**
Greedy method – Basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path.
Divide and conquer - Basic strategy, binary search, Quick sort, Merge sort, Fast Fourier Transform.

**Unit IV:**
Dynamic Programming - Basic strategy, multistage graphs, all pair shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

**Unit V:**
Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen’s problem, Graph coloring, Hamiltonian cycles.

**Unit VI:**
NP-hard and NP-complete problems, basic concepts, non deterministic algorithms, NP-hard and NP complete, Cook’s Theorem, decision and optimization problems, polynomial reduction.

**TEXT BOOKS**

**REFERENCE BOOKS**
## BECME602P Design and Analysis of Algorithms Lab

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Syllabus:

Practical Based on Syllabus of BECME602T
BECME603T  Database Management System

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Syllabus:

UNIT I: Introduction to Database Systems
Database Systems: Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, DBMS Architecture, Functions of DBMS, Formal relational query languages: Relational Algebra, Tuple Relational calculus, Domain Relational Calculus.

UNIT II: Relational Database Manipulation

UNIT III: Data Models and Relational Database Design
Evolution of Data Models, Entity Relationship Model, Development of ER Diagrams, Extended Entity Relationship Model. Relational model: Logical View of Data, Keys, Integrity Rules, Relational set operators, Data Dictionary and System Catalog, Indexes, Codd’s Relational Database Rules. Normalization of Database Tables: Need and Significance, the normal forms - 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, normalization & database design, renormalization.

UNIT IV: Query Processing and Query Optimization

Unit V: Transaction Management & Concurrency Control

UNIT VI: Distributed Database
Introduction, data distribution, object naming, distributed query processing, consistency, concurrency control, distributed commitment and recovery, deadlocks, security and protection in DDBMS, homogenous and heterogeneous systems.
R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Engineering

Text Books:

Reference Books:
## Database Management System Lab

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**Syllabus**

Practicals based on syllabus of **BECME603T**
### Syllabus:

**Unit I: Introduction to Software Engineering**

**Unit II: Requirements Engineering**
System Engineering: Hierarchy, Business Process and Product Engineering: Overview, Requirements Engineering, Initiating the process, Eliciting Requirements, Building the Requirements Model, Negotiating, Validating requirements, Requirements Analysis, Scenario-Based Analysis, Requirements Modeling strategies, Flow-Oriented Modeling, Class based modeling, SRS.

**Unit III: Design Engineering**

**Unit IV: Testing**

**Unit V: Project Management Concepts**
Management Spectrum: people, product, process, project, Critical practices, Process and project Metrics: Metrics in process and project domains, software measurement, metrics for software quality, Estimation for software project: project planning objectives, software scope and feasibility, resources, Decomposition Techniques, Empirical Estimation Models, Specialized Estimation techniques, Make by decision.

**Unit VI: Project Planning**
Project Scheduling: Task set for software project, defining a task network, scheduling, earned value analysis, Software Quality: Software Quality Factors, Software Quality Assurance (SQA): SQA Activities, Software reviews, FTR, Software reliability, Software configuration management: software configuration management, the SCM Repository, SCM process.
Text Books:

Reference Books:
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Syllabus:

Practicals based on syllabus of BECME604T.
**BECME605T  Functional English**

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**Syllabus:**

**Unit I. Functional Grammar:** (4 Hours) (3+3+4=10)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

**Unit II. English for Competitive Exams & Interview Techniques:** (6 Hours) (3+3+4=10)

IPA (vowel & consonant phonemes), Word building [English words/phrases derived from other languages], Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment: [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/Antonyms, 25 words for Analogies, 50 examples of give one word for]

**Unit III**

(A) **Formal Correspondence** (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) **Analytical comprehension:** (4 Hours)

[Four fictional & four non-fictional unseen texts]

**Unit IV. Technical & Scientific Writing:** (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: (Any one project/review as assignment)

**Total number of periods required = 22 for each Branch of Engineering**
Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
4. *Contemporary Business Communication* by Scot Ober, Published by Biztantra,
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

**EVALUATION PATTERN:**

Internal Examination: Weightage = 10 marks

- Written Examination: 05 marks
- Project Seminar: 05 marks

External Examination: Weightage = 40 marks

**Question pattern for end semester examination**

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<td>1(B)</td>
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<td>2(B)</td>
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<td>3 out of 5</td>
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<td>2(C)</td>
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<td>Unit 3 &amp; Unit 4</td>
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Syllabus of B.E 6th Semester Computer Engineering

BEIT606P Mini Project & Industrial Visit

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Syllabus:

Course Objective:

1. To develop an understanding of applications in real life
2. To develop research skills of students
3. To help the students in exploring career opportunities in their areas of interest
4. To give an insight into the overall functioning of the organizations where students visited
5. To develop Industry Institute Interaction
6. To provide means to immerse students in actual supervised professional experiences

Constraints:

1. Students shall work in groups of 4-5 each and work on small application or research based / Industry Oriented real time problems.
2. Local Mentor and Industry mentor shall work in coordination
3. Industry visit should be planned to explore students about real time problems
4. Students shall work on providing solutions to identified problems
5. Detailed reports are expected to be submitted at the end using Standard Technical Writing Tool
6. Evaluation should be done based on feedback of Local and Industry Mentor

Expected Outcome:

1. Real Time Problem Identification
2. Requirement analysis and identification of relevant data sources
3. Literature survey / Industrial survey
4. Overall Project development as per the phases of SDLC