



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

## **COURSE STRUCTURE AND SYLLABUS**

**For UG –R20**

**B. TECH - COMPUTER SCIENCE & ENGINEERING**

*(Applicable for batches admitted from 2020-2021)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

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<b>II Year – I SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BS	Mathematics III	3	0	0	3
2	CS	Object Oriented Programming through C++	3	0	0	3
3	CS	Operating Systems	3	0	0	3
4	CS	Software Engineering	3	0	0	3
5	CS	Mathematical Foundations of Computer Science	3	0	0	3
6	CS	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	CS	Operating Systems Lab	0	0	3	1.5
8	CS	Software Engineering Lab	0	0	3	1.5
9	SO	<b>Skill oriented Course - I</b> Applications of Python-NumPy <b>OR</b> 2) Web Application Development Using Full Stack -Frontend Development – Module-I	0	0	4	2
10	MC	Constitution of India	2	0	0	0
<b>Total Credits</b>			<b>21.5</b>			

<b>II Year – II SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BS	Probability and Statistics	3	0	0	3
2	CS	Database Management Systems	3	0	0	3
3	CS	Formal Languages and Automata Theory	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS	Database Management Systems Lab	0	0	2	1
7	CS	R Programming Lab	0	1	2	2
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	<b>Skill Oriented Course - II</b> Applications of Python-Pandas <b>OR</b> 2) Web Application Development Using Full Stack -Frontend Development –Module-II	0	0	4	2
<b>Total Credits</b>			<b>21.5</b>			
10	Minor	Operating Systems <sup>\$</sup>	3	0	2	3+1
11	Honors	Any course from the Pool, as per the opted track	4	0	0	4

<sup>\$</sup>- Integrated Course



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<b>III B. Tech – I Semester</b>						
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>Hours per week</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	
1	PC	Computer Networks	3	0	0	3
2	PC	Design and Analysis of Algorithms	3	0	0	3
3	PC	Data Warehousing and Data Mining	3	0	0	3
4	Open Elective / Job Oriented	<b>Open Elective-I</b> Open Electives offered by other departments/ Optimization in Operations Research (Job oriented course)	3	0	0	3
5	PE	<b>Professional Elective-I</b> Artificial Intelligence Software Project Management Distributed Systems Advanced Unix Programming	3	0	0	3
6	PC	Data Warehousing and Data Mining Lab	0	0	3	1.5
7	PC	Computer Networks Lab	0	0	3	1.5
8	SO	<b>Skill Oriented Course – III</b> 1. Animation course: Animation Design <b>OR</b> 2. Continuous Integration and Continuous Delivery using DevOps	0	0	4	2
9	MC	Employability Skills-I	2	0	0	0
10	PR	<b>Summer Internship 2 Months</b> <b>(Mandatory) after second year (to be</b> <b>evaluated during V semester</b>	0	0	0	1.5
<b>Total credits</b>						<b>21.5</b>
11	Minor	Database Management Systems <sup>\$</sup>	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4

<sup>\$</sup>- Integrated Course



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III B. Tech – II Semester						
S.No	Course Code	Courses	Hours per week			Credits
			L	T	P	C
1	PC	Machine Learning	3	0	0	3
2	PC	Compiler Design	3	0	0	3
3	PC	Cryptography and Network Security	3	0	0	3
4	PE	<b>Professional Elective-II</b> 1.Mobile Computing 2.Big Data Analytics 3.Object Oriented Analysis and Design 4.Network Programming	3	0	0	3
5	Open Elective /Job Oriented	<b>Open Elective-II</b> Open Electives offered by other departments/ MEAN Stack Development ( <i>Job Oriented</i> )	3	0	0	3
6	PC	Machine Learning using Python Lab	0	0	3	1.5
7	PC	Compiler Design Lab	0	0	3	1.5
8	PC	Cryptography and Network Security Lab	0	0	3	1.5
9	SO	<b>Skill Oriented Course - IV</b> 1.Big Data:Spark OR 2.MEAN Stack Technologies-Module I (HTML 5, JavaScript, Node.js, Express.js and TypeScript)	0	0	4	2
10	MC	Employability skills-II	2	0	0	0
<b>Total credits</b>						<b>21.5</b>
<b>Industrial/Research Internship(Mandatory) 2 Months during summer vacation</b>						
11	Minor	Data Structures and Algorithms <sup>\$</sup>	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
<b>Minor course through SWAYAM</b>			-	-	-	<b>2</b>

\$- Integrated Course



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<b>IV B. Tech –I Semester</b>						
<b>S.No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Hours per week</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	PE	<b>Professional Elective-III</b> 1.Cloud Computing 2.Neural Networks and Soft Computing 3.Ad-hoc and Sensor Networks 4.Cyber Security & Forensics	3	0	0	3
2	PE	<b>Professional Elective-IV</b> 1. Deep Learning Techniques 2. Social Networks & Semantic Web 3. Computer Vision 4.MOOCs-NPTEL/SWAYAM <sup>%</sup>	3	0	0	3
3	PE	<b>Professional Elective-V</b> 1.Block-Chain Technologies 2.Wireless Network Security 3.Ethical Hacking 4.MOOCs-NPTEL/SWAYAM <sup>%</sup>	3	0	0	3
4	Open Elective /Job Oriented	<b>Open Elective-III</b> Open Electives offered by other departments/ API and Microservices (Job Oriented Course)	3	0	0	3
5	Open Elective /Job Oriented	<b>Open Elective-IV</b> Open Electives offered by other departments/ Secure Coding Techniques (Job Oriented Course)	3	0	0	3
6	HS	Universal Human Values 2: Understanding Harmony	3	0	0	3
7	SO	1.PYTHON: Deep Learning <b>OR</b> 2.MEAN Stack Technologies-Module II- Angular JS and MongoDB <b>OR</b> 3.APSSDC offered Courses	0	0	4	2
8	PR	<b>Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester)</b>	0	0	0	3
<b>Total credits</b>						<b>23</b>
11	Minor	Software Engineering <sup>\$</sup> / any other from PART-B (For Minor)	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
<b>Minor course through SWAYAM</b>			-	-	-	<b>2</b>

\$- Integrated Course

% - MOOC Course



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IV B. Tech –II Semester						
S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	C
1	Project	Major Project Work, Seminar Internship	-	-	-	12
Total credits						12

Note:

1. **For integrated courses:** Theory and laboratory exams will be conducted separately, and the student concern will get credits if successfully completes both theory and laboratory. Only external exam will be conducted for Laboratory component. Credit based weightage shall be considered while awarding the grade.
2. **For MOOC courses:** Based on the students interest, student can register and complete a 12 week course one year in advance, by prior information to the concern.



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**SUGGESTED COURSES FOR HONORS PROGRAM**

<b>POOL1- AI &amp; ML</b> <ol style="list-style-type: none"> <li>1. Mathematics for Machine Learning</li> <li>2. Text Mining and Time Series Analysis</li> <li>3. Natural Language Processing</li> <li>4. Reinforcement Learning</li> </ol>	<b>POOL2- Systems Engineering</b> <ol style="list-style-type: none"> <li>1. Internet of Things</li> <li>2. Data Communications and Information Coding Theory</li> <li>3. Service Oriented Architectures</li> <li>4. Design of Secure Protocols</li> <li>5. Network Coding</li> </ol>
<b>POOL3- Information Security</b> <ol style="list-style-type: none"> <li>1. Principles of Cyber Security</li> <li>2. Computational Number Theory</li> <li>3. Cryptanalysis</li> <li>4. Elliptic Curve Cryptography</li> <li>5. Introduction to Quantum Computing and Quantum Cryptography</li> <li>6. Public Key Infrastructure and Trust Management</li> <li>7. Information Security Analysis and Audit</li> <li>6. Cloud and IoT Security</li> <li>7. Web Security</li> <li>8. Block Chain Architecture Design and Use Cases</li> </ol>	<b>POOL4 – Data Science</b> <ol style="list-style-type: none"> <li>1. Data Visualization</li> <li>2. Statistical Foundations for Data Science</li> <li>3. Mining Massive Data Sets</li> <li>4. Medical Image Data Processing</li> </ol>



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**SUGGESTED COURSES MINOR ENGINEERING IN CSE**

**Note:**

1. Any THREE courses need to be studied from PART-A.
2. Any ONE course need to be studied from PART-B.
3. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by CSE Department only), Student can register at any time after the completion of II B.Tech. I Sem.
4. Students can pursue suggested MOOC Courses via NPTEL from II B.Tech II Sem and onwards, by prior information to the concern.

**Eligibility for Minor in CSE:**

<b>PART A</b>					
<b>S.No</b>	<b>Subject</b>	<b>L-T-P</b>	<b>Credits</b>	<b>Course available in NPTEL</b>	<b>NPTEL Link</b>
<b>1</b>	Operating Systems	3-0-2	4	Operating Systems	<a href="https://onlinecourses.swayam2.ac.in/cec21_cs20/preview">https://onlinecourses.swayam2.ac.in/cec21_cs20/preview</a>
<b>2</b>	Data Structures and Algorithms	3-0-2	4	Data Structures Programming, Data Structures and Algorithms using Python	<a href="https://onlinecourses.swayam2.ac.in/cec22_cs10/preview">https://onlinecourses.swayam2.ac.in/cec22_cs10/preview</a> <a href="https://onlinecourses.nptel.ac.in/noc22_cs26/preview">https://onlinecourses.nptel.ac.in/noc22_cs26/preview</a>
<b>3</b>	Software Engineering	3-0-2	4	Software Engineering	<a href="https://onlinecourses.swayam2.ac.in/cec21_cs21/preview">https://onlinecourses.swayam2.ac.in/cec21_cs21/preview</a>
<b>4</b>	Computer Networks	3-0-2	4	Computer Networks	<a href="https://onlinecourses.swayam2.ac.in/cec22_cs05/preview">https://onlinecourses.swayam2.ac.in/cec22_cs05/preview</a>
<b>5</b>	Database Management Systems	3-0-2	4	Data Base Management System (noc22-cs51)	<a href="https://onlinecourses.nptel.ac.in/noc22_cs51/preview">https://onlinecourses.nptel.ac.in/noc22_cs51/preview</a>
<b>PART B</b>					
<b>S.No</b>	<b>Subject</b>	<b>L-T-P</b>	<b>Credits</b>	<b>Course available in NPTEL</b>	<b>NPTEL Link</b>
<b>1</b>	Computational Thinking	4-0-0	4	Physics through Computational Thinking	<a href="https://onlinecourses.nptel.ac.in/noc22_ph12/preview">https://onlinecourses.nptel.ac.in/noc22_ph12/preview</a>
<b>2</b>	Object Oriented Programming through JAVA	3-0-2	4		
<b>3</b>	Data Analytics using Python	3-0-2	4	Data Analytics with Python	<a href="https://onlinecourses.nptel.ac.in/noc22_cs8/preview">https://onlinecourses.nptel.ac.in/noc22_cs8/preview</a>
<b>4</b>	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	1. <a href="https://onlinecourses.nptel.ac.in/noc22_cs56/preview">https://onlinecourses.nptel.ac.in/noc22_cs56/preview</a> 2. <a href="https://onlinecour">https://onlinecour</a>





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				(noc22-cs02), An Introduction to Artificial Intelligence (noc22-cs56), AI: Constraint Satisfaction (noc22-cs06)	ses.swayam2.ac.i n/cec21_cs08/pre view
<b>5</b>	Unix and Shell Programming	3-0-2	4		
<b>6</b>	Cloud Computing	4-0-0	4	Cloud Computing and Distributed Systems (noc22- cs18), Cloud computing(noc22- cs20)	1. <a href="https://onlinecourses.nptel.ac.in/noc22_cs18/preview">https://onlinecourses.nptel.ac.in/noc22_cs18/preview</a> 2. <a href="https://onlinecourses.nptel.ac.in/noc22_cs20/preview">https://onlinecourses.nptel.ac.in/noc22_cs20/preview</a>



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**Open Electives to be offered by CSE for other Branches:**

<b>Open Elective-I:</b> <ol style="list-style-type: none"> <li>1. Data Structures</li> <li>2. Object Oriented Programming through JAVA</li> <li>3. Data Base Management Systems</li> <li>4. Computer Graphics</li> <li>5. Advanced UNIX Programming</li> <li>6. Computer Organization and Architecture</li> <li>7. Operating Systems</li> </ol>	<b>Open Elective-II:</b> <ol style="list-style-type: none"> <li>1. Python Programming</li> <li>2. Web Technologies</li> <li>3. Soft Computing</li> <li>4. Distributed Computing</li> <li>5. AI and ML for Robotics</li> <li>6. Computer Networks</li> <li>7. Big Data Analytics</li> <li>8. Computational Tools</li> </ol>
<b>Open Elective-III:</b> <ol style="list-style-type: none"> <li>1. AI Tools &amp; Techniques</li> <li>2. Image Processing</li> <li>3. Information Security</li> <li>4. Mobile Application Development</li> <li>5. Data Science</li> <li>6. Cyber Security</li> <li>7. Introduction to Internet of Things</li> </ol>	<b>Open Elective-IV:</b> <ol style="list-style-type: none"> <li>1. MEAN Stack Technologies</li> <li>2. Deep Learning Techniques</li> <li>3. Cloud computing with AWS</li> <li>4. Block Chain Technologies</li> <li>5. Cryptography &amp; Network Security</li> <li>6. Introduction to Machine Learning</li> <li>7. Machine Learning with Python</li> </ol>



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II Year I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III					

**Course Objectives:**

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**Course Outcomes:**

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

**UNIT I: Vector calculus:** (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

**UNIT II: Laplace Transforms:** (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

**UNIT III: Fourier series and Fourier Transforms:** (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

**UNIT IV: PDE of first order:** (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.



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**UNIT V: Second order PDE and Applications:** (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients

– RHS term of the type  $e^{ax+by}$ ,  $\sin(ax + by)$ ,  $\cos(ax + by)$ ,  $x^m y^n$ .

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

**Text Books:**

- 1) B. S. Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**Reference Books:**

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India.
- 2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3<sup>rd</sup> Edition, CRC Press.
- 3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

**Course Objectives:**

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

**Course Outcomes:**

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

**UNIT I**

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

**UNIT II**

Classes and Objects & Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

**UNIT III**

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.



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**UNIT IV**

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

**UNIT V**

Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

**Text Books:**

- 1) A First Book of C++, Gary Bronson, Cengage Learning.
- 2) The Complete Reference C++, Herbert Schildt, TMH.

**Reference Books:**

- 1) Object Oriented Programming C++, Joyce Farrell, Cengage.
- 2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
- 3) Programming in C++, Ashok N Kamthane, Pearson 2<sup>nd</sup> Edition

**e- Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105151/>
- 2) <https://github.com/topics/object-oriented-programming>



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II Year – I Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

**Course Objectives:**

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

**Course Outcomes:**

After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

**UNIT I**

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

**UNIT II**

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.



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**UNIT III**

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

**UNIT IV**

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

**UNIT V**

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

**Text Books:**

- 1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
- 2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

**Reference Books:**

- 1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
- 2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
- 3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105214/>





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**KAKINADA – 533 003, Andhra Pradesh, India**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

II Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

**Course Objectives:**

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

**Course Outcomes:**

Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

**UNIT I**

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

**UNIT II**

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

**UNIT III**

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

**UNIT IV**

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,



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Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

**UNIT V**

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Quality Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

**Text Books:**

- 1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
- 2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

**Reference Books:**

- 1) Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
- 2) Software Engineering, Ugrasen Suman, Cengage.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105182/>



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

**Course Objectives:**

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

**Course Outcomes:**

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

**UNIT I**

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

**UNIT II**

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

**UNIT III**

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem,



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Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

**UNIT IV**

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

**UNIT V**

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

**Text Books:**

- 1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
- 2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3<sup>rd</sup> Edition, Tata McGraw Hill.

**Reference Books:**

- 1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2<sup>nd</sup> Edition, Prentice Hall of India.
- 2) Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
- 3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7<sup>th</sup> Edition, Tata McGraw Hill.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/106/106106094/>



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

II Year – I Semester		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB					

**Course Objectives:**

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.

**Course Outcomes:**

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.

**Exercise -1 (Classes Objects)**

Create a Distance class with:

- feet and inches as data members
  - member function to input distance
  - member function to output distance
  - member function to add two distance objects
1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
  2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
  3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

**Exercise – 2 (Access)**

Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class



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**Exercise -3 (Operator Overloading)**

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
  1. Unary operator as member function
  2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

**Exercise -4 (Inheritance)**

1. Write C++ Programs and incorporating various forms of Inheritance
  - i) Single Inheritance
  - ii) Hierarchical Inheritance
  - iii) Multiple Inheritances
  - iv) Multi-level inheritance
  - v) Hybrid inheritance
2. Also illustrate the order of execution of constructors and destructors in inheritance

**Exercise -5(Templates, Exception Handling)**

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

**Exercise -6**

1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order



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II Year – I Semester		L	T	P	C
		0	0	3	1.5
OPERATING SYSTEM LAB					

**Course Objectives:**

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

**Course Outcomes:**

- To use Unix utilities and perform basic shell control of the utilities
  - To use the Unix file system and file access control
  - To use of an operating system to develop software
  - Students will be able to use Linux environment efficiently
  - Solve problems using bash for shell scripting
- 1) a) Study of Unix/Linux general purpose utility command list: man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.  
 b) Study of vi editor  
 c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system  
 d) Study of Unix/Linux file system (tree structure)  
 e) Study of .bashrc, /etc/bashrc and Environment variables.
  - 2) Write a C program that makes a copy of a file using standard I/O, and system calls
  - 3) Write a C program to emulate the UNIX ls -l command.
  - 4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort
  - 5) Simulate the following CPU scheduling algorithms:  
 (a) Round Robin (b) SJF (c) FCFS (d) Priority
  - 6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
  - 7) Simulate the following:  
 a) Multiprogramming with a fixed number of tasks (MFT)  
 b) Multiprogramming with a variable number of tasks (MVT)
  - 8) Simulate Bankers Algorithm for Dead Lock Avoidance
  - 9) Simulate Bankers Algorithm for Dead Lock Prevention.



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- 10) Simulate the following page replacement algorithms:  
a) FIFO b) LRU c) LFU
- 11) Simulate the following File allocation strategies  
(a) Sequenced (b) Indexed (c) Linked
- 12) Write a C program that illustrates two processes communicating using shared memory
- 13) Write a C program to simulate producer and consumer problem using semaphores
- 14) Write C program to create a thread using pthreads library and let it run its function.
- 15) Write a C program to illustrate concurrent execution of threads using pthreads library.





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II Year – I Semester		L	T	P	C
		0	0	3	1.5
SOFTWARE ENGINEERING LAB					

**Course Objectives:**

The objective of this lab is to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

**Course Outcomes:**

- By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
- prepare SRS document, design document, test cases and software configuration management and risk management related document.
- develop function oriented and object oriented software design using tools like rational rose.
- use modern engineering tools necessary for software project management, estimations, time management and software reuse
- generate test cases for software testing

1) Perform the following, for the following experiments:

- i. Do the Requirement Analysis and Prepare SRS
- ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.

1) Course Registration System

2) Students Marks Analyzing System

3) Online Ticket Reservation System

4) Stock Maintenance

5) Consider any application, using COCOMO model, estimate the effort.

6) Consider any application, Calculate effort using FP oriented estimation model.

7) Draw the UML Diagrams for the problem 1,2, 3, 4.

8) Design the test cases for e-Commerce application (Flipcart, Amazon)

9) Design the test cases for a Mobile Application (Consider any example from Appstore)

10) Design and Implement ATM system through UML Diagrams.



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
APPLICATIONS OF PYTHON-NumPy					

**Course Objectives:**

The objective of this lab is to acquire programming skills in Python package NumPy and perform mathematical and statistical operations.

**Course Outcomes:**

By the end of this lab the student is able to

- Explain how data is collected, managed and stored for processing
- Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
- Understand how to apply some linear algebra operations to n-dimensional arrays
- Use NumPy perform common data wrangling and computational tasks in Python.

Perform the following:

- 1) NumPy Installation using different scientific python distributions( Anaconda, Python(x,y), WinPython, Pyzo)
- 2) NumPy Basics (np.array, np.arange, np.linspace, np.zeros, np.ones, np.random.random, np.empty)
- 3) Arrays ( array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
- 4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
- 5) Mathematical Operations( np.add, np.subtract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations( np.mean, np.median, np.std, array.corrcoef( ) )
- 6) NumPy data types
- 7) NumPy ndarray
- 8) NumPy String Operations
- 9) NumPy Financial functions
- 10) NumPy Functional Programming



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
WEB APPLICATION DEVELOPMENT USING FULL STACK					
Frontend Development – Module -I					

**Course Objectives:**

The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

**Course Outcomes:**

By the end of this lab the student is able to

- Analyze a web page and identify its elements and attributes.
- Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
- Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
- Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

**A) HTML**

- 1) Introduction to HTML
- 2) Browsers and HTML
- 3) Editor's Offline and Online
- 4) Tags, Attribute and Elements
- 5) Doctype Element
- 6) Comments
- 7) Headings, Paragraphs, and Formatting Text
- 8) Lists and Links
- 9) Images and Tables

**B) CSS**

- 1) Introduction CSS
- 2) Applying CSS to HTML
- 3) Selectors, Properties and Values
- 4) CSS Colors and Backgrounds
- 5) CSS Box Model
- 6) CSS Margins, Padding, and Borders
- 7) CSS Text and Font Properties
- 8) CSS General Topics



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II Year - I Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

**Course Objectives:**

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

**Course Outcomes:**

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
  1. Know the sources, features and principles of Indian Constitution.
  2. Learn about Union Government, State government and its administration.
  3. Get acquainted with Local administration and Pachayati Raj.
  4. Be aware of basic concepts and developments of Human Rights.
  5. Gain knowledge on roles and functioning of Election Commission

**UNIT I**

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties



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**UNIT II**

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

**UNIT III**

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

**UNIT IV**

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation  
 Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zilla Panchayat block level organisation

**UNIT V**

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women



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**References:**

- 1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
- 2) SubashKashyap, Indian Constitution, National Book Trust
- 3) J.A. Siwach, Dynamics of Indian Government & Politics
- 4) D.C. Gupta, Indian Government and Politics
- 5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
- 6) J.C. Johari, Indian Government and Politics Hans
- 7) J. Raj Indian Government and Politics
- 8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
- 9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

**e-Resources:**

- 1) [nptel.ac.in/courses/109104074/8](https://nptel.ac.in/courses/109104074/8)
- 2) [nptel.ac.in/courses/109104045/](https://nptel.ac.in/courses/109104045/)
- 3) [nptel.ac.in/courses/101104065/](https://nptel.ac.in/courses/101104065/)
- 4) [www.hss.iitb.ac.in/en/lecture-details](http://www.hss.iitb.ac.in/en/lecture-details)
- 5) [www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution](http://www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution)