



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

**DEPARTMENT OF INFORMATION TECHNOLOGY**

## **COURSE STRUCTURE AND SYLLABUS**

**For UG – R20**

**B. TECH - INFORMATION TECHNOLOGY**

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



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

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


**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**
**KAKINADA – 533 003, Andhra Pradesh, India**
**DEPARTMENT OF INFORMATION TECHNOLOGY**
**COURSE STRUCTURE**

<b>I 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	HS	Communicative English	3	0	0	3
2	BS	Mathematics - I (Calculus And Differential Equations)	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Programming for Problem Solving using C	3	0	0	3
5	ES	Computer Engineering Workshop	1	0	4	3
6	HS	English Communication Skills Laboratory	0	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	ES	Programming for Problem Solving using C Lab	0	0	3	1.5
<b>Total Credits</b>			<b>19.5</b>			

<b>I 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	Mathematics – II (Linear Algebra And Numerical Methods)	3	0	0	3
2	BS	Applied Chemistry	3	0	0	3
3	ES	Computer Organization	3	0	0	3
4	ES	Python Programming	3	0	0	3
5	ES	Data Structures	3	0	0	3
6	BS	Applied Chemistry Lab	0	0	3	1.5
7	ES	Python Programming Lab	0	0	3	1.5
8	ES	Data Structures Lab	0	0	3	1.5
9	MC	Environment Science	2	0	0	0
<b>Total Credits</b>			<b>19.5</b>			



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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	IT	Object Oriented Programming through C++	3	0	0	3
3	IT	Operating Systems	3	0	0	3
4	IT	Database Management Systems	3	0	0	3
5	IT	Discrete Mathematics and Graph Theory	3	0	0	3
6	IT	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	IT	Operating Systems Lab	0	0	3	1.5
8	IT	Database Management Systems Lab	0	0	3	1.5
9	SO	<b>Skill Oriented Course I</b> 1) Animations- 2D Animation 2) Distributed Technologies- NoSQL	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	Statistics with R	2	0	2	3
2	IT	Principles of Software Engineering	3	0	0	3
3	IT	Automata Theory and Compiler Design	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	IT	UML Lab	0	1	2	2
7	IT	FOSS Lab	0	0	2	1
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	<b>Skill Oriented Course II</b> 1) Animations- 3D Animation <b>OR</b> 2) Distributed Technologies- MongoDB	0	0	4	2
<b>Total Credits</b>			<b>21.5</b>			
10	Minor	Object Oriented Programming through C++ <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>	<b>C</b>
1	PC	Computer Networks	3	0	0	3
2	PC	Design and Analysis of Algorithms	3	0	0	3
3	PC	Data Mining Techniques	3	0	0	3
4	Open Elective/Job Oriented	<b>Open Elective-I</b> Open Electives offered by other departments/ DevOps (Job Oriented course)	3	0	0	3
5	PE	<b>Professional Elective-I</b> 1. Artificial Intelligence 2. Agile Software Process 3. Distributed Systems 4. Advanced Unix Programming	3	0	0	3
6	PC	Data Mining Techniques with R 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</b> <b>Months(Mandatory) after second year(to</b> <b>be evaluated during V semester</b>	0	0	0	1.5
<b>Total credits</b>						<b>21.5</b>
11	Minor	Computer Networks <sup>\$</sup>	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4

\$- Integrated Course



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<b>III B. Tech – II 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>	<b>C</b>
1	PC	Machine Learning	3	0	0	3
2	PC	Big Data Analytics	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.MEAN Stack Development 3. Design Patterns 4.Scripting Languages	3	0	0	3
5	Open Elective/ Job Oriented	<b>Open Elective-II</b> Open Electives offered by other departments	3	0	0	3
6	PC	Big Data Analytics lab	0	0	3	1.5
7	PC	Machine Learning using Python 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.Data Science: Natural Language Processing <b>OR</b> 2.Video Analytics	0	0	4	2
10	MC3201	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. Artificial Neural Networks 3. Internet of Things (IoT) 4.Cyber Security & Forensics	3	0	0	3
2	PE	<b>Professional Elective-IV</b> 1. Deep Learning Techniques 2. Social Networks Analysis 3. Advanced Databases 4.MOOCs-NPTEL/SWAYAM	3	0	0	3
3	PE	<b>Professional Elective-V</b> 1.Block-Chain Technologies 2.M-Commerce 3.Ethical Hacking 4.MOOCs-NPTEL/SWAYAM	3	0	0	3
4	Open Elective /Job Oriented	<b>Open Elective-III</b> Open Electives offered by other departments	2	0	2	3
5	Open Elective /Job Oriented	<b>Open Elective-IV</b> Open Electives offered by other departments	2	0	2	3
6	HS	Universal Human Values 2: Understanding Harmony	3	0	0	3
7	SO	PYTHON: Deep Learning <b>OR</b> Secure Coding Techniques <b>OR</b> 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



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<b>IV B. Tech –II 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	Project	Major Project Work, Seminar Internship	-	-	-	<b>12</b>
<b>Total credits</b>						<b>12</b>

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>8. Cloud and IoT Security</li> <li>9. Web Security</li> <li>10. 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>



## DEPARTMENT OF INFORMATION TECHNOLOGY

**Note:**

- ### Eligibility for Minor in IT:

PART A						
Regular Mode				MOOCS*		
S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link	Credits
1	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>	As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Data Structures and Algorithms	3-0-2	4	Data Structure and algorithms using Java	<a href="https://nptel.ac.in/courses/106105225">https://nptel.ac.in/courses/106105225</a>	
3	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>	
4	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>	
5	Database Management Systems	3-0-2	4	Data Base Management System	<a href="https://onlinecourses.nptel.ac.in/noc22_cs51/preview">https://onlinecourses.nptel.ac.in/noc22_cs51/preview</a>	

\* If sufficient number of students are not available to offer, can pursue under MOOCS

## DEPARTMENT OF INFORMATION TECHNOLOGY

PART B						
S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link	Credits
1	Object Oriented Programming through C++	3-0-2	4	Programming in C++ (Two Credits)	<a href="https://onlinecourses.nptel.ac.in/noc21_cs02/preview">https://onlinecourses.nptel.ac.in/noc21_cs02/preview</a>	As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Data Analytics using Python	3-0-2	4	Data Analytics with Python	<a href="https://nptel.ac.in/courses/106107220">https://nptel.ac.in/courses/106107220</a>	
3	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	<a href="https://nptel.ac.in/courses/106106140">https://nptel.ac.in/courses/106106140</a>	
				OR		
				An Introduction to Artificial Intelligence	<a href="https://onlinecourses.nptel.ac.in/noc22_cs56/preview">https://onlinecourses.nptel.ac.in/noc22_cs56/preview</a>	
4	Unix and Shell Programming	3-0-2	4			
5	Cloud Computing	4-0-0	4	Cloud computing	<a href="https://onlinecourses.nptel.ac.in/noc22_cs20/preview">https://onlinecourses.nptel.ac.in/noc22_cs20/preview</a>	
				OR		
				Cloud Computing and Distributed Systems (TWO Credits)	<a href="https://onlinecourses.nptel.ac.in/noc21_cs15/preview">https://onlinecourses.nptel.ac.in/noc21_cs15/preview</a>	

\* If sufficient number of students are not available to offer, can pursue under MOOCS



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## DEPARTMENT OF INFORMATION TECHNOLOGY

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:

(10hrs)

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: (10hrs)

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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II Year – I Semester		L	T	P	C
		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.

**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.





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### 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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II Year – I Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

**Course Objectives:**

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes:**

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

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

**UNIT I**

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

**UNIT II**

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

**UNIT III**

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

**UNIT IV**

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).



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**UNIT V**

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

**Text Books:**

- 1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
- 2) Database System Concepts, 5/e, Silberschatz, Korth, TMH

**Reference Books:**

- 1) Introduction to Database Systems, 8/e C J Date, PEA.
- 2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
- 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105175/>  
<https://www.geeksforgeeks.org/introduction-to-nosql/>



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## DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		3	0	0	3
DISCRETE MATHEMATICS AND GRAPH THEORY					

### Course Objectives:

- 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

### 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, 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



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**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, 3rd Edition, Tata McGraw Hill.
- 3) Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

**Reference Books:**

- 1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
- 2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
- 3) Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
- 4) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.



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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

**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



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**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.
  - 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



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- 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
DATABASE MANAGEMENT SYSTEMS LAB					

### Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

### Course Outcomes:

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

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

### List of Exercises:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to\_char, to\_number and to\_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next\_day, add\_months, last\_day, months\_between, least, greatest, trunc, round, to\_char, to\_date)
5.
  - i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
  - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.



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9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

**Text Books/Suggested Reading:**

- 1) Oracle: The Complete Reference by Oracle Press
- 2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
- 3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
ANIMATIONS- 2D ANIMATION					

**Course Objectives:**

This Course will enable students to learn various aspects of animation using a variety of 2-D software and to implement advance principles of traditional animation in Adobe animate to create high quality animation for production

**Course Outcomes:**

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

- learn various tools of digital 2-D animation.
- understand production pipeline to create 2-D animation.
- analyze special effects in animation to bring interest and awe in the scenes and backgrounds.
- apply the tools to create 2D animation for films and videos.

Perform Experiments related to the following concepts:

**2D GRAPHIC DESIGN**

Adobe Photoshop:

1. Create your visiting card
2. Create Title for any forthcoming film
3. Digital Matte Paint
4. Convert Black and White to Color
5. Convert Day mode to Night mode
6. Design Image manipulation
7. Smooth skin and remove blemishes & scars
8. Create a 3D pop-out effect
9. Create Textures
10. Timeline Animation

Adobe Illustrator:

1. Advertisement
2. Digital Illustrations
3. Brochure
4. Packet Design(Toothpaste packet, Soap cover, any Food product)
5. Dangers for display
6. Menu cards
7. Calendar Design
8. Tracing image
9. Vehicle Design
10. Festival



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Adobe Indesign:

1. Magazine A4 Size
2. Newspaper layout design & advertisements – Fine arts
3. Special Supplement
4. Different categories of Books
5. Info-graphics
6. Caricatures

Corel DRAW:

1. Create a paper ad for advertising of any commercial agency
2. Package Design
3. Corporate ID
4. Exhibition Layout
5. Oblers

**2D ANIMATION**

1. Creating Web Banners in Adobe Flash
2. Creating a Logo Animation in Adobe Flash
3. Creating Frame by Frame animation
4. Draw Cartoon Animation using reference.
5. Create Lip Sink to Characters
6. Using filters & Special effects
7. Create a scene by using Mask layers animation

E-Learning Lab:

8. Student Application form
9. Video Controlling
10. Audio Controlling
11. Start Drag and Stop Drag Actions
12. Interactive Keyboard Controls using Flash Action Script.
13. Interactive Flash Game.
14. Creating Character Animation in After Effects



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
DISTRIBUTED TECHNOLOGIES-SQLITE					

**Course Objectives:**

This Course will enable students to learn about SQLite Database and applying CRUD operations

**Course Outcomes:**

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

- learn about SQLite which is a relational database that is present in android and helps the users by storing important information.
- Perform various operations on server less database SQLite
- implement a small, fast, self-contained, high-reliability, full-featured using SQL database engine.

Perform Experiments related to the following concepts:

1. SQLite Installation
2. DOT(.) Commands
3. Attach, Detach Databases
4. Data types
5. Constraint
6. Create, Alter, Drop Index
7. SELECT statement
8. Operators
9. Aggregate functions
10. Core Functions
11. JOINS
12. Triggers



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## DEPARTMENT OF INFORMATION TECHNOLOGY

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

### 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



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#### 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  
Pachayati 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

#### References:

- 1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
- 2) Subash Kashyap, 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



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**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)