

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY



Course Structure and Syllabus

FOR

B.Tech.

(INFORMATION TECHNOLOGY)



DEPARTMENT OF INFORMATION TECHNOLOGY
DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY

Lonere-402103, Tal. Mangaon, Dist. Raigad (MS) India

Programme Objectives:

The program educational objectives for the B.Tech. programme in Information Technology describes accomplishments that graduates are expected to attain within the four years of graduation.

Graduates will be able to apply their expertise to contemporary problem solving, be engaged professionally, and have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives are:

PEO1: To enable graduates gain strong skills for employment in multidisciplinary domains driven by IT

PEO2: To enable graduates to pursue higher education and research

PEO3: To enable graduates develop entrepreneurship and leadership skills

PEO4: To enable graduates to contribute to the society in accordance with highest standards of ethics

PEO5: To develop breakthroughs solutions enabling transformations in a rapidly changing world

Programme Outcomes:

The graduates of this programme will be able to demonstrate:

PO1: An Understanding of IT architecture, software and hardware concepts, functionalities and applications

PO2: An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages

PO3: Competency of business domains and functional processes that employ IT systems and applications

PO4: Practical use of communication protocols and their applications in the field of internet and world wide web

PO5: Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century

PO6: An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains

PO7: Thought leadership to design and implement practical solutions for global industry needs.

PO8: An Acumen to embrace and adopt futuristic IT technological developments

PO9: Sound knowledge of entrepreneurship traits to succeed

PO10: Adoption of practices that are ethical ensuring transparency and accountability

PO11: Capability to provide solutions that are socially empowering and environment friendly

PO12: Effective communication and collaboration techniques with stakeholders to achieve best results

Scheme w.e.f. from 2017-18 (Second Year)

Table 1: Third Semester

Sr. No.	Course Code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA-I	CA-II	ESE	TW	PR	
1	IT301	Microprocessors and Microcontroller	Nil	03	-	-	20	10	10	60	-	-	03
2	IT302	Switching Theory and Logic Design	Nil	03	-	-	20	10	10	60	-	-	03
3	IT303	Human Rights	Nil	03	01	-	20	10	10	60	-	-	04
4	IT304	Engineering Mathematics -III	M I, M II	03	01	-	20	10	10	60	-	-	04
5	IT305	Object Oriented Paradigm with C++	BCP	03	-	-	20	10	10	60	-	-	03
6	IT306	Elective I • NSS-1 • Physics - II • Chemistry - II • Behavioral Skill • Economics and Management	Nil Physics - I Chemistry - I Nil Nil	03	01	-	20	10	10	60	-	-	04
7	IT301L	Microprocessors and Microcontroller Lab	Nil	-	-	02	-	30		-	10	10	01
8	IT302L	Switching Theory and Logic Design Lab	Nil	-	-	02	-	30		-	10	10	01
9	IT305L	Object Oriented Paradigm with C++ Lab	Nil	-	-	02	-	30		-	10	10	01
TOTAL				18	03	06	120	210		360	30	30	24

Table 2: Fourth Semester

Sr. No	Course code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA- I	CA-II	ESE	TW	PR	
1	IT401	Data Communications	Nil	03	-	-	20	10	10	60	-	-	03
2	IT402	Data Structures and Algorithms	IT305	03	-	-	20	10	10	60	-	-	03
3	IT403	Computer Organization and Architecture	Nil	03	01	-	20	10	10	60	-	-	04
4	IT404	Programming in Java	BCP, IT305	03	-	-	20	10	10	60	-	-	03
5	IT405	Numerical Methods	Nil	03	01	-	20	10	10	60	-	-	04
6	IT406	Elective II • NSS-2 • Environmental Sciences • Development Engineering • Probability Statistics and Queuing Theory • Business Processes • Computer Science: Scientific Applications • Entrepreneurship in India	Nil Nil Nil IT304 Nil Nil Nil	03	01	-	20	10	10	60	-	-	04
7	IT401L	Data Communications Lab	Nil	-	-	02	-	30		-	10	10	01
8	IT402L	Data Structures and Algorithms Lab	Nil	-	-	02	-	30		-	10	10	01
9	IT404L	Programming in Java Lab	Nil	-	-	02	-	30		-	10	10	01
TOTAL				18	03	06	120	210		360	30	30	24

Abbreviations

CA	: Continuous Assessment
ESE	: End Semester Examination
Mid Test	: Middle Semester Test
L	: Lecture Hours
P	: Practical Hours
PR	: Practical Marks
T	: Tutorial Hours
TW	: Term Work

Scheme w.e.f. from 2018-19 (Third Year)

Table 3: **Fifth Semester**

Sr. No	Course code	Title of the Course	Prerequisite	Teaching Structure			Credit Structure						Credit
				L	T	P	Mid Test	CA- I	CA-II	ESE	TW	PR	
1	IT501	Database Management Systems	Nil	03	-	-	20	10	10	60	-	-	03
2	IT502	Discrete Structures and Applications	Nil	03	01	-	20	10	10	60	-	-	04
3	IT503	Computer Networks	IT401	03	-	-	20	10	10	60	-	-	03
4	IT504	Elective IV • IPR and Cyber Law • IT Project Management • Theory of Computation	Nil	03	01	-	20	10	10	60	-	-	04
5	IT505	Elective V • IT Business Methodology- ERP Systems • E-Commerce Systems • Web Applications and Engineering	Nil Nil IT305	03	01	-	20	10	10	60	-	-	04
6	IT501L	Data Base Management Systems Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT503L	Computer Networks Lab	Nil	-	-	02	-	30	-	-	10	10	01
8	IT507	Seminar	Nil	-	-	02	-	-	-	-	-	-	02
9	IT508	Technical Projects for Community Services	Nil	-	-	02	-	-	-	-	-	-	02
TOTAL				15	03	08	100	160		300	20	20	24

Table 4: **Sixth Semester**

Sr. No	Course code	Title of the Course	Prerequisite	Teaching Structure			Credit Structure						Credit
				L	T	P	Mid Test	CA- I	CA-II	ESE	TW	PR	
1	IT601	Business Communications	Nil	03	01	-	20	10	10	60	-	-	04
2	IT602	Operating System	Nil	03	-	-	20	10	10	60	-	-	03
3	IT603	Ethical and Social Issues in Computing	IT503	03	01	-	20	10	10	60	-	-	04
4	IT604	Elective-VI • Real Time System • Embedded Systems • Network Programming • Web Technologies	Nil IT403 IT503 IT503	03	-	-	20	10	10	60	-	-	03
5	IT605	Elective VII • Human Computer Interaction • Soft Computing • Artificial Intelligence • Internetworking Protocol	Nil Nil Nil IT503	03	-	-	20	10	10	60	-	-	03
6	IT606	Elective VIII • Computer Graphics • Multimedia Retrieval Systems • Digital Image Processing	Nil	03	-	-	20	10	10	60	-	-	03
7	IT602L	Operating System Lab	Nil	-	-	02	-	30	-	-	10	10	01
8	IT604L	Elective VI Lab	Nil	-	-	02	-	30	-	-	10	10	01
9	IT605L	Elective VII Lab	Nil	-	-	02	-	30	-	-	10	10	01
10	IT606L	Elective VIII Lab	Nil	-	-	02	-	30	-	-	10	10	01
11	IT607	Industrial Training*	Nil	-	-	-	-	-	-	-	-	-	-
TOTAL				18	02	08	120	240		360	40	40	24

Abbreviations

CA	: Continuous Assessment
ESE	: End Semester Examination
Mid Test	: Middle Semester Test
L	: Lecture Hours
P	: Practical Hours
PR	: Practical Marks
T	: Tutorial Hours
TW	: Term Work

Proposed Scheme w.e.f. from 2019-20 (Final Year)

Table 5: Seventh Semester

Sr. No.	Course Code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA-I	CA-II	ESE	TW	PR	
1	IT701	Data warehouse and Data Mining	IT501	03	-	-	20	10	10	60	-	-	03
2	IT702	Elective IX •Natural Language Processing •Pattern Recognition •Machine Learning	Nil Nil Nil	03	-	-	20	10	10	60	-	-	03
3	IT703	Elective X •Bioinformatics Algorithms •Advance Database Techniques •Distributed Operating System	IT501 IT501 IT602,IT503	03	01	-	20	10	10	60	-	-	04
4	IT704	Elective XI •Information Security •Software Testing	IT503 Nil	03	-	-	20	10	10	60	-	-	03
5	IT701L	Data warehouse and Data Mining Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT702L	Elective IX Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT704L	Elective XI Lab	Nil	-	-	02	-	30	-	-	10	10	01
8	IT705	Project Phase I	Nil	-	-	04	-	-	-	-	-	-	06
9	IT607	Industrial Training Assessment	Nil	-	-	-	-	-	-	-	-	-	02
Total				12	01	10	80	170		240	30	30	24

Table 6: Eighth Semester

Sr. No.	Course Code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA-I	CA-II	ESE	TW	PR	
1	IT801	Ethical Hacking and Digital Forensics	IT503	03	-	-	20	10	10	60	-	-	03
2	IT802	Big Data	IT501, IT701	03	-	-	20	10	10	60	-	-	03
3	IT803	Elective XII • Parallel Computing • Grid Computing • Mobile Computing	IT403, IT602 IT602, IT503 IT401, IT503	03	01	-	20	10	10	60	-	-	04
4	IT804	Elective XIII • Biometrics • Cloud Computing and Security • Reinforcement Learning	IT402 IT503 Nil	03	01	-	20	10	10	60	-	-	04
5	IT801L	Ethical Hacking and Digital Forensic Lab	Nil	-	-	02	-	30	-	-	10	10	01
6	IT802L	Big Data Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT805	Project Phase II	Nil	-	-	04	-	-	-	-	-	-	08
Total				12	02	08	80	140		240	20	20	24

Course Title:	Computer Organization and Architecture	SEMESTER –III
Course Code:	IT301	Credits: 03
Prerequisite:	Nil	

UNIT-I

Computer Evolution and Arithmetic

Computer structure and function, Designing for performance, Von Neumann architecture, Hardware architecture, Interconnection structures, Bus interconnection, Arithmetic and logic unit, Scalar data types, Fixed and floating point numbers, Booths algorithm, Hardware implementation, Division, Restoring and non restoring algorithms.

UNIT-II

The Central Processing Unit

Machine instruction characteristics, Types of operands, Types of operations, Instruction formats, Instruction types, Processor organization, Register organization, Instruction cycle, Instruction pipelining.

UNIT-III

The Control Unit

Single bus organization, Control unit operations: Instruction sequencing, Micro operations and register transfer, Hardwired implementation, Micro-programmed control, Control unit design, Microinstructions and micro- program sequencing, Microinstruction execution.

UNIT-IV

Memory Organization

Characteristics of memory systems, Internal and external Memory, Types of memories, High-speed memories: Cache memory, Organization and mapping techniques, Replacement algorithms, Cache coherence, Virtual memory, Address translation: virtual to physical, Secondary storage devices.

UNIT-V

I/O Organization

Input/output Systems, Programmed I/O, Interrupt driven I/O, Direct memory access(DMA), Input/Output Channels and processors.

UNIT-VI

Parallel Organization

Parallelism in uniprocessor systems, Instruction level pipelining, Pipeline computers, Array computers, Multiple processor organizations, Closely and loosely coupled multiprocessors systems, Symmetric multiprocessors.

TEXT/REFERENCE BOOKS

Text Books:

1. J. P. Hayes, “*Computer Architecture and Organization*”, McGraw-Hill Publication, 3rd edition, 2012.

2. K. Hwang , Briggs, “*Computer Architecture and Parallel Processing*”, Tata Mc-Graw Hill Publication, 1st edition, 2012.

Reference Books:

1. W. Stallings, “*Computer Organization and Architecture: Designing for performance*”, Prentice Hall of India Publication, 9th edition, 2012.
2. A. S. Tanenbaum , “*Structured Computer Organization*”, Prentice Hall of India Publication, 5th edition, 2005.
3. G. George, “*Computer Organization: Hardware and Software*”, Prentice Hall of India Publication, 2nd edition, 1986.
4. D. A. Patterson, J. L. Hennessy, “*Computer Organization and Design: The Hardware / Software Interface*”, Morgan Kauffmann Publication, 5th edition, 2014.
5. C. Hamacher, V. Zvonko, S. Zaky, “*Computer Organization*”, McGraw Hill Publication, 6th edition, 2012.

Course Title: Switching Theory and Logic Design
Course Code: IT302
Prerequisite: Nil

SEMESTER –III
Credits: 03

UNIT-I

Number Systems and Codes

Number systems: Binary, Octal, Hexa-decimal number systems, Binary arithmetic, Codes: Binary code, Excess-3 code, Gray code, Error detection and correction codes.

UNIT-II

Boolean Algebra and Logic Functions

Boolean algebra: Postulates and theorems, Logic functions, Minimization of boolean functions using algebra, Karnaugh map and Quine – McClusky methods, Realization using logic gates.

&

UNIT-III

Logic Families

Logic families: Characteristics of logic families, TTL, CMOS, and ECL families.

UNIT-IV

Combinational Functions

Realizing logical expressions using different logic gates, Design of combinational circuits using combinational ICs, Realization of adders and subtractors, Design of code converters, Comparators and decoders, Design of multiplexers, Demultiplexers.

UNIT-V

Introduction to Sequential Circuits

Moore and mealy machines, Introduction to flip-flops like SR, JK, D and T with truth tables, Logic diagrams and timing relationships, Conversion of flip-flops, Excitation table, State tables, Realization of state tables.

UNIT-VI

Programmable Logic Devices

Semiconductor memories, RAM, ROM, PLA, PAL, Memory System design.

TEXT/REFERENCE BOOKS

Text Books:

1. M. M. Mano, “*Digital Logic and Computer Design*”, Prentice Hall of India Publication, 4th edition, 2006.
2. R.P. Jain “*Modern Digital Electronics*”, Tata McGraw Hill Publication, 4th edition, 2010.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, “*Digital Principles and Applications*”, Tata McGraw Hill Publication, 8th edition, 1993.
2. Comer, “*Digital Logic & State Machine Design*”, Oxford Universities Press, 3rd edition, 2014.

Course Title: Discrete Structures and Applications
Course Code: IT303
Prerequisite: Nil

SEMESTER –III
Credits: 03

UNIT-I

The Foundations

Sets theory and its applications sets, Set operations, Laws of set theory, Power sets, Partitions, Multisets, Cardinality, Principle of inclusion and exclusion, Algebra of sets and duality, Applications of sets: Problems on set operations and principle of inclusion-exclusion, Logics and proofs, Propositional logic, Propositional equivalences, Propositional algebra, Basic logical operations, De Morgan's laws, Predicates and quantifiers, Nested quantifiers, Rules of inference, Proof methods and strategy, Applications of logic: Translating English statements into propositions, Boolean searches in web pages, Bit operations.

UNIT-II

Induction, Sequences and Summations

Induction and recursion: Mathematical induction, Strong induction, Recursive definitions, Recursive algorithms, Applications: Proofs using mathematical induction, Program correctness, Well formed formulae, Functions, Sequences and summations, Definition and types of functions: Injective, surjective and bijective, Composition, Identity and inverse of function, Recursively defined functions, Sequences and summations, Applications of functions, Sequences and summations: Job scheduling problem, Countability of rational numbers.

UNIT-III

Basic Counting Principles

Permutations, Combinations, Binomial coefficients, Generalized permutations and combinations, Combinations and permutations with repetition, Generating permutations and combinations, Recurrence relation, Solving linear recurrence relations with constant coefficients, Applications of counting principles, Pigeonhole principle and its applications.

UNIT-IV

Relations

Properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations and partitions, Partial ordering relations and lattice application of relations: n-ary relations and their applications, Databases and relations.

UNIT-V

Graph Theory

Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path in weighted graph, Hamiltonian and Euler paths and circuits, Factors of a graph, Shortest path algorithm, Travelling salesman problem, Transport networks, Special types of graphs and applications: Job assignment, LANs, Interconnection networks for parallel computation, Mesh networks, Graph coloring and applications.

UNIT-VI

Algebraic Structures

Algebraic systems, Groups, Semi groups, Monoid, Subgroups, Permutation groups, Codes and group codes, Isomorphism and automorphisms, Homomorphism, Fermat's little theorem, Polynomial rings, Applications of groups.

TEXT/REFERENCE BOOKS

Text Books:

1. K. H. Rosen, "*Discrete Mathematics and Its Applications*", Tata McGraw Hill Publication, 7th edition, 2012.
2. J. P. Tremblay, R. Manohar, "*Discrete Mathematical Structures with Applications to Computer Science*", 1st edition, McGraw Hill Publication, 2001.

Reference Books:

1. B. Kolman, R. Busby, S. Ross, "*Discrete Mathematical Structures*", Pearson Education, 6th edition, 2009.
2. R. K. Bisht, H. S. Dhami, "*Discrete Mathematics*", Oxford University Press, 2015.

Course Title:	Engineering Mathematics - III	SEMESTER –III
Course Code:	IT304	Credits: 03
Prerequisite:	M I, M II	

UNIT-I

Laplace Transform

Definition – Conditions for existence, Transforms of elementary functions, Properties of Laplace transforms - Linearity property, First shifting property, Second shifting property, Transforms of functions multiplied by t^n , Scale change property, Transforms of functions divided by t , Transforms of integral of functions, Transforms of derivatives, Evaluation of integrals by using Laplace transform, Transforms of some special functions- Periodic function, Error function, Unit step function .

UNIT-II

Inverse Laplace Transform

Introductory remarks , Inverse transforms of some elementary functions, General methods of finding inverse transforms, Partial fraction method and Convolution Theorem for finding inverse Laplace transforms, Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT-III

Fourier Transform

Definitions – Integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals, Complex form of Fourier integrals, Fourier sine and cosine transforms, Properties of Fourier transforms, Convolution theorem for Fourier transforms, Application to boundary value problems.

UNIT-IV

Series Solutions of Differential Equations and Special Functions

Validity of series solution, Series solutions about ordinary and singular point, Frobenius method, Series solution of Bessel equation, Recurrence relations for Bessel function, Generating function for Bessel function, Orthogonality of Bessel function.

UNIT-V

Partial Differential Equations and Their Applications Formation of Partial differential equations, Solutions of Partial differential equations – Direct integration, Linear equations of first order (Lagrange's linear equations), Homogeneous linear equations with constant coefficients, Method of separation of variables – Application to find solutions of wave equation, One dimensional heat equation and Laplace equation.

UNIT-VI

Calculus of Complex Functions Limit and continuity of $f(z)$, Derivative of $f(z)$ – Cauchy-Riemann equations, Analytic functions, Harmonic functions - Orthogonal system, Conformal transformations, complex integration – Cauchy's theorem, Integral formula, Residue theorem.

TEXT/REFERENCE BOOKS

Text Books:

1. B. S. Grewal, “ *Higher Engineering Mathematics*” , Khanna Publishers, New Delhi.
2. P. N. Wartikar , J. N. Wartikar, “ *A Text Book of Applied Mathematics (Vol I & II)* ”, Pune Vidyarthi Griha Prakashan, Pune.
3. N. P. Bali , N. Ch. Narayana Iyengar, “ *A Text Book of Engineering Mathematics*”, Laxmi Publications (P) Ltd. , New Delhi.
4. Dr. B. B. Singh, “ *A course in Engineering Mathematics (Vol II & III)*”, Synergy Knowledge, Mumbai.

Reference Books:

1. B. V. Ramana, “ *Higher Engineering Mathematics*”, Tata McGraw-Hill Publications, New Delhi.
2. Erwin Kreyszig, “ *Advanced Engineering Mathematics*”, John Wiley and Sons, New York.
3. Peter O’ Neil, “ *A Text Book of Engineering Mathematics*”, Thomson Asia Pvt. Ltd., Singapore.
4. C. R. Wylie, L. C. Barrett, “ *Advanced Engineering Mathematics*”, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Course Title: Object Oriented Paradigm with C++
Course Code: IT305
Prerequisite: BCP

SEMESTER –III
Credits: 03

UNIT-I

Elements of computer systems, DOS commands and Linux environment, Language processors, Algorithms, Flowcharts, Object-Oriented Programming Paradigm : Benefits, Applications. Object-Oriented Systems Development
Object-Oriented Analysis: Static and dynamic modeling, Object-Oriented Design: Class design and algorithm design, Case studies design, Case studies.

UNIT-II

Beginning with C++: Tokens, Data types, Operators, Expressions, Control structures, Array, Functions, Structures and Unions.
Class and Objects
Specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions.

UNIT-III

Constructors and Destructors
Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructors. Programming for class diagram and relationship.

UNIT-IV

Inheritance
Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.

UNIT-V

Polymorphism
Operator overloading, Function overloading. Virtual functions, Pure virtual functions. Abstract class.

UNIT-VI

Working with Files
Classes for file stream operations and I/O stream operation, Opening and closing a file, Detecting end-of-file, More about Open(): File Modes, Sequential input and output operations.

TEXT/REFERENCE BOOKS

Text Books:

1. Robert Lafore, “*Object Oriented Programming in C++*”, Pearson Education, 4th edition, 2008. Reference Books
2. B. B. Meshram, “*Object Oriented Paradigm with C++*”, Shroff Publisher.

Reference Books:

1. J. R. Hubbard, "*Programming with C++:Schaum's outlines*", Tata McGraw-Hill publication, 2005.
2. B. B. Meshram, "*Programming Workbook for Object Oriented Paradigm with C++*", Shroff Publisher.
3. P. J. Deitel, H..M..Deitel, "*C++ How to Program*", Pearson Education, 9th edition, 2016.
4. E. Balagurusamy, "*Object Oriented Programming with C++*", Tata McGraw Hill Publication, 6th edition, 2013.

Course Title:	Human Rights (Elective-I)	SEMESTER –III
Course Code:	IT306	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction

Magna Carta, English bill of rights, American/French declaration, Universal declaration of human rights: background, Content and relevance.

Theories/Justification/Perspectives on Human Rights

Natural, Moral, Legal and human rights, Natural rights, Positivist, Liberal, Marxist, Feminist, Asian perspectives.

UNIT-II

Debates

Universality of rights, Rights vs duties, Individual vs group rights, Civil and political rights vs social, The notion of rights in various religious traditions (Hindu, Muslim, Buddhist traditions), Western Influence (especially the impact of the british rule), National freedom movement, The roles of Gandhi, Ambedkar and Nehru.

UNIT-III

Constitutional Developments in India

Constitutional provisions (especially fundamental rights vs directive principles of state policy and emergency).

Intergovernmental Organization

The united nations (study of specific UN agencies related to human rights), Regional instruments.

UNIT-IV

International NGO

Amnesty international: Its working and impact on India, Case studies of selected national NGOs, Case studies of selected regional NGOs, The government: Role and effort of some of its agencies including the army, police, and paramilitary forces.

UNIT-V

National Human Rights Commission of India

Background, Structure and functioning, International humanitarian law, International refugee law, The judiciary including public interest litigation, The medical profession and human rights, The role of the media in human rights.

UNIT-VI

Some Issues in Human Rights

Violence and terrorism, Women's rights, Child rights, Dalit rights, Minority rights, Tribal rights, Refugee rights, Capital punishment, Euthanasia, Rights of the elderly, Gay Rights.

TEXT/REFERENCE BOOKS

Text Books:

1. D. D. Basu, V. R. Manohar, B. P. Banerjee, S.A. Khan, "*Introduction to the Constitution of India*", 20th edition, Lexis Nexis Butterworths publication, 2008.
2. A. R. Desai, "*Violation of Democratic Rights in India*", Bombay Popular Prakashan.

Reference Books:

1. M. Mohanty, P. N. Mukherji, O. Tornquist, "*People's Rights: Social Movements and the State in the Third World*", New Delhi: Sage Publications, 1998.
2. Nanda, P. Ved, J. R. Scarritt, G. W. Shepherd, "*Global Human Rights: Public Policies, Comparative Measures and NGO Strategies*", Boulder: Westview Press Inc., 1981.
3. Nirmal, J. Chiranjivi, "*Human Rights in India: Historical, Social and Political Perspectives*", New Delhi: Oxford University Press, 2000.
4. Kothari, Smitu, Harsh Sethi, "*Rethinking Human Rights: Challenges for Theory and Action*", Delhi : Lokayan, 1991.
5. A. J. M. Milne, "*Human Rights and Human Diversity: An Essay in The Philosophy of Human Rights*", New York: State University of New York Press, 1986.

Course Title: Economics and Management (Elective-I)
Course Code: IT306
Prerequisite: Nil

SEMESTER –III
Credits: 03

UNIT-I

The Fundamentals of Managerial Economics

Goals and constraints, The nature and importance of profits, Understanding incentives, Economic rationality, Scarcity and opportunity cost, Marginal and incremental analysis, Basic calculus: The calculus of optimization.

UNIT-II

Theory of Demand

Demand and supply, Market equilibrium, Price ceilings and price floors, Comparative statics: Changes in demand and supply, Price elasticity of demand: Price elasticity, Total revenue, Marginal revenue, Factors affecting price elasticity, Cross price elasticity, Income elasticity of demand, Other elasticities, Elasticities for nonlinear demand functions, Elasticity of supply demand forecasting, Choice and utility theory, Law of diminishing marginal utility, Consumer equilibrium, Indifference curve analysis, Consumer surplus, Price effect, Substitution effect and income effect.

UNIT-III

Theory of Production and Cost

The production function, Profit-maximizing input usage, Isoquants and isocosts, Cost minimization and optimal input substitution, The cost function, Breakeven analysis, Contribution analysis, Long-run costs and economies of scale, Multiple cost functions and economies of scope, Learning curve.

UNIT-IV

Theory of Market and Pricing

The nature of industry, Perfect competition, Monopoly, Monopolistic competition, Oligopoly, Game theory, Product pricing.

UNIT-V

Introduction to Management

Introduction of management science, Contributions of F.W. Taylor, Henry Fayol, Gantt, Gilbreth etc., Definitions of management, Management as an art, Science and profession, Importance of management, Administration and organization concept, Levels of management, Functions of management, Management by objectives.

UNIT-VI

Managerial Economics

Basic economy concepts: Human wants, Economics, Goods, Price, Value, Utility, Wealth, Law of demands, Law of supply, Scales of production, Internal and external economics of scale, Concepts of E-commerce, E-business management, E-governance, Enterprise Resource Planning (ERP), Intellectual property laws, Patents, Copyrights, Trademarks, Law of contracts: Salient features, Role of chambers of commerce and industries.

TEXT/REFERENCE BOOKS

Text Books:

1. C. R. Thomas, S.C. Maurice, “*Managerial Economics: Concept and Applications*”, McGraw-Hill Education, 9th edition.
2. A. R. Aryasri, “*Managerial Economics and Financial Analysis*”, Tata McGraw Hill Publication, 3rd edition, 2008.

Reference Books:

1. H. Koontz, H. Weihrich, “*Essentials of Management: An International Perspective*”, Tata McGraw Hill Publication, 8th edition, 2009.
2. P. Chandra, “*Financial Management Theory and Practice*”, Tata McGraw Hill Publication, 8th edition, 2011.
3. A. R. Aryasri, “*Management Science*”, Tata McGraw Hill Publication, 4th edition, 2008.

Course Title:	Behavioral Skills (Elective-I)	SEMESTER –III
Course Code:	IT306	Credits: 03
Prerequisite:	Nil	

UNIT-I

Fundamentals of Organizational Behaviour

Understanding organizational behaviour - Fundamental concepts, Organizational processes, Organizational structure, Organizational change and innovation processes.

Effectiveness in organizations - Models of organizational behaviour, Systems theory and time dimension of effectiveness, Developing competencies, Limitations of organizational behaviour, Continuing challenges.

Social systems and organizational culture - Understanding a social system, Social culture, Role, Status, Organizational culture, Influencing culture change, Sustaining the culture, Characteristics of effective socialization.

UNIT-II

Understanding and Managing Individual

Behaviour Individual differences and work behaviour - Why individual differences are important?, The basis for understanding work behaviour, Individual differences influencing work behaviour.

Personality- Sources of personality differences, Personality structure, Personality and behaviour, Measuring personality.

Attitudes - The nature of employee attitudes, Effects of employee attitudes, Studying job satisfaction, Changing employee attitudes.

Perceptions, Attributions and emotions -The perceptual process, Perceptual grouping, Impression management, Emotions, Emotional intelligence.

Motivation - Concept of motivation, Content approaches, Process approaches, Motivation and psychological contract.

Job Design, work and motivation - Job design and quality of work life, A conceptual model of job design, Job performance outcomes, Job analysis, Job designs: The result of job analysis, The way people perceive their jobs, Designing job range: Job rotation and job enlargement, Designing Job depth: Job enrichment, Total quality management and job design.

Evaluation, feedback and rewards - Evaluation of performance, Performance Evaluation feedback, Reinforcement theory, A model of individual rewards, Rewards affect organizational concerns, Innovative reward system.

Managing misbehaviour - The emergence in management of the study of misbehaviour, Selected misbehaviour.

Stress and counseling -Stress, Stress model, Work stressors, Stress outcomes, Stress moderators, Stress prevention and management, Employee counseling, Types of counseling.

UNIT-III

Group Behaviour and Interpersonal Influence

Informal and formal groups - Group dynamics, The nature of informal, Organizations, Formal groups.

Teams and team building - Organizational context for teams, Teamwork, Team building.

Managing conflict and negotiation -Conflict in organizations, A contemporary perspective on intergroup conflict, What causes intergroup conflict?, The causes of dysfunctional intergroup conflict, Managing intergroup conflict through resolution, Stimulating constructive intergroup

conflict, Negotiations, Negotiation tactics, Increasing negotiation effectiveness.

Power and politics - The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics, Power and politics, Using power to manage effectively.

Empowerment and participation - The nature of empowerment and participation, How participation works?, Programs for participation, Important considerations in participation.

Assertive behaviour -Interpersonal Orientations, Facilitating smooth relations, Stroking.

UNIT-IV

Organizational Processes

Communication - The importance of communication, The communication process, Communicating within organizations, Information richness, How technology affects communication?, Interpersonal communication, Multicultural communication, Barriers to effective communication, Improving communication in organizations, Promoting ethical communications.

Decision Making -Types of decisions, A rational decision-making process, Alternatives to rational decision making, Behavioural influences on decision making, Group decision making, Creativity on group decision making.

Leadership - What is leadership?, Trait approaches, Behavioural approaches, Situational approaches, Other perspectives, Concepts and issues of leadership, Multicultural leadership, Emerging approaches to leadership.

UNIT-V

Organizational design, Change and Innovation

Organizational structure and design - Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control, Dimensions of structure, Organizational design models, Multinational structure and design, Virtual organizations. Managing change and innovation - Change at work, Resistance to change, Alternative change management approaches, Learning principles in change management, Change agents: Forms of interventions, A model for managing organizational change, Diagnosis of a problem, Selection of appropriate methods, Impediments and limiting conditions, Implementing change successfully, Understanding organizational development.

UNIT-VI

Emerging Aspects of Organizational Behaviour

Organizational behaviour across cultures - Conditions affecting multinational operations, Managing international workforce, Productivity and cultural contingencies, Cross culture.

TEXT/REFERENCE BOOKS

Text Books:

1. J.W. Newstrom, D. Keith, “*Organizational Behaviour*”, Tata McGraw Hill publication.
2. S. P. Robbins, T. A. Judge, “*Organizational Behaviour*”, *Pearson Education*, 15th edition, 2013.

Reference Books:

1. L. J. Mullins, “*Management and Organizational Behaviour*”, Pearson education, 7th edition, 2007.

2. S. L. McShane, M.A.V. Gilnow and R. R. Sharma, “*Organization Behaviour*”, Tata McGraw Hill Publication, 4th edition, 2008.

Course Title: Switching Theory and Logic Design Lab
Course Code: IT302L

SEMESTER –III
Credits: 01

1. Implementation of Boolean functions using Gates.
2. Implementation of following code conversions:
 - Binary to gray
 - Gray to binary
 - Excess –3 to BCD
 - BCD to Excess –3.
3. Implementation of half adder, full adder.
4. Implementation of half subtractor, full subtractor.
5. Implementation of K-map examples.
6. Implementation of Quine-Mc’Clusky examples.
7. Implementation of :
 - 3 bit odd Parity Checker
 - 4 bit odd Parity Checker
 - 3 bit even Parity Checker
 - 4 bit even Parity Checker
8. Implementation of Multiplexer and Demultiplexer.
9. Implementation of BCD adder using 4 bit adder IC.
10. Study of flip flops:
 - RS flip-flop
 - D flip-flop
 - T flip-flop
 - J-K flip-flop
11. Implementation of following counters:
 - Synchronous counter
 - Asynchronous counter
 - Up / down counter
 - Ring counter
 - Johnson Counter

Course Title: Object Oriented Paradigm with C++ Lab
Course Code: IT305L

SEMESTER –III
Credits: 01

1. Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called `power ()` that takes a double value for n and an int value for p , and returns the result as double value. Use a default argument of 2 for p , so that if this argument is omitted, the number will be squared. Write a `main ()` function that gets values from the user to test this function.

2. A point on the two dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4,5) represents a point 4 units to the right of the origin along the X axis and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of the X coordinates of the points and whose Y coordinate is the sum of their Y coordinates.

Write a program that uses a structure called point to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:

Enter coordinates for P1: 3 4

Enter coordinates for P2: 5 7

Coordinates of P1 + P2 are : 8, 11

3. Create the equivalent of a four function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be Y or N . Some sample interaction with the program might look like this:

Enter first number, operator, second number: 10/ 3

Answer = 3.333333

Do another (Y/ N)? Y

Enter first number, operator, second number 12 + 100

Answer = 112

Do another (Y/ N) ? N

4. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure `phone`. Create two structure variables of type `phone`. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

Enter your area code, exchange, and number: 415 555 1212

My number is (212) 767-8900

Your number is (415) 555-1212

5. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results maybe a DM object

or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

6. Create a class rational which represents a numerical value by two double values- NUMERATOR and DENOMINATOR. Include the following public member Functions: constructor with no arguments (default), constructor with two arguments, void reduce() that reduces the rational number by eliminating the highest common factor between the numerator and denominator.

Overload + operator to add two rational number

Overload << operator to enable input through cin

Overload >> operator to enable output through cout

Write a main () to test all the functions in the class.

7. Consider the following class definition:

```
class father {
protected:int age;
public;
father (int x) {age = x;}
virtual void iam()
{
cout<<"I AM THE FATHER " ;
cout << "My age is : " << age<< endl;}
};
```

Derive the two classes son and daughter from the above class and for each, define iam () to write similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main () that creates objects of the three classes and then calls iam () for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.

8. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll no., name (a string of 30 or lesser no. of characters) and marks.
9. A hospital wants to create a database regarding its indoor patients. The information to store include
- a. Name of the patient
 - b. Date of admission
 - c. Disease
 - d. Date of discharge

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the patients to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

10. Imagine a tollbooth with a class called toll Booth. The two data items are a type Unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar () increments the car total and adds 0.50 to the cash total. Another function, called nopayCar (), increments the car total but adds nothing to the cash total. Finally, a member function called display() displays the two totals i.e. total cars and total cash Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.

Course Title: Data Communications
Course Code: IT401
Prerequisite: Nil

SEMESTER –IV
Credits: 03

UNIT-I

Introduction to Network Models

Components of communication, Data representation, Data flow, Communication model, Network, Network topologies, Network connection, LAN, WAN, MAN, Internet, Layered tasks, OSI Model - layered architecture, Layers in OSI model, TCP/IP model, Comparison.

Data and signals: Analog and digital data, Analog and digital signals, Periodic and non-periodic signals, Sine wave, Parameters of sine wave, Time and frequency domain, Composite signals, Bandwidth, Digital signal - bit rate, Baseband and broadband transmission, Transmission impairments, Nyquist bit rate, Shannon capacity, Performance: Throughput, latency, bandwidth, delay, jitter.

UNIT-II

Analog Transmission and Multiplexing

Digital to analog conversion, Amplitude shift keying, Frequency shift keying, Phase shift keying, Quadrature amplitude modulation, Analog to analog Conversion, Amplitude modulation, Frequency modulation, Phase modulation, Need of multiplexing, Multiplexer and demultiplexer, Frequency division multiplexing, Wavelength division multiplexing, Time division multiplexing - Statistical TDM, Synchronous TDM, Data rate management in TDM.

UNIT-III

Digital Transmission

Digital to digital conversion, Signals element, Data element, Signal rate, Data rate, DC component, Self synchronization, Line coding schemes, NRZ, NRZI, Bipolar AMI, Pseudoternary, Manchester, Differential Manchester, Block coding schemes - 4B/5B, 8B/10B, Scrambling, HDB3, B8ZS, Analog to digital conversion, Pulse code modulation, Delta modulation, Transmission modes - Serial and parallel transmission.

UNIT-IV

Transmission Media

Guided Media, Twisted pair cable, Co-axial cable, Fiber optic cable, Performance of guided media, Unguided media, Radio waves, Microwaves, Infrared, Introduction to fiber optics, Nature of light, Fiber characteristics, Sources and detectors, Connectors and splices.

UNIT-V

Error Detection and Correction

Types of errors, Redundancy, Detection versus correction, Forward error correction and retransmission, Modular arithmetic, Block Coding, Error detection, Error correction, Hamming distance, Minimum hamming distance, Linear block codes, Cyclic codes, Cyclic redundancy check, Hardware implementation, Polynomials, Cyclic code analysis, Checksum concept, One's component.

UNIT-VI

Introduction to Multiple Access

Random Access Protocol: ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled access: Reservation, Polling, Token passing, Channelization, FDMA, TDMA, CDMA.

Cellular Phones and Satellite Networks

Frequency reuse principle, Roaming, Satellite networks, Orbits, GEO, MEO, LEO satellite.

TEXT/REFERENCE BOOKS

Text Books:

1. W. L. Schweber, "*Data Communications*", Tata McGraw Hill Publication, 1st edition, 2009.
2. B. Forouzan, "*Data Communications and Networking*", McGraw Hill Publication, 5th edition, 2013.

Reference Books:

1. W. Stallings, "*Data and Computer Communications*", Prentice Hall of India Publication, 10th edition, 2013.
2. Trivedi, "*Data Communication and Networks*", Oxford University Press, 2016.

Course Title:	Data Structure and Algorithms	SEMESTER –IV
Course Code:	IT402	Credits: 03
Prerequisite:	IT305	

UNIT-I

Introduction to Data Structures and Analysis of Algorithms

Need of data structures, Types of data structures, Recursion, ADT (Abstract Data Types), Basics of algorithm, Analysis of algorithm through time complexity and space complexity, Asymptotic notations, Pseudo code analysis, Recurrence relations and solving recurrences using substitution, Recursion tree and master method.

UNIT-II

Stack and Queue

Stack: Representation, Stack operation, Application.

Queue: Representation, Queue operation, Circular and priority queue, Applications.

UNIT-III

Linked List

Linked list: Operation on linked list, Linked stacks and Queues, Array implementation of linked list, Linked list using dynamic variable, Doubly linked list, Circular linked list.

UNIT-IV

Binary Tree

Basic tree concept, Binary tree operations, Binary tree representation, Binary tree traversals, Binary search tree and operations on it, Balanced tree: AVL trees and operations, Applications of binary trees, Implementing priority queue using binary heap data structure.

UNIT-V

Graphs

Basics concepts of graphs, Representation of graphs, Graph traversals BFS and DFS, Minimum spanning tree algorithms: Kruskal's algorithm and Prim's algorithm, Applications of graphs.

UNIT-VI

Searching Techniques and Hashing

Linear search and binary search, Hashing: Direct-address tables, Hash tables, Open addressing, Perfect Hashing.

Sorting techniques

Various sorting methods and their time complexity analysis: Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort.

TEXT/REFERENCE BOOKS

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, "*Fundamentals of Data Structures in C++*", Silicon Press, 2nd edition, 2008.

2. R.S. Bichkar, "*Programming with C and Data structures*", Universities Press, 1st edition, 2014.

Reference Books:

1. Goodrich, Tamassia, "*Data Structures and Algorithm in Java*", Wiley publication, 6th edition, 2014.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, "*Introduction to Algorithms*", MIT Press, 3rd edition, 2009.
3. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, "*Data structures using Java*", Pearson Education, 2003.
4. J. Murach, "*Murach's Java Programming*", Shroff Publishers, 4th edition, 2012.
5. V. Goyal, L. Goyal, P. Kumar, "*A Simplified Approach to Data Structures*", Shroff Publishers, 1st Edition, 2014

Course Title: Operating Systems
Course Code: IT403
Prerequisite: Nil

SEMESTER –IV
Credits: 03

UNIT-I

Operating System Structures

Definition, Types of operating system, Real time operating system, System components, System services, Systems calls, System programs, System structure, Virtual machines, System design and implementation.

UNIT-II

Processes and CPU scheduling

Process concept, Process scheduling, Operation on a process, Co-operating processes, Threads, Interprocess communication, Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling, Scheduling algorithms and performance evaluation.

UNIT-III

Process Synchronization

The critical-section problem, Critical regions, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors.

UNIT-IV

Deadlocks

Systems model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, Combined approach to deadlock handling.

UNIT-V

Memory Management and Virtual Memory

Logical versus physical address space, Swapping, Contiguous allocation, Paging, Segmentation with paging, Demand paging, Page replacement algorithms, Thrashing.

UNIT-VI

File Management

File system and secondary storage devices, Real-time operating systems.

TEXT/REFERENCE BOOKS

Text Books:

1. A. Silberschatz, P. Galvin, “*Operating System Concepts*”, Wiley Publication, 9th edition, 2013.
2. A. S. Tanenbaum, H. Bos, “*Modern Operating Systems*”, Pearson Education, 4th Edition, 2015.

Reference Books:

1. D.M. Dhamdhere, “*Systems Programming and Operating Systems*”, Tata McGraw Hill Publication, 2nd edition, 2001.
2. G. Nutt, “*Operating Systems Concepts*”, Addison Wesley Publication, 3rd Edition.
3. H. M. Deitel, “*An Introduction to Operating Systems*”, Addison Wesley Publication, 1990.

Course Title: Programming in Java
Course Code: IT404
Prerequisite: BCP, IT305

SEMESTER –IV
Credits: 03

UNIT-I

Introduction to Java

Fundamentals of Object-Oriented Programming, Evolution of Java, Overview of java language: Data types in Java, Operators and expressions, Decision making and branching: Control statements such as if-else, do statement, for statement, The else if ladder, jumps in loops, labeled loops, while repetition statement, Switch statement, Break and continue statement, Arrays, Strings, Vectors, Wrapper classes, Enumerated types, Annotations.

UNIT-II

Object Oriented Programming

Classes, Objects and methods: Defining class, Methods, Creating objects, Accessing class members, Static methods, Finalize methods, Visibility control, Method overloading, Method overriding, Recursion, Interfaces, Constructors.

UNIT-III

Packages and Applet Programming

Java API packages, Using system packages, Naming conventions, Creating packages and jar files, Accessing and using a package, Hiding classes, Applet programming

UNIT-IV

Multithreading

Creating threads, Extending thread class, Stopping and blocking a thread, Life cycle of a thread, Using thread method, Thread exceptions, Implementing the run able interface, Inter thread communication.

Managing errors and exceptions

Types of errors, Exceptions, Syntax of exception handling code, Multiple catch statements, Throwing your own exception, Using exceptions for debugging.

UNIT-V

Graphics Programming

The graphics class, Lines and rectangles, Circles, Arc and ellipses, Polygons, Drawing bar charts, AWT package and swings.

UNIT-VI

Managing Files and I/O Handling

Files and streams, Stream classes, Byte stream classes, Character stream classes, Using streams, Reading / writing bytes and characters, Interactive input and output, Other stream classes.

TEXT/REFERENCE BOOKS

Text Books:

1. Steven Holzner, “*Java 8 Programming: Black Book*”, Dreamtech Press, 2015.
2. H.M. Deitel, P.J. Deitel , “*Java : How to Program (Early Objects)*”, Pearson Publication, 10th edition, 2014.

Reference Books:

1. B. Eckel , “*Thinking in Java*”, Prentice Hall of India Publication, 2nd Edition, 2000.
2. P. Naughton, “*The Java Handbook*”, McGraw Hill Publication, 1996.
3. T. Lindholm, F. Yellin, “*The Java Virtual Machine Specification*”, Addison Wesley Publication, 1996.
4. E. Balagurusamy, “*Programming with Java: A Primer*”, Tata McGraw Hill Publication, 5th Edition, 2014.
5. J. Murach, M. Urban, “*Murach’s Beginning Java with Eclipse*”, Shroff Publishers, 1st edition, 2016.

Course Title:	Numerical Methods (Elective-II)	SEMESTER –IV
Course Code:	IT405	Credits: 03
Prerequisite:	Nil	

UNIT-I

Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method, Approximate solution of equation – Horner's method.

UNIT-II

Solution of Linear Simultaneous Equation: Gauss elimination method, Gauss-Jordan method, Crout's triangular method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method, Relaxation method.

UNIT-III

Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, Newton's interpolation formulae, Newton's forward-backward-central interpolation formulae, Sterling formula, Bessel's formula, Interpolation with unequal intervals.

UNIT-IV

Differentiation and Integration: Newton-Cotes formula, Trapezoidal rule, Simpson one-third rule, Simpson three-eighth rule, Weddle's rule.

UNIT-V

Numerical Solution of ODE: Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge - Kutta method, Predictor-corrector method, Milne's method.

UNIT-VI

Adams-Bash fourth method, Second-order differential equation, Numerical solution for elliptical partial differential equation.

TEXT/REFERENCE BOOKS

Text Books:

1. B.S Grewal, "*Higher Engineering Mathematics*", 40th edition, Khanna Publication.
2. S. S. Shastri, "*Introduction to Numerical Methods*", PHI Publication.

Reference Books:

1. Conte and De boor, "*Elementary Numerical Analysis*", BPB Publication.
2. V. Rajaraman, "*Computer Oriented Methods*", 3rd edition, PHI Publication
3. E. Kreyszig, "*Advanced Engineering Mathematics*", BPB Publication.
4. Steven C Chapra, "*Numerical Methods for Engineers*", 5th edition, McGraw Hill Publication.

Course Title: Probability Statistics and Queuing Theory (Elective-II)
Course Code: IT405
Prerequisite: IT304

SEMESTER –IV
Credits: 03

UNIT-I

Probability Theory

Definition of probability: Classical, Empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Baye's theorem of inverse probability, Properties of probabilities with proofs, Examples.

UNIT-II

Random Variable and Mathematical Expectation

Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Joint and marginal probability distributions, Properties of expectation and variance with proofs, Examples.

UNIT-III

Theoretical Probability Distributions

Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between poisson and normal distributions, Importance of normal distribution, Examples.

UNIT-IV

Correlation

Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples.

UNIT-V

Linear Regression Analysis

Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient, Examples.

UNIT-VI

Queuing Theory

Introduction, Queuing systems, The input or arrival pattern, The service pattern and service discipline, Notation, Performance measures, Little's formula, Relation between the probabilities of states, $M/M/1/\infty$ systems, Examples.

TEXT/REFERENCE BOOKS

Text Books:

1. S. C. Gupta, “*Fundamentals of Statistics*”, Himalaya Publishing House, 7th edition, 2016.
2. G. Haribaskaran, “*Probability, Queuing Theory and Reliability Engineering*”, Laxmi Publication, 2nd edition, 2009.

Reference Books:

1. Kishor S. Trivedi, “*Probability, Statistics with Reliability, Queuing and Computer Science Applications*”, Wiley India Pvt. Ltd., 2nd edition, 2008.
2. G.V. Kumbhojkar, “*Probability and Random Processes*”, C. Jamnadas and Co., 14th edition, 2010.

Course Title:	Microprocessors and Microcontroller (Elective-III)	SEMESTER –IV
Course Code:	IT406	Credits: 03
Prerequisite:	Nil	

UNIT-I

Intel 8086/8088 Microprocessor Family

Architecture and organization of 8086/8088 microprocessor family, Instruction set, Assembly language programming, Introduction to mixed language programming using C and Assembly language, 8086 family minimum and maximum mode operation, Timing diagram for 8086 family, Detailed study of maximum mode connection: Study of 8288 bus controller, 8086 interrupt structure.

UNIT-II

8086 Instruction Set and Programming

Addressing modes, Instruction Set, ALP, Mixed language programming, Stacks, Strings, Procedures, Macros, Timers, Counters and delay, Programming examples using DOS and BIOS Interrupts, Device Drivers Programming.

UNIT-III

8086 Interrupt System

8086 Interrupt structure, Types and applications: Study of Interrupt Controller 8259A and Interrupt Priority Management using 8259A.

UNIT-IV

Memory System Design and I/O Interfacing

Interfacing SRAM, ROM and DRAM to 8086, Address decoding and Timing Considerations, I/O interfacing in 8086: Serial communication interface includes Synchronous and Asynchronous, Protocols, Parallel communication interface includes I/O Mapped I/O, Memory Mapped I/O, and Handshaking Signals, 8087 Math Co-processor: Study of architecture of 8087, Floating point co- processor, Data types supported by 8087, Host and co - processor interface, Assembly language Programming for 8086 - 8087 based systems.

UNIT-V

Intel MCS 51 Family

Introduction to Single chip microcontrollers of Intel MCS 51 family, Architectural and operational features, Instruction set, CPU timing and machine cycles, Interrupt structure and priorities, Internal Timer / counters, Serial interface, Connection of external memory, Power saving modes, Interfacing of 8051 with EPROM, Programming for EPROM versions, 8051 variation.

UNIT-VI

Introduction to the PIC18 Microcontroller

Overview of the PIC18 MCU, The PIC18 Memory Organization, The PIC18 CPU Register, The PIC18 Pipelining, PIC18 Instruction Format, Addressing Modes, A Sample of PIC18 Instruction, Overview of the 8-Bit MCU Market.

TEXT/REFERENCE BOOKS

Text Books:

1. Douglas Hall, "*Microprocessors and Interfacing: Programming and Hardware*", Tata McGraw-Hill, 2nd Edition.
2. Han-Way Huan, "*An Introduction to Software and Hardware Interfacing*".

Reference Books:

1. Peter Norton, "*IBM PC, Assembly Language programming*", BPB publication.
2. John Uffenback, "*8086/8088 Interfacing, Programming and Design*", Prentice Hall of India Publication.
3. A. K. Ray, K. M. Bhurchandi, "*Advanced Microprocessors and Peripherals*", Tata McGraw Hill, 2000.

Course Title:	Open Source Tools (Elective-III)	SEMESTER –IV
Course Code:	IT406	Credits: 03
Prerequisite:	Nil	

UNIT-I

Overview of Open-Source Software

Introduction, Need and advantages of open-source software, FOSS, Open-source licensing, Certification, Open-source software development model, How to run a successful free software project? Comparing open-source software with other software, Widely used open-source software licenses: apache license, BSD license, GNU general public license, GNU lesser general public license, MIT license, Eclipse public license, Mozilla Public license.

UNIT-II

Open Source Operating System

Introduction to Linux, Linux's root in unix, Comparing Linux with windows, Installation of Linux, Command line interface, Understanding FHS of Linux, Basic file system management tasks, Absolute path vs relative path in Linux, Working with files, What is command, Where is command, which command in Linux, Piping and redirection, Working with the vi editor, Basic vi commands, Use of sed.

UNIT-III

System Administrator Tasks

Process management: Ps, kill, kill all, Job Management, Mounting devices and the file system, Backup, Handling user accounts, Groups and permissions, Managing software, Understanding boot process and related files, Common kernel management tasks.

UNIT-IV

Network and Security Administration

Basic networking commands, Configuration of apache web servers, DNS servers , DHCP Servers , Mail Servers, Working principle of NFS, FTP servers, Securing servers with IPtables, Setting up cryptographic services.

UNIT-V

Shell Programming

Bash shell scripting, Executing Script, Working with variables and input, Using control structures, Handling signals, Creating functions, Working with sed and gawk commands, Working with web using shell script.

UNIT-VI

Open Source Tools Used in Lab

Version control using RCS and CVS, Content management with Drupal, Security assessment: OpenVAS, Working in Eclipse IDE.

Open Source Mobile Programming

Android programming, Setting up the android environment, Activities and intents, User interface, Designing UI using views, Data persistence, Content Providers, Messaging and networking, Location-based services, Publishing android applications.

TEXT/REFERENCE BOOKS

Text Books:

1. D. Ambawade, D. Shah, "*Linux Labs and Open source Technologies*", Dream tech Press Publication, 2014.
2. W. Lee, "*Beginning AndroidTM Application Development*", Wiley Publication, 2011.

Reference Book:

1. S.Vugt , "*Redhat Linux 6.0 Administration: Real World Skills for Red Hat Administrators*", Sybex Publication, 2013.

Course Title: Data Communications Lab
Course Code: IT401L

SEMESTER –IV
Credits: 01

List of Practical:

1. Implementation of sampling theorem.
2. Implementation of amplitude modulation, frequency modulation, phase modulation.
3. Implementation of frequency division multiplexing and demultiplexing.
4. Implementation of time division multiplexing and demultiplexing.
5. Implementation of Amplitude Shift Keying (ASK).
6. Implementation of Frequency Shift Keying (FSK).
7. Implementation of Phase Shift Keying (PSK).
8. Study of stop and wait protocol.
9. Study of ALOHA (Pure and Slotted) and CSMA.
10. Study of CSMA/CD.
11. Study of token passing access method.

Note: Practical 1 to 7 may be implemented with the help of kits.

Course Title: Data Structures and Algorithms Lab
Course Code: IT402L

SEMESTER –IV
Credits: 01

List of Practical:

1. Write a program to compute $\sin(x)$ using series for sine function.
2. Implement a hashing scheme for string data where on a hash collision, the empty slot is searched at each second subsequent location.
3. Implement a character stack data type and use it to reverse a string.
4. Implement an integer stack data type that grows on demand.
5. Write a program using appropriate stacks for evaluating an infix expression with parenthesis.
6. Implement a stack using a queue.
7. Write a program, using a queue data type, to simulate a bank where customers are served on a first-come-first-serve basis.
8. Write one program for each of the following operations with singly linked lists:
 - a. concatenate two linked list and create third one.
 - b. free all nodes in a linked list
 - c. reverse a linked list
 - d. given two linked list, create a third list which is set-intersection of the elements in the two.
 - e. delete every third element from the linked list.
 - f. copy a given linked list into another (new) list
9. Implement a queue using a doubly linked list.
10. Write the following recursive functions for a singly-linked NULL-terminated list: insert(), traverse(), search().

Course Title: Operating Systems Lab
Course Code: IT403L

SEMESTER –IV
Credits: 01

List of Practical:

1. Implementation of Unix commands.
2. Study of making disk bootable and installation of operating systems.
3. Implementation of FCFS CPU scheduling algorithm.
4. Implementation of SJF CPU scheduling algorithm.
5. Implementation of RR CPU scheduling algorithm.
6. Implementation of priority CPU scheduling algorithm.
7. Implementation of various synchronization problems using semaphores, Producer-Consumer problem, Dining Philosopher problem.
8. Implementation of Banker's algorithm.
9. Implementation of first-fit, best-fit and worst fit algorithms for memory allocation.
10. Implementation of page replacement algorithms (FIFO, LRU, Optimal).
11. Shell programming :
 - A. Write a program to handle student data base with options given below,
 - a. Create data base.
 - b. View data base.
 - c. Insert a record.
 - d. Delete a record.
 - e. Modify a record.
 - f. Result of a particular student.
 - g. Exit.
 - B. Menu driven program to:
 - a. Find factorial of a number.
 - b. Find greatest of three numbers.
 - c. Find a prime number.
 - d. Find whether a string is palindrome.
 - C. Write shell program using command-line argument to
 - i. Find biggest of three numbers
 - ii. Reverse a number
 - iii. Accept a number N and a word and print the word N times, one word per line.
 - iv. Add individual digits of a 4-digit number (1234 – > 1+2+3+4=10).

Course Title: Programming in Java Lab
Course Code: IT404L

SEMESTER –IV
Credits: 03

List of Practical:

1. a) Write a program that displays the x and y position of the cursor movement using Mouse.
b) Write a program to implement matrix addition, subtraction and multiplication by using Class matrix.
c) Write a program to concatenate strings find a substring in a string by using string Class.
2. a) Write a program for addition of complex variable by using class complex & use multiple constructors to initialize the objects with no argument, one argument & two arguments respectively.
b) Write a program to calculate interest by using interest function that uses the value of rate 11 as default.
3. a) Create an hierarchy of Employee, manager, Sales manager. They should have the following functionality Employee :- display the name, DOB and id of the employee Manager :- display all above information with salary drawn Sales Manager :- display all information and commission if applicable b) Write a program to create class account as parent class & from that create two subclasses savact (for saving account) & curract (for current account) & use their private member to perform different operations on them.(single inheritance)
4. Write a program to demonstrate Operator overloading of '-' operator for unary as well as binary operation. (Overload different arithmetic operators by considering your own examples. eg. Matrix addition, matrix subtraction, string concatenation etc).
5. Write a program to copy character from one file into another, use exception handling related to files. Implement a pair of classes, one Reader and one Writer that count the number of times a particular character is read or written. The character can be specified when the stream is created. Write a program to test your classes. You can use any text file as the input file.
6. Write a program for package implementation to import the classes 'student', 'teacher' and 'courses' .
7. Write a frame class to display "hello java" with the setting font-courier, foreground as red and background as blue. Write a program to display one text file and one button.
8. a) Write a program for Event delegation Model when mouse is clicked on button text field displays the Message "button clicked". Write a program to display one text field and two buttons (OK/CANCEL) such that when mouse is clicked on the OK button, text field displays the message 'OK clicked' and when mouse is clicked on CANCEL button, text field displays the message 'CANCEL clicked'.
b) Write a program for creating Notepad.
9. Write a program to copy character from one file to another. Also use exception handling related to files.
10. Write a program to display two strings moving in the opposite direction.

Note: Concerned faculty may design own set of practical based on syllabus.

Scheme w.e.f. from 2018-19 (Third Year)

Table 7: **Fifth Semester**

Sr. No	Course code	Title of the Course	Prerequisite	Teaching Structure			Credit Structure						Credit
				L	T	P	Mid Test	CA- I	CA-II	ESE	TW	PR	
1	IT501	Database Management Systems	Nil	03	01	-	20	10	10	60	-	-	04
2	IT502	Design and Analysis of Algorithms	IT402	03	-	-	20	10	10	60	-	-	03
3	IT503	Computer Networks	IT401	03	-	-	20	10	10	60	-	-	03
4	IT504	Theory of Computation	Nil	03	01	-	20	10	10	60	-	-	04
5	IT505	Elective IV • IPR and Cyber Laws • IT Project Management	Nil	03	-	-	20	10	10	60	-	-	03
6	IT506	Elective V • IT Business Methodology • E-Commerce Systems • OO Software and Web Engineering	Nil Nil IT305	03	-	-	20	10	10	60	-	-	03
7	IT501L	Data Base Management Systems Lab		-	-	02	-	30		-	10	10	01
8	IT502L	Design and Analysis of Algorithms Lab		-	-	02	-	30		-	10	10	01
9	IT503L	Computer Networks Lab		-	-	02	-	30		-	10	10	01
10	IT507	Seminar		-	-	02	-	-		-	-	-	02
11	IT508	Technical Projects for Community Services		-	-	02	-	-		-	-	-	02
TOTAL				18	02	10	120	210		360	30	30	27

Table 8: **Sixth Semester**

Sr. No	Course code	Title of the Course	Prerequisite	Teaching Structure			Credit Structure						Credit
				L	T	P	Mid Test	CA- I	CA-II	ESE	TW	PR	
1	IT601	Web Technologies	IT503	03	-	-	20	10	10	60	-	-	03
2	IT602	Software Engineering	Nil	03	-	-	20	10	10	60	-	-	03
3	IT603	Internetworking Protocol	IT503	03	-	-	20	10	10	60	-	-	03
4	IT604	Elective-VI • Real Time System • Embedded Systems • Network Programming	IT403 IT301, IT403 IT503	03	-	-	20	10	10	60	-	-	03
5	IT605	Elective VII • Human Computer Interaction • Soft Computing • Artificial Intelligence	Nil	03	-	-	20	10	10	60	-	-	03
6	IT606	Elective VIII • Computer Graphics • Multimedia Retrieval Systems • Digital Image Processing	Nil	03	-	-	20	10	10	60	-	-	03
7	IT601L	Web Technologies Lab		-	-	02	-	30		-	10	10	01
8	IT602L	Software Engineering Lab		-	-	02	-	30		-	10	10	01
9	IT603L	Internetworking Protocol Lab		-	-	02	-	30		-	10	10	01
10	IT603L	Industrial Training*		-	-	-	-	-	-	-	-	-	-
TOTAL				18	Nil	06	120	210		360	30	30	21

Abbreviations

CA	: Continue Assessment
ESE	: End Semester Examination
Mid Test	: Middle Semester Test
L	: Lecture Hours
P	: Practical Hours
PR	: Practical Marks
T	: Tutorial Hours
TW	: Term Work
*	: Assesment will be done in 7 th semester.

List of Core Courses:

1)IT501; 2)IT502; 3)IT503; 4)IT504; 5)IT601; 6)IT602; 7)IT603.

Course Title:	Database Management Systems	SEMESTER –V
Course Code:	IT501	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction: Basic concepts, Advantages of DBMS over file-processing systems, Data abstraction, Data models and data independence, Components of DBMS and overall structure of DBMS, Data modeling, Entity, Attributes, Relationships, Constraints, Keys E-R diagrams, Components of E-R Model.

UNIT-II

Relational Model: Basic concepts, Attributes and domains, Concept of integrity and referential constraints, Schema diagram. Relational query languages, Relational Algebra and Relational Calculus: Tuple relational and domain relational calculus.

UNIT-III

Structured Query Language-I: Introduction, Characteristics and advantages, Data types and literals, DDL, Tables: creating, modifying, deleting, Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT query and clauses.

UNIT-IV

Structured Query Language- II: Set operations, Predicates and joins, Set membership, Tuple variables, Set comparison, Ordering of tuples, Aggregate functions, Nested queries, Database modification using SQL Insert, Update and Delete queries, Dynamic and embedded SQL and concept of stored procedures, Query-by-example.

UNIT-V

Relational Database Design: Notion of normalized relations, Functional dependency, Decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued dependency and join dependency. Storage and File Systems: Secondary storage, RAID, File organization, Indices, Static and dynamic hashing, B-Trees and B+ Trees.

UNIT-VI

Query Processing and Transaction Management: Measures of query cost, Selection operation, Sorting and join operation, Transaction concept, Components of transaction management, Concurrency and recovery system, Different concurrency control protocols such as timestamps and locking, Validation, Multiple granularity, Deadlock handling, Different crash recovery methods such as log-based recovery, Shadow-paging, Buffer management and Remote backup system.

TEXT/REFERENCE BOOKS

Text Books:

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, “*Database system concepts*”, 6th edition, McGraw Hill Education, 2011.
2. Ramez Elmasri and Shamkant B. Navathe, “*Fundamental Database Systems*”, 7th edition, Pearson Education, 2015.
3. Raghu Ramkrishnan, Johannes Gehrke, “*Database Management Systems*”, 3rd edition, McGraw Hill Education, 2007.

Reference Books:

1. Carlos Coronel, Steven Morris “*Database systems: Design implementation and management*”, 11th edition, Cengage Learning Press, 2014.
2. J. Murach, “*Murach’s MySQL*”, 2nd edition, Shroff Publication, 2016.
3. J. Murach, “*Murach’s Oracle SQL and PL/SQL: Works with All Versions Through 11g*”, Shroff Publication, 2008.

Course Title:	Design and Analysis of Algorithms	SEMESTER –V
Course Code:	IT502	Credits: 03
Prerequisite:	IT402	

UNIT-I

Introduction: Instruction counts, Growth functions, Necessity of time and space analysis of algorithms, Order notations (O , Θ , Ω notations), Problem instance size, Frequently occurring recurrence relations in analysis of algorithms.

UNIT-II

Design Techniques-I: Divide and Conquer: Binary search, Finding maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication. Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge pattern, Single source shortest paths.

UNIT-III

Design Techniques-II: Dynamic Programming: Multistage graphs, All pairs shortest paths, 0/1 Knapsack, Travelling salesman problem.

UNIT-IV

Design Techniques: Backtracking: 8-Queens Problems, Sum of subsets, Graph coloring. Branch-and-bound: Least cost(LC) search, Control abstractions for LC search, FIFO branch and bound, LC branch and bound.

UNIT-V

Selected Algorithms From Various Areas: Graph Theory, Elementary Algorithms: DFS, BFS, Topological Sort, Minimum spanning trees (Kruskal and Prim's algorithms), Shortest Paths: Single source shortest paths, All pairs shortest paths, String Matching: The naïve string-matching algorithm, The Robin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

UNIT-VI

Complexity Theory: Lower-bound arguments, NP-completeness: Introduction to NP-Complete, Reducibility (SAT, Independent Set, 3VC, Subset Sum and Partition, Hamiltonian Circuit).

TEXT/REFERENCE BOOKS

Text Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, "*Introduction to Algorithms*", 3rd edition, MIT Press, 2009.
2. E. Horowitz, S. Sahni and S. Rajsekar, "*Computer Algorithms*", 2nd edition, Silicon Press, 2008.

Reference Books:

1. B. K. Joshi, "*Data Structures and Algorithms in C++*", Tata McGraw Hill Education, 2010.

2. G. T. Heineman, Gary Pollice, Stanley Selkow, “*Algorithms in a Nutshell*”, 1st edition, Shroff Publication, 2008.
3. Kyle Loudon, “*Mastering Algorithms with C*”, 1st edition, Shroff Publication, 2008.

Course Title: Computer Networks
Course Code: IT503
Prerequisite: IT401

SEMESTER –V
Credits: 03

UNIT-I

The physical Layer and Data Link Layer: The theoretical basis for data communication, Guided transmission media, Wireless transmission, Communication satellites, Digital modulation and multiplexing, The public switched telephone network, The mobile telephone system, Data link layer: Design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols.

UNIT-II

The Medium Access Control - I: The channel allocation problem, Multiple access protocols - ALOHA, Carrier Sense Multiple Access (CSMA) protocols, Collision free protocols, Limited contention protocols. Ethernet: Physical layer, MAC sublayer protocol, Performance, Switched, Fast, Gigabit Ethernet, Wireless LANs - 802.11 architecture and protocol stack, Physical layer, MAC sublayer protocol, Frame structure .

UNIT-III

The Medium Access Control – II: Broadband wireless: Comparison of 802.16 with 802.11 and 3G, Architecture and protocol stack, Physical layer, MAC sublayer protocol, Frame structure. Bluetooth: Architecture, Applications, Protocol stack, Radio layer, Link layer, Frame structure, RFID, Data link layer switching: Uses of bridges, Learning bridges, Spanning tree bridges, Repeaters, Hub, Switches, Routers, and Gateways.

UNIT-IV

The Network Layer: Network layer design issues, Store and forward packet switching, Service to the transport layer, Implementation of connectionless service, Connection-oriented service. Routing Algorithms: The optimality principle, Shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing. Congestion Control Algorithms: Approaches to congestion control, Traffic aware routing, Admission control, Integrated services, Differentiated services.

UNIT-V

The Transport Layer: The transport services: Service provided to the upper layers, Transport service primitives, Berkeley sockets, Elements of transport protocols: Addressing, Connection establishment, Connection release, Error control and flow control, Multiplexing. Congestion control: Desirable bandwidth allocation, Sending rate regulation.

UNIT-VI

The Application Layer: Domain Name System (DNS): Name space, Domain resource records, Name servers. Electronic mail: Architecture and services, The user agent, Message formats, Message transfer, Final delivery. World Wide Web: Architectural overview, Static web pages, Dynamic web pages and web applications, HTTP .

TEXT/REFERENCE BOOKS

Text Books:

1. A.Tanenbaum, "*Computer Networks*", Pearson Education, 5th edition, 2010.
2. B. Forouzan, "*Data Communications and Networking*", Tata McGraw Hill Publication, 5th edition, 2013.

Reference Books:

1. S. Keshav, "*An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network*", Addison-Wesley Publication, 1997.
2. D. E. Comer, "*Computer Networks and Internet*", Pearson Education, 5th edition, 2009.
3. M. Gallo, W. Hancock, "*Computer Communications and Networking Technologies*", 2001.

Course Title: Theory of Computation
Course Code: IT504
Prerequisite: Nil

SEMESTER –V
Credits: 04

UNIT-I

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, Definitions, Finite automaton model, Acceptance of strings and languages, Deterministic finite automaton and Non deterministic finite automaton, Transition diagrams, Language recognizers.

UNIT-II

Finite Automata: Transforming NFA to DFA, NFA with epsilon moves, Minimization of DFA, Finite state automata with output – Moore and Mealy machine.

UNIT-III

Regular Languages: Regular sets, Closure properties of regular sets, Regular expressions, Identity rules, Constructing finite automata for a given regular expressions, Conversion of finite automata to regular expressions, Pumping lemma of regular sets.

UNIT-IV

Grammar: Formal grammar, Types of grammar, Chomsky hierarchy, Regular grammar, Equivalence of regular grammars and finite automata, Left linear and right linear Grammar. Context Free Grammar: Derivation, Parse tree, Ambiguity in grammars and languages, language specification using CFG, Minimization of context free Grammars. Chomsky normal form, Greiback normal form, Pumping lemma for context free Languages. Closure properties of CFL.

UNIT-V

Pushdown Automata: Pushdown automata definition, Model, Equivalence of pushdown automata and CFG, Deterministic pushdown automata.

UNIT-VI

Context Free Languages : Pumping lemma for CFL, Closure properties of CFL, Turing Machines: Definition, Model, Design of turing machine, Computable functions, Properties of recursive and recursively enumerable languages, Programming techniques for turing machine. Undecidability: Decidability of problems, Universal turing machine, Undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXT/REFERENCE BOOKS

Text Book:

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, “*Introduction to Automata Theory, Languages and Computations*”, 3rd edition, Pearson Education, 2008.

Reference Books:

1. Michael Sipser, "*Introduction to the Theory of Computation*", 3rd edition, Cengage Learning, 2012.
2. John Martin, "*Introduction to Languages and the Theory of Computation*", 4th edition McGraw-Hill, 2011.

Course Title: IPR and Cyber Laws (Elective IV)	SEMESTER –V
Course Code: IT505	Credits: 03
Prerequisite: Nil	

UNIT-I

Concept of Cyberspace and Netizens, Objective and scope of the Information Technology Act, Comparisons between traditional criminal techniques and cyber crime, Public and private societies face challenges in addressing cybercrime, Computer hardware, Networks and Internet: Introduction.

UNIT-II

Nature and scope of computer crime, Understanding how cyber criminals and hackers work, Types of cyber crime: Financial crime, Cyber pornography, Forgery, Web defacement, Data diddling, Email frauds, Hacking, Tempering, Spamming, Phishing, Spoofing, Pharming, DoS attacks, Viruses, Trojan, Worm, Malware, Spyware, Botnet etc. Concept of digital signatures and cryptography, Digital signature certificate and public key infrastructure. Authorities under the IT Act., Impact of cyber crime on e-governance and e-commerce.

UNIT-III

Cyber crime and Computer-based Electronic and Digital Evidence: Indian law perspective, Procedure for search and Seizure, Best practices for cyber crime investigations involving the computer, Internet and Networks : E-mail, Websites, Chat rooms, File sharing, Network intrusion/Denial of services, Messages boards, Password breaking, Keyloggers, IP tracing, etc., Case studies.

UNIT-IV

Introduction to cyber forensic, Forensic examination of computer-based electronic and digital evidence, Evidence-assessment, Acquisition, Examination, Handling real world investigations: Email account hacking, Profile hacking of social networking site, Credit card fraud, Source code and confidential information theft, Piracy, Pornography, Virus attacks, etc. Detailed procedures for obtaining a bitstream backup of a hard drive, Evidence collection and analysis tools and case studies.

UNIT-V

IT Act.2000, Jurisdiction under the IT act-territorial and extra-territorial jurisdiction of the IT Act 2000, Intellectual property right issues in cyberspace, Concept of property in cyberspace. Copyright and related issues, Issues relating to trademarks and domain names. Liability for hyperlinking and metatags, Domain name dispute resolution policy, Role of ICANN.

UNIT-VI

Security Technologies: IDS, IPS, Firewall, Antivirus, Access control, Encryption etc., Ethical hacking.

TEXT/REFERENCE BOOKS

Text Books:

1. Albert J. Marcella, Jr. Doug Menendez, “*CYBER FORENSICS: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes*”, 2nd edition, Auerbach Publications, 2007.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, “*Guide to Computer Forensics and Investigations*”, 5th edition, Cengage Learning, 2014.
3. John R. Vacca, “*Computer Forensics: Computer Crime Scene Investigation*”, 5th edition, Charles River Media Publication, 2005.
4. Rodney Ryder, “*Guide to Cyber Laws*”, Wadhwa Publication, 2001.

Reference Books:

1. Mr. Vakul Sharma, “*Handbook of Cyber Laws*”, Macmillan India Publication, 2002.
2. Justice Yatindra Singh, “*Cyber Laws*”, 4th edition, Universal Law Publication, 2010.
3. Dr. Sundeep Oberoi, “*E-Security and you*”, Tata McGraw Hill Publication, 2001.

Legislative Text:

Information Technology Act-2000 IT Act.2000 url :

<http://eprocure.gov.in/cppp/sites/default/files/eproc/itact2000.pdf>

Course Title:	IT Project Management (Elective IV)	SEMESTER –V
Course Code:	IT505	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction to Software Project Management: Project definition, Contract management, Activities covered by software project management, Overview of project planning, Stepwise project planning.

UNIT-II

Project Evaluation: Strategic assessment, Technical assessment, Cost benefit analysis, Cash flow forecasting, Cost benefit evaluation techniques, Risk evaluation.

UNIT-III

Activity Planning: Objectives, Project schedule, Sequencing and scheduling activities, Network planning models, Forward pass, Backward pass, Activity float, Shortening project duration, Activity on arrow networks, Risk management, Nature of risk, Types of risk, Managing risk, Hazard identification, Hazard analysis, Risk planning and control.

UNIT-IV

Monitoring and Control: Creating framework, Collecting the data, Visualizing progress, Cost monitoring, Earned value, Prioritizing monitoring, Getting project back to target, Change control, Managing contracts, Types of contract, Stages in contract placement, Typical terms of a contract, Contract management, Acceptance.

UNIT-V

Managing People: Introduction, Understanding behavior, Organizational behavior: A background, Selecting the right person for the job, Instruction in the best methods, Motivation, The Oldman – Hackman job characteristics model.

UNIT-VI

Organizing Teams: Working in groups, Becoming a team, Decision making, Leadership, Organizational structures, Stress, Health and safety, Case studies.

TEXT/REFERENCE BOOKS

Text Book:

1. Bob Hughes, Mikecatterell, “*Software Project Management*”, 4th edition, Tata McGraw Hill, 2006.

Reference Books:

1. Ramesh, Gopalaswamy, “*Managing Global Software Projects*”, Tata McGraw Hill, 2005.
2. Royce, “*Software Project Management*”, Pearson Education, 1999.
3. Jalote, “*Software Project Management in Practice*”, Addison-Wesley Professional, 2002.

Course Title:	IT Business Methodology (Elective V)	SEMESTER –V
Course Code:	IT506	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction to ERP: Overview, Accommodating variety, Integrated management information, Integration, Supply chain and resource management, Integrated data model scope, Technology and benefits of ERP and the modern enterprise.

UNIT-II

Business Modeling for ERP: Overview, Concept, Significance and principles of business engineering, BRP, ERP and IT business engineering, ERP and management concerns, Building an MIS, Business as a system, Core process in a manufacturing company, Entities for data model in a manufacturing company, Extended ERP.

UNIT-III

ERP Implementation: Overview, Role of consultants, Vendors and users, Customization, Precautions, Post implementation, Option, ERP implementation methodology and guidelines for ERP implementation, Mercedes Bens, Keehind Industries, Bull Electronics, Angers Plant Manufactures, Twentieth century companies, Ameritech, Essar Steel, Jindal Iron and Steel Company Ltd., Godrej Soaps and associate companies, IREDA.

UNIT-IV

Getting Started on Basic SAP R/3 Elements: The client or SAP customer, The clients representative, The SAP consultant, The SAP R/3 business application software architecture, Financial accounting and controlling (FI/CO) modules, The sales and distribution (SD) module, The materials management (MM) module, The plant maintenance (PM) and service management, The production planning (PP) module, The project system (PS) module, The human resources (HR) module, The SAP retail model, Industry solutions (IS) modules, The ASAP road map.

UNIT-V

Electronic Commerce Environment and Opportunities, Modes of Electronic Commerce: Background, The electronic commerce environment, Electronic marketplace technologies, Overview of electronic commerce, Electronic data interchange, Migration of open EDI, Electronic commerce with WWW/internet, Commerce net advocacy, Web commerce going forward.

UNIT-VI

Approaches to Safe Electronic Commerce, Electronic Cash and Electronic Payment: Overview, Secure transport protocols, Secure transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication, Security on web servers and enterprise networks, Internet monetary payment and security requirements, Payment and purchase order process, Online electronic cash.

TEXT/REFERENCE BOOKS

Text Books:

1. Vinod Kumar Garg, N. K. Venkat Krishna, “*Enterprise Resource Planning-Concept and Practice*”, 2nd edition PHI Learning Publication, 2003.
2. Alexis Leon, “*Enterprise Resource Planning Demystified*”, 3rd edition, Tata McGraw Hill Publication, 2014.
3. Daniel Minoli, Emma Minoli, “*Web Commerce Technology Handbook*”, McGraw Hill Publication, 1999.

Reference Books:

1. Sadagopan S., “*ERP-A Managerial Perspective*”, Tata McGraw-Hill, 2001.
2. Jose Antonio Hernandez, “*The SAP R/3 Handbook*”, 3rd edition, Tata McGraw-Hill, 2006.
3. Vinod Kumar Garg and Bharat Vakharia, “*Enterprise Resource Planning Strategy*”, Jaico Publishing House, Mumbai.
4. Garg and Venkitakrishnan, “*ERPWARE: ERP Implementation Framework*”, Prentice Hall Publication, 2004.
5. Brady, E. F. Monk, B. J. Wagner, “*Concepts in Enterprise Resource Planning*”, Course Technology, 2001.

Course Title:	E- Commerce Systems (Elective V)	SEMESTER –V
Course Code:	IT506	Credits: 03
Prerequisite:	Nil	

UNIT-I

E-Commerce: Meaning, Advantages and disadvantages, Electronic commerce framework, Electronic commerce and media convergence, Types of E-Commerce: B2C, B2B, C2C, P2P, M Commerce, Architectural framework for electronic commerce, World Wide Web as the architecture, Web background: Hypertext publishing, Security and the web.

UNIT-II

Legal Issues of E-commerce: Risks, Paper document verses electronic document, Technology for authenticating an electronic document. Laws for E-commerce: EDI interchange agreement, E-commerce in India, Laws for e-commerce in India.

UNIT-III

Ethical and Other Public Policy Issues Related to Electronic Commerce: Protecting privacy, Protecting intellectual property, Copyright, Trademarks and patents, Taxation and encryption policies.

UNIT-IV

E-Commerce Business Models: Key element of a business model, Major B2C business models portal, E-tailor, Content provider, Transaction broker, Market creation, Service provider, Community provider, Major B2B business models, Market place, E-distributor, B2B service provider, Match-Maker, Informatory, Business models in emerging e-commerce areas- C2C business models, P2P business models commerce business models.

UNIT-V

Types of electronic payment systems, Digital token based electronic payment systems, Digital wallet, Digital cash, Smart cards electronic payment systems, Credit card based electronic payment systems, Risk in electronic payment systems, Secure electronic transaction protocol.

UNIT-VI

Electronic Data Interchange, EDI Applications in Business: Legal, Security and privacy issue, EDI and electronic commerce. Applications of electronic ecommerce, Application of e commerce in direct marketing and selling, Value chain integration, Supply chain management, Corporate purchasing, Financial and information services, Obstacles in adopting e-commerce applications, Future of e commerce.

TEXT/REFERENCE BOOKS

Text Books:

1. Kenneth C Laudon, Carol G. Traver, “*E-Commerce*”, 11th edition, Pearson Education, 2015.
2. S. Jaiswal, “*Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business)*”, Galgotia Publications, 2003.

Reference Books:

1. Efraim Turban, Jae Lee, David King, “*Electronic Commerce: A managerial perspective*”, 5th edition, Prentice-Hall International, 2008.
2. Kamlesh K. Bajaj, Debjani Nag, “*Electronic Commerce: The cutting edge of business*”, 2nd edition, Tata McGraw-Hill Publication, 2005.
3. Jeffrey F. Rayport, Bernard J. Jaworski, “*e-Commerce*”, Tata McGraw Hill, 2002.
4. David Whiteley, “*e-Commerce*”, Tata McGraw Hill, 2002.
5. Pete Loshin, Paul A. Murphy, “*Electronic Commerce*”, 4th edition, Firewall Media, 2006.
6. Ravi Kalakota, Andrew B. Whinston, “*Frontiers of Electronic Commerce*”, DIANE Publication, 1999.
7. Parag Kulkarni, Sunita Jahirabadkar and Pradip Chande, “*E-Business*”, 1st edition, OUP India, 2013.

Course Title:	OO Software and Web Engineering (Elective V)	SEMESTER –V
Course Code:	IT506	Credits: 03
Prerequisite:	IT305	

UNIT-I

Object Oriented Software Engineering: Concepts such as object, Class, Inheritance, Polymorphism, Encapsulation, Overloading, Overriding, OO process model. Object oriented analysis, Use case diagram, Class diagram, Dynamic model, State transition and interaction diagram, Sequence and collaboration diagram, Activity diagram.

UNIT-II

Object Oriented Design: Data structure design, Component diagram, Deployment diagram.

UNIT-III

An Introduction to Web Engineering: Characteristics of web application, Requirements engineering for web application, RE specifics in web engineering, Principles for RE of web application, Adapting RE methods to web application development.

UNIT-IV

Modeling Web Application: Modeling specifics in web engineering, Modeling requirements, Content modeling, Hypertext modeling, Presentation modeling, Customization modeling.

UNIT-V

Technology-aware Web Engineering: Web design from an evolutionary perspective, Web app design, Presentation design, Interaction design, Information design, Functional design.

UNIT-VI

Conceptual Modeling of Web Application: UML approach, The OOWS approach, The OOHDH approach, W2000: A modeling notation for complex web application.

TEXT/REFERENCE BOOKS

Text Books:

1. Gerti Kappel, Brigit Proll, “*Web Engineering*”, Wiley-India, 2009.
2. Roger S Pressman, David Love, “*Web Engineering*”, Tata McGraw-Hill, 2008.

Reference Books:

1. E. Mendes, N. Mosely, “*Web Engineering*”, Springer Science and Business Media, 2010.
2. Roger S. Pressman, “*Software Engineering*”, 6th edition, Tata McGraw-Hill, 2006.
3. Stephen R. Scatch, “*Object-Oriented and Classical Software Engineering*”, 7th edition, Tata McGraw-Hill, 2007.

Course Title: Database Management System Lab
Course Code: IT501L

SEMESTER –V
Credit: 01

List of Practical:

1. Creation of databases and use of SQL commands (DDL, DML and DCL).
2. Suitable exercises to practice SQL commands may be given for Insert, Update, Delete etc.
3. Write SQL procedure for an application which uses exception handling.
4. Write SQL procedure for an application with cursors.
5. Write SQL for implementing Nested Queries.
6. Write SQL for implementing Join Queries.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write SQL block containing triggers.
9. Write SQL block containing stored procedures.
10. Develop a menu driven, GUI-based database application in any one of the domains such as Banking, Billing, Library management, Payroll, Insurance, Inventory, Healthcare etc. integrating all the features specified in the above exercises.

Course Title: Design and Analysis of Algorithms Lab
Course Code: IT502L

SEMESTER –V
Credit: 01

List of Practical:

Description:

Design, develop, and implement the specified algorithms for the following problems under LINUX/ Windows environment.

1. A. Create a class called Student with the following details as variables within it
 - i. USN
 - ii. Name
 - iii. Branch
 - iv. PhoneWrite a program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.
- B. Write a program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2. A. Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a program to read and display at least 3 staff objects of all three categories.
- B. Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as *< name, dd/mm/yyyy >* and display as *< name, dd, mm, yyyy >* using StringTokenizer class considering the delimiter character as “/”.
3. A. Write a program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
- B. Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.
4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n, 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
5. Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra’s algorithm. Write the program.
7. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal’s algorithm. Use Union-Find algorithms in your program.
8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim’s algorithm.
9. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd’s algorithm (b) Implement Travelling Sales Person problem using Dynamic programming.

10. Design and implement a program to find a subset of a given set $S = S_1, S_2, \dots, S_n$ of n positive integers whose SUM is equal to a given positive integer d . For example, if $S = 1, 2, 5, 6, 8$ and $d = 9$, there are two solutions $1, 2, 6$ and $1, 8$. Display a suitable message, if the given problem instance doesn't have a solution.
11. Design and implement a program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Course Title: Computer Networks Lab
Course Code: IT503L

SEMESTER –V
Credit: 01

List of Practical:

1. Implementation of Data Link Layer Protocols: Stop and wait protocol, Sliding window protocol.
2. Implementation of Network layer functions e.g. Routing, flow control.
3. Windows socket programming.
4. Network management: IP tables.
5. Case study: existing networks.
6. Study of network components and resources.
7. Study of network tool “NetSim- Network Simulator”:
 - Network Basic
 - OSI Reference Model
 - RS-232
 - LAN & WAN Protocols
8. Programming on following concepts:
 - Transmission Flow Control
 - Spanning Tree
 - PC to PC communication
 - Leaky Bucket Algorithm
 - Error Correcting Code –Hamming Code
 - Error Detecting Code –CRC
 - Distance Vector Routing

Course Title: Seminar
Course Code: IT507

SEMESTER –V
Credits: 02

Seminar topic is included to enable the students to apply their knowledge to understand advanced technologies, designs etc. Literature survey may help to select such topics which are invaluable to an engineer in an Information Technology industry. It will encourage students to develop their presentation skills, good communication skills and skills of collecting the correct information regarding the technical topic.

The students will be able to deliver seminar with useful information. He/she should understand the technologies, designs and skills of writing technical report, to do literature survey and to attempt the queries from examiner.

Report and Assessment:

The concerned guide will assess the term work as a continuous activity done by students to complete seminar. The students will have to deliver seminar for 20-25 minutes, during examination and explain the topic in presence of all students and department faculties. Questions and answers session will be of five minutes to each student. Examiner, concerned guide and senior faculty of the department will assess the performance during examination. Report writing should be as per given format.

Course Title: Technical Projects for Community Services
Course Code: IT508

SEMESTER –V
Credits: 02

Every group of students working for their project work will have to complete a community project assigned to them by their guide. The guide will assess the work completed by each student within the group and group as a whole, award the appropriate grade to every student.

The topic could be a product design, specific equipment, live problem, simulation, presentation, etc. related to community services. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey.

The group should submit a completion and implementation certificate from the organization/social group for which the community project is implemented. This project is to develop the programming skills of the students after learning C and C++ programming in first and second year.

Course Title: Web Technologies
Course Code: IT601
Prerequisite: IT503

SEMESTER –VI
Credits: 03

UNIT-I

Introduction: Web Essentials: Clients, Servers, Communication, Basic internet protocols, HTTP request message, HTTP response message, Web clients, Generations of web applications.

UNIT-II

Markup Languages: An introduction to HTML, Fundamental HTML elements head, Body etc., Basic XHTML syntax and semantics, Document publishing style sheets, Introduction to cascading style sheets, CSS features, CSS syntax, Style properties of text, box, layout, list, table, cursor etc., User defined classes, Inheritance.

UNIT-III

Client-Side Programming: Introduction to JavaScript, Basic syntax, Variables and data types, Statements, Operators, Literals, Functions, JavaScript Objects – properties, references, methods, constructors, arrays, other built-in objects, Debugging JavaScript, Host objects Document Object Model (DOM), Document tree, DOM event handling, Browsers.

UNIT-IV

Server-Side Programming: Java servlet-architecture, life cycle. The client request – form data, request headers, The server response - HTTP status codes, HTTP response headers, Sessions, Cookies, URL rewriting, Concurrency in servlets separating programming and presentation Java server pages, Basic JSP, JavaBeans classes and JSP, JSF, Java Database Connectivity (JDBC).

UNIT-V

Representing Web Data: XML – Namespaces, AJAX-overview, Basics, Toolkits, Security, DOM based XML processing, XSL, X Path, XSLT.

UNIT-VI

Web Services: Web service concepts, Creating, Publishing, Testing and describing a web service, WSDL, Representing Data Types: XML dshema, Communicating Object Data: SOAP, REST.

TEXT/REFERENCE BOOKS

Text Books:

1. Jeffrey C. Jackson, “*Web Technologies: A Computer Science Perspective*”, 2nd edition, Pearson Education, 2011.
2. H.M. Deitel, P.J. Deitel and A.B. Goldberg, “*Internet and World Wide Web How To Program*”, 5th edition, Pearson Education, 2012.

Reference Books:

1. Marty Hall, Larry Brown, “*Core Web Programming*”, 2nd edition, Pearson Education, 2009.
2. Robert. W. Sebesta, “*Programming the World Wide Web*”, 8th edition, Pearson Education, 2014.

Course Title:	Software Engineering	SEMESTER –VI
Course Code:	IT602	Credits: 03
Prerequisite:	Nil	

UNIT-I

Software Development Process: Software crisis and myths, Software process and development: Generic view of process, Software life cycle and models, Analysis and comparison of various models, An agile view of process.

UNIT-II

Requirement Engineering: Requirements engineering tasks, Initiating requirement engineering process, Eliciting requirement, Developing use-cases, Building the analysis model, Negotiating and validating requirement, Building the analysis model.

UNIT-III

System Design Overview: Design process and design quality, Design concepts, Design model, Pattern based software design, Architectural design, User interface design. UML: Different methods: Rumbaugh / Booch / Jacobsons, Need for standardization. Diagramming in UML (Use CASE, Class, Interaction, State diagrams) CASE TOOLS.

UNIT-IV

Validation and Testing: Strategic approach to Software testing, Strategic issues, Test strategies for conventional software, Validation testing, System testing, Debugging. White box testing and Black box testing.

UNIT-V

Web Engineering: WebApp engineering layers, Web engineering processes planning for web engineering projects, Project management issue for web engineering. Metrics, Requirement analysis, Analysis models for web engineering design for webApps, Testing for webApps.

UNIT-VI

Planning and Management of Project: Project management, Metrics for process and projects, Estimation, Project scheduling, Risk management, Importance of software quality and measurements software engineering techniques for quality assurance, Change management. ISO 9000 and CMM/PCMM.

TEXT/REFERENCE BOOKS

Text Books:

1. Roger S. Pressman, “*Software Engineering*”, 6th edition, Tata McGraw-Hill, 2006.
2. G. Booch, J. Rumbaugh, and I. Jacobson, “*The Unified Modeling Language User Guide*”, 2nd edition, Addison Wesley, 2005.

Reference Books:

1. Shari Pfleeger, “*Software Engineering*”, 3rd edition, Pearson Education, 2008.

2. Ian Sommerville, “*Software Engineering*”, 10th edition, Pearsons Higher Education, 2016.
3. Pankaj Jalote, “*An Integrated Approach to Software Engineering*”, 2nd edition, Springer Newyork, 2013.

Course Title:	Internetworking Protocols	SEMESTER –VI
Course Code:	IT603	Credits: 03
Prerequisite:	IT503	

UNIT-I

The ISO Model and the TCP/IP Protocol Suit: Protocol layers, The OSI model, TCP/IP protocol suite, Addressing.

UNIT-II

Underlying Technology: Wired local area networks, Wireless lans, Point-to-point wans, Switched wans, Connecting devices, Switching, Packet switching at network layer, Network layer services, Other network layer issues.

UNIT-III

IPv4 Addresses and Delivery and Forwarding of IP Packets and Internet Protocol: Introduction, Classful addressing, Classless addressing, Special addresses, NAT, Delivery, Forwarding, Structure of a router, Datagrams, Fragmentation, Options, Checksum, IP over ATM, Security, IP package.

UNIT-IV

Address Resolution Protocol and Internet Control Message Protocol: Address mapping, The ARP protocol, ATMARF, ARP package, Introduction, Message, Debugging tools, ICMP package.

UNIT-V

Mobile IP and Unicast Routing Protocols and Introduction to Multicasting and Multicast Routing: Addressing, Agents, Three phases, Inefficiency in mobile IP, Introduction, Intra and inter domain routing, RIP, Link state routing, COPF, Path vector routing, BGP, Introduction, Multicast addresses, IGMP, Multicast routing, Routing protocols, Mbone.

UNIT-VI

Transport Layer and User Datagram Protocol, Transmission Control Protocol: Introduction, User datagram, UDP services, UDP applications, UDP package, TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control, Error control, Congestion control, TCP timers, Options, TCP package

TEXT/REFERENCE BOOKS

Text Books:

1. Douglas E. Comer, “*Internetworking with TCP/IP: Principles, Protocols and Architecture*”, Volume 1, 6th edition, Pearson Education, 2013.
2. Behrouz A. Forouzan, “*TCP-IP Protocol Suite*”, 4th edition, Mc-Graw Hill Publication, 2010.

Reference Books:

1. Comer, *“Internetworking with TCP-IP Vol. 3”*, 2nd edition, Prentice Hall Publication, 2013.
2. William Stalling, *“SNMP SNMPv2, SNMPv3, and RMON 1 and 2”*, 3rd edition, Addison Wesley Publication, 2013.
3. Loshin, Harwurt, *“TCP-IP Cleanly Explained”*, 4th edition, Morgan Kauffman Publication, 2003.
4. B. B. Meshram, K. Nalwade, *“TCP/IP and Network Security”*, Shroff Publication.

Course Title:	Real Time Systems (Elective- VI)	SEMESTER –VI
Course Code:	IT604	Credits: 03
Prerequisite:	IT403	

UNIT-I

Typical Real Time Applications: Digital control, High level control, Signal processing, Applications and introduction of different approaches of real time system scheduling. Hard and soft real Time System: Jobs and processors, Release times, Deadlines, and timing constraints, Hard and soft Constraints, Hard and soft real time systems.

UNIT-II

A Reference Model of Real Time System: Processors and resources, Temporal parameter of real time workload, Periodic task model, Precedence constraints and data dependency, Other type of dependency, Functional parameters, Resource parameter of job and parameter of resources.

UNIT-III

Clock-Driven Scheduling: Notations and assumptions, Static, Timer driven scheduler, General structure of cyclic scheduler, Cyclic executives, Improving the average response time of Aperiodic jobs, Practical consideration and generalization, Algorithm for constructing static schedules.

Priority-Driven Scheduling of Periodic Tasks: Static assumption, Fixed priority versus Dynamic –priority algorithms, Maximum schedule utilization, Optimality of the RM and DM algorithms, Sufficient scheduling conditions for the RM and DM algorithms.

UNIT-IV

Scheduling Periodic and Sporadic Jobs in Priority Driven Systems: Assumptions and approaches, Deferrable servers, Sporadic servers, Constant utilization, Total bandwidth, Weighted fair-queuing servers, Slack stealing in deadline-driven systems, Slack stealing in fixed priority systems, Scheduling of sporadic jobs, Real-time performance for jobs with soft timing constraints.

UNIT-V

Resources and Resource Access Control: Assumptions on resources and their usage, Effect of resource contention and resource access control, Non pre-emptive critical sections, Basic priority-inheritance protocol, Basic priority-ceiling protocol, Stack based priority-ceiling protocol, Controlling accesses to multiple-unit resources, Controlling concurrent accesses to data objects.

Multiprocessor Scheduling and Resource Synchronization: Model of multiprocessor and distributed system, Task assignment, Multiprocessor priority ceiling protocol, Elements of scheduling algorithms for end to end periodic tasks, Schedulability of fixed-priority end to end periodic tasks, End-to-end tasks in heterogeneous systems.

UNIT-VI

Real-Time Communication: Model of real time communication, Priority based service disciplines for switched networks, Weighted Round-Robin service disciplines, Medium access-control protocols of broadcast network, Internet and resource reservation protocols, Real-time

Protocol. Real Time Operating System based Embedded System Design: Threads, Processes and scheduling, Task communication, Task synchronization, Device drivers, How to choose an RTOS.

TEXT/REFERENCE BOOKS

Text Books:

1. Jane W.S., Liu, “*Real time Systems*”, Prentice Hall, 2011.
2. Shibu K V, “*Introduction to Embedded systems*”, Tata McGraw Hill 2011.

Reference Books:

1. Albert M.K Cheng, “*Real time Systems*”, WSE Wiley, 2010.
2. Rajib Mall, “*Real-Time Systems: Theory and Practice*”, Pearson, 2009.

Course Title:	Embedded Systems (Elective- VI)	SEMESTER –VI
Course Code:	IT604	Credits: 03
Prerequisite:	IT301, IT403	

UNIT-I

Introduction: Introduction to embedded systems-hardware and software components, Types, Examples, Characteristics, Challenges in embedded computing system design, Embedded system design processes, Introduction to IC technology.

UNIT-II

Analysis and Design of Embedded System: Software engineering practices in the embedded systems, Software develop process, Interprocess communication and synchronization of process, Task and threads, Programme language, Program concept and embedded programming in C, Software components-Interpreter, Compiler, Assembler, Cross assembler.

UNIT-III

OS for Embedded Systems: Introduction to real time theory, Operating system services, Real time operating system concepts, Basic design using a RTOS, Introduction to RTOS programming tools Micro C/OSII and VxWorks.

UNIT-IV

Hardware for Embedded Systems: Hardware components, SOC, Processors, CPU, Types of memory, Memory management, I/O devices and interfacing, Parallel I/O interface, Blind counting synchronization and busy waiting, Parallel port interfacing with switches, Keypads and display unit, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above using C language.

UNIT-V

Performance Issues of an Embedded System: CPU performance, CPU power consumption, Analysis and optimization of CPU power consumption program execution time, Analysis and optimization of energy and power, Analysis of program size, Hardware accelerators.

UNIT-VI

Design Examples and Case Studies: Personal Digital Assistants, Set Top Boxes, Ink Jet Printers, Digital thermometer, Case Studies of digital camera, Smart card, Case study of coding for sending application layer byte stream on TCP/IP network using RTOS VxWorks.

TEXT/REFERENCE BOOKS

Text Books:

1. Raj Kamal, “*Embedded Systems Architecture, and Programming*”, 3rd edition, TMH Publication, 2015.
2. Iyer, Gupta, “*Embedded Real Time Systems Programming*”, TMH Publication, 2003.

Reference Books:

1. Wayne Wolf, “*Computer as Components – Principles of Embedded Computing System Design*”, 2nd edition, Gulf Professional Publishing, 2008.
2. David E Simon, “*An Embedded Software Primer*”, Addison Wesley Publication, 2004.
3. Raj Kamal, “*Embedded Systems – Architecture, Programming and Design*”, 2nd edition, Tata McGraw Hill Publication, 2003.

Course Title:	Network Programming (Elective- VI)	SEMESTER –VI
Course Code:	IT604	Credits: 03
Prerequisite:	IT503	

UNIT-I

Introduction to Java Programming: Basic network and Web concepts: The Internet standards, Client/Server model, URL, HTML, SGML, XML, HTTP, Server side programming, Streams: Input stream, Output stream and filter stream, Threads: Returning information from thread, Synchronization, Deadlock, Scheduling, Thread pool.

UNIT-II

Looking up Internet Addresses: The Inet4 address and Inet6 address, Network interface class, URL and URLs: The URL class, URL decoder.

UNIT-III

Socket Programming: Socket for client, Socket for server, Secure socket.

UNIT-IV

UDP Datagrams and Socket.

UNIT-V

Multicast Sockets.

UNIT-VI

URL Connections, Protocol handlers, Content handlers RMI and java Mail API.

TEXT/REFERENCE BOOKS

Text Books:

1. Elliotte Harold, “*Java Network Programming*”, O’relly Publications, 2013.
2. Comer, “*Internetworking with TCP-IP Vol. 3*”, 2nd edition, Prentice Hall Publication, 2013.

Reference Book:

1. Richard Stevens, “*Unix Network Programming volume- I and II*”, Addison Wesley Publication, 2004.

Course Title:	Human Computer Interaction (Elective- VII)	SEMESTER –VI
Course Code:	IT605	Credits: 03
Prerequisite:	Nil	

UNIT-I

Overview of HCI, Theories and Principles: Introduction, Goals of system engineering, Goals of user-interface design, Usability of interactive systems, Motivations for human factors in design, Guidelines, Principles, Theories, Conceptual, Semantic, Syntactic and lexical model, GOMS and the keystroke-level model, Object action interface model.

UNIT-II

Managing Design Processes and Tools and Testing: Three pillars of design, Development methodologies, Ethnographic observation, Participatory design, Scenario development, Expert reviews, Usability testing and laboratories, Acceptance tests, Evaluation during active use, Specification methods, Interface building and Evaluation tools.

UNIT-III

Design Principles for Designing GUI Objects: Direct manipulation (examples, explanations), Visual thinking and icons, 3D interfaces, Virtual reality, Fitt's law, Introduction to menu selection, Form fill-in, Dialog boxes, Task related organizations, Fast movement through menus, Item presentation sequence, Response time and display rate, Data entry with menus, Menu layout, Command-organizational strategies, Naming and abbreviations, Command menus, Web user interface, Natural language in computing.

UNIT-IV

Interaction Styles: Introduction to interaction devices, Keyboards and function keys, Pointing devices, Speech and auditory interfaces, Speech recognition, Image and video displays, Printers, Response time and display rate with respect to display, Goals of collaboration, Asynchronous and synchronous interfaces, Face-to-Face interfaces, Ubiquitous computing.

UNIT-V

Presentation Design Issues: Error messages, Display design, Individual-window design, Multiple window design, Co-ordination by tightly-coupled windows, Color, Printed versus online manuals, Preparation of online facilities, Online tutorials, Online communities for user assistance, Design case studies.

UNIT-VI

Information Search and Visualization: Introduction, Search in textual documents and database querying, Multimedia document searches, Advanced filtering and search interfaces, Information visualization, OAI model for website design.

TEXT BOOKS

Text Books:

1. Ben Shneiderman, "*Designing the User Interface*", 5th edition, Pearson Education, 2013.
2. Alan Dix, Janet Finlay, Gregory Abowd, and Russell Beale, "*Human-Computer Interaction*", Prentice Hall, 2008.

Course Title:	Soft Computing (Elective- VII)	SEMESTER –VI
Course Code:	IT605	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction: Artificial neural network, Advantages of neural network, Fuzzy logic, Genetic algorithms, Hybrid systems: Neuro fuzzy hybrid system, Neuro genetic hybrid system, Fuzzy genetic hybrid system

UNIT-II

Artificial Neural Networks: Fundamental concept, Evolution of neural networks, Basic models of artificial neural network, Terminologies of ANNs, McCulloch-Pitts neuron, Linear separability, Hebb network.

UNIT-III

Supervised Learning Network :Perceptron networks, Adaptive linear neuron (Adaline), Multiple adaptive linear neuron, Back propagation network, Radial basis function network.

UNIT-IV

Introduction to Fuzzy Sets: Introduction, Classical sets, Fuzzy sets, Fuzzy relations, Membership function, Defuzzification, Fuzzy arithmetic and fuzzy measures, Fuzzy rule base and approximate reasoning, Fuzzy decision making, Fuzzy logic control system.

UNIT-V

Genetic Algorithms: Introduction, Basic operators and terminologies in GAs, Traditional algorithm vs. Genetic algorithms, Simple GA, General genetic algorithm, The schema theorem, Classification of genetic algorithm, Holland classifier system, Genetic programming, Applications of GA.

UNIT-VI

Applications of Soft Computing: GA based internet search technique, Soft computing based hybrid fuzzy controllers.

TEXT/REFERENCE BOOKS

Text Books:

1. S.N.Sivanandam, S.N.Deepa, “*Principles of Soft Computing*”, 2nd edition, Wiley Publication, 2011.
2. K Mehrotra, C.K. Mohan, and S. Ranka, “*Elements of Artificial Neural Networks*”, 2nd edition, MIT Press, 2000.

Reference Books:

1. Fakhreddine O. Karray, Clarence W. De Silva, “*Soft Computing and Intelligent Systems Design –theory, tools and applications*”, Pearson/Addison Wesley, 2004.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, “*Neuro-Fuzzy and Soft Computing –A computational approach to learning and machine intelligence*”, Prentice-Hall Of India Pvt. Limited, 2008.

Course Title:	Artificial Intelligence (Elective- VII)	SEMESTER –VI
Course Code:	IT605	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction: Definition AI, History, AI problems, Production systems, Problem characteristics, Intelligent agents, Agent architecture, AI application (E-Commerce, and Medicine), AI representation, Properties of internal representation, Future scope of AI, Issues in design of search algorithms.

UNIT-II

Heuristic Search Techniques: Heuristic search, Hill climbing, Best first search, mean and end analysis, Constraint satisfaction, A* and AO* algorithm, Knowledge Representation: Basic concepts, Knowledge representation paradigms, Propositional logic, Inference rules in propositional logic, Knowledge representation using predicate logic, Predicate calculus, Predicate and arguments, ISA hierarchy, Frame notation, Resolution, Natural deduction.

UNIT-III

Logic Programming: Introduction, Logic, Logic programming, Forward and backward reasoning, forward and backward chaining rules. Knowledge representation using non monotonic logic: TMS (Truth maintenance system), statistical and probabilistic reasoning, fuzzy logic, structure knowledge representation, semantic net, Frames, Script, Conceptual dependency.

UNIT-IV

Learning: Definition, Types of learning (Rote, Direct instruction analogy, Induction, Deduction) Planning: Block world, strips, Implementation using goal stack, Non linear planning with goal stacks, Hierarchical planning, Least commitment strategy.

UNIT-V

Advance AI Topics: Game playing: Min-max search procedure, Alpha beta cutoffs, Waiting for Quiescence, Secondary search, Natural Language Processing: Introduction, Steps in NLP, Syntactic Processing, ATN, RTN, Semantic analysis, Discourse and pragmatic processing. Perception and Action: Perception, Action, Robot architecture.

UNIT-VI

Neural Networks and Expert system: Introduction to neural networks and perception-qualitative analysis, Neural net architecture and applications, Utilization and functionality, Architecture of expert system, Knowledge representation, Two case studies on expert systems.

TEXT/REFERENCE BOOKS

Text Books:

1. Elaine Rich and Kerin Knight, “*Artificial Intelligence*”, 3rd edition, Tata McGraw Hill Education, 2004.
2. Eugene, Charniak, Drew McDermott: “*Introduction to artificial intelligence*”, Pearson Education India.

3. Kishen Mehrotra, Sanjay Ranka, C. K. Mohan, “*Artificial Neural Network*”, MIT Press.

Reference Books:

1. Stuart Russell and Peter Norvig, “*Artificial Intelligence: A Modern Approach*”, 3rd edition, Pearson Education, 2016.
2. Ivan Bratko, “*Prolog Programming For Artificial Intelligence*”, 4th edition, Addison Wesley, 2011.
3. Tim Jones, “*Artificial Intelligence Application Programming*”, 2nd edition, Dreamtech Publication, 2006.
4. George F. Luger, “*Artificial Intelligence: Structures and Strategies for Complex Problem Solving*”, 6th edition, Addison-Wesley Publication, 2009.

Course Title:	Computer Graphics (Elective- VIII)	SEMESTER –VI
Course Code:	IT605	Credits: 03
Prerequisite:	Nil	

UNIT-I

Basic concepts: Introduction to computer graphics, Lines, Line segments, Vectors, Pixels and frame buffers, Vector generation, DDA and Bresenham's line and circle drawing algorithms, Antialiasing, Thick lines, Character Generation: Stroke principle, Starburst principle, Bit map method, Display of frame buffer. Graphics Primitives: Primitive operations, Display file structure, Algorithms and Display file interpreter, Text and line styles.

UNIT-II

Polygons: Introduction, Representation, Entering polygons, Polygon Filling: Seed fill, Edge fill, Scan conversion algorithm, Filling with patterns.

2D Transformations: Introduction, Matrices, Scaling, Rotation, Homogeneous co-ordinates, Translation, Co-ordinate transformation, Rotation about an arbitrary point, Inverse transforms, Shear transforms and reflections.

UNIT-III

Segments: Introduction, Segment table, Segment creation, Closing, Deletion, Renaming. Image transformations, Raster techniques. Windowing and clipping: Introduction, Viewing transforms, 2D clipping, Cohen-Sutherland algorithm, Midpoint subdivision algorithm, Cyrus Beck algorithm, Interior and exterior clipping, Text clipping, Polygon clipping, Sutherland-Hodgman algorithm, Generalized clipping.

UNIT-IV

3-D Transformations: Introduction, 3-D geometry, Primitives, Transformations, Rotation about an arbitrary axis, Concept of parallel and perspective projections, Viewing parameters, 3D clipping, 3D viewing transformations. Hidden Surfaces and Lines: Introduction, Back-face removal algorithm, Z buffers, Scan-line and the Painter's algorithm, Warnock's algorithm, Hidden line methods, Binary space partition.

UNIT-V

Light, Color and Shading: Introduction, Diffuse illumination, Point-source illumination, Specular reflection, Shading algorithms, Transparency, Reflections, Shadows, Ray tracing, Color models and tables.

Curves and Fractals: Introduction, Curve generation, Interpolation, Interpolating algorithms, Interpolating polygons, B-Splines and corners, Bezier curves, Fractals, Fractal lines and surfaces.

UNIT-VI

Animation: Devices for producing animation, Computer assisted animation, Video formats, Real time animation, Frame-by-frame animation, Method for controlling animation, Animation software. Texture Mapping: Surface texturing, Bump mapping, Environment mapping.

TEXT/REFERENCE BOOKS

Text Books:

1. D. Hearn, M. Baker, “*Computer Graphics–C Version*”, 2nd edition, Pearson Education, 2002.
2. J. Foley, Van Dam, S. Feiner, J. Hughes, “*Computer Graphics Principles and Practice*”, 2nd edition, Pearson Education, 2003.
3. Z. Xiang, R. Plastock, “*Computer Graphics*”, 2nd edition, TATA Mc-Graw-Hill Publication, 2007.
4. F. Hill, “*Computer Graphics: Using OpenGL*”, 3rd edition, Pearson Education, 2007.

Reference Books:

1. S. Harrington, “*Computer Graphics*”, 2nd edition, McGraw-Hill Publications, 1987.
2. A. Sinha, A. Udai, “*Computer Graphics*”, 1st edition, TATA Mc-Graw-Hill Publication, 2008.
3. M. Pakhira, “*Computer Graphics Multimedia and Animation*”, 1st edition, PHI, 2010.
4. Dr. S. Dey, “*Graph Theory with Applications*”, Shroff Publication, 2012.

Course Title:	Multimedia Retrieval Systems (Elective- VIII)	SEMESTER –VI
Course Code:	IT606	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction: Data retrieval Vs information retrieval, Goals and history of IR, The impact of the web on IR, The role of AI in IR, Applications of IR, Basic Models of IR: Boolean and vector-space retrieval models, Ranked retrieval, Weighting, Cosine similarity.

UNIT-II

Automatic Text Analysis and Classification: Representation of the text of a document inside a computer, Automatic classification methods in general and then takes a deeper look at the use of these methods in information retrieval.

UNIT-III

File Structures and Search Strategies: File structures from the point of view information retrieval, Search strategies when applied to document collections structured in different ways, Use of feedback.

UNIT-IV

Probabilistic Retrieval and Evaluation: Formal model for enhancing retrieval effectiveness by using sample information about the frequency of occurrence and co-occurrence of index terms in the relevant and non-relevant documents, Traditional view of measurement of effectiveness, Theory of evaluation.

UNIT-V

Multimedia IR and Digital Libraries: Models and languages, Including MULTOS and SQL3, Libraries and bibliographical systems, Digital libraries, Online systems and public access catalogs, Challenges for effective deployment of digital libraries.

UNIT-VI

Parallel and Distributed IR and Searching the Web: Algorithms and architectures ,Parallel computing, Performance measure MIMD, SIMD architectures, Distributed IR collection partitioning, Source selection, Query processing searching the web, Challenges, Characterizing the web , Search engines , Ranking , Web crawlers.

TEXT/REFERENCE BOOKS

Text Books:

1. Richardo Baeza-Yates, Berthier Ribiero-Neto, “*Modern Information Retrieval*”, 2nd edition, Addison – Wesley, 2011.
2. C J Van Rijsbergen, “*Information Retrieval*”, Springer and Business Media. 2008.

Reference Book:

1. Christopher D. Manning, “*Introduction to Information Retrieval*”, Cambridge University Press, 2008.

Course Title:	Digital Image Processing (Elective- VIII)	SEMESTER –VI
Course Code:	IT606	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction and Fundamental of Image Processing: Digital image processing, Origins of digital image processing, Examples of fields that use digital image processing, Fundamental steps in digital image processing, Components of an image processing system, Elements of visual perception, Light and the electromagnetic spectrum.

UNIT-II

Digital Image Characterization, Image sampling and reconstruction, Image quantization, Discrete two- dimensional processing, Discrete image mathematical characterization, Superposition and convolution, Unitary transforms.

UNIT-III

Image enhancement in the spatial domain and frequency domain, Some basic gray level transformations, Histogram processing, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Introduction to the Fourier Transform and the frequency, Domain smoothing frequency- Domain filters, Sharpening frequency domain filters.

UNIT-IV

Image Restoration, A model of the image degradation/restoration process noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction by frequency domain filtering, Color image processing, Basics of full-color image processing, Color transformations, Color segmentation.

UNIT-V

Image segmentation, Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region-based segmentation, Segmentation by morphological watersheds.

UNIT-VI

Image representation, Boundary descriptors, Regional descriptors, Object recognition, Patterns and pattern classes, Image detection and registration, Matched filtering of discrete images, Matched filtering of continuous images.

TEXT/REFERENCE BOOKS

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods, “*Digital Image Processing*”, 3rd edition, Pearson Education, 2009.
2. William K Pratt, “*Digital Image Processing*”, 4th edition, John Wiley, 2007.
3. B. Chanda, Dutta Majumdar, “ *Digital Image Processing and Applications*”, Prentice Hall of India, 2007.

Reference Books:

1. Millman Sonka, Vaclav hlavac, Roger Boyle, “*Image Processing Analysis and Machine Vision*”, Thompson Learning, 2008.
2. A.K. Jain, “*Fundamentals of Digital Image Processing*”, 7th edition, PHI, 1995.
3. R. R. Manza, Y. M. Rajput, D. Rathod, M. B. Patwari, “*Understanding Digital Image Processing Using Matlab*”, Shroff Publication, 2016.

Course Title: Web Technologies Lab
Course Code: IT601L

SEMESTER –VI
Credit: 01

List of Practical:

1. Install, setup and configure Web server bundles (wamp/xamp/Apache/IIS etc.).
2. Create a web page with all possible elements of HTML5.
3. Create a web page with all types of Cascading style sheets.
4. Programs to demonstrate JavaScript array, object and functions.
5. Client Side Scripts for Validating Web Form Controls using JavaScript.
6. Programs to demonstrate DOM event bubbling.
7. Programs using XML – DTD Schema – XSLT/XSL.
8. Programs using XML – Schema XSLT/XSL.
9. Programs using XML – XSLT/XSL.
10. Programs using AJAX.
11. Server Side Scripting using PHP.
12. Programs using session tracking in PHP.
13. Programs using cookies tracking in PHP.
14. Programs using MySQL database connectivity in PHP.

Course Title: Software Engineering Lab
Course Code: IT602L

SEMESTER –VI
Credit: 01

List of Practical:

Objective is to develop a significant software product using sound software engineering principles by small student groups. Choice of appropriate methodology and standard tools are also expected. The lab will have deliverables at each milestone of development.

1. Problem Statement/Product Specification.
2. Project Plan – Project Management Tool to be identified and Estimation and Costing to be done.
3. Requirements Document – Specification Tool choice to be justified - In class Review.
4. Design Document – Choice of Methodology to be justified - In class Review.
5. Code and Test Report – Peer review documents of standards adherence to be provided.
6. Demo – Integrated Product or Solution to the problem.
7. Review of the process and analysis of variation from initial plan and estimation.

Course Title: Internetworking Protocol Lab
Course Code: IT603L

SEMESTER –VI
Credit: 01

List of Practical:

1. Conversion of IP addresses- Binary to Decimal, Binary to Hex, Hex to Decimal and vice-versa.
2. Study of different network simulators like NetSim™ , Wireshark, etc.
3. Simulation and analysis of following protocols using tools like NetSim™, Wireshark, etc.
 - ARP
 - IP
 - ICMP
 - UDP
 - TCP
4. Configure HTTP Server and explain the traffic using Wireshark.
5. Configuration of FTP Server and analyze FTP traffic using Wireshark.
6. Configuration and analysis of DNS and DHCP Servers.
7. Understanding TCP Congestion Control Mechanism in Linux™ Environment.
8. Socket programming for UDP and TCP.

Course Title: Industrial Training
Course Code: IT607

SEMESTER –VI
Credits: 02

The students receive theoretical knowledge of the basic engineering and applied engineering in first six semesters. They have to do in plant training of at least four weeks during vacation after sixth semester. The training enables the students to expose to industry during their training, provides orientation and improves their prospects for employment.

The students should prefer industrial training in the domain of Information Technology.

Training report and Assessment

During the industrial training he/she will observe layout, working environment, various equipments, tools, instruments etc. under the supervision of supervisor and engineer of the company. Students are required to submit a printed report of industrial training in the seventh semester. The report should contain information about the major field of company, particularly about the section/department where he/she have undergone the training giving the details of equipments, product, tools their detailed specification, use etc. The training report and field work done by students will be assessed by internal examiner(s) and appropriate grade will be awarded.

Proposed Scheme w.e.f. from 2019-20 (Final Year)

Table 9: Seventh Semester

Sr. No.	Course Code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA-I	CA-II	ESE	TW	PR	
1	IT701	Information Security	IT503, IT603	03	-	-	20	10	10	60	-	-	03
2	IT702	Software Testing	IT602	03	-	-	20	10	10	60	-	-	03
3	IT703	Data warehouse and Data Mining	IT501	03	-	-	20	10	10	60	-	-	03
4	IT704	Elective IX ●Natural Language Processing ●Pattern Recognition ●Machine Learning	Nil IT502 Nil	03	-	-	20	10	10	60	-	-	03
5	IT705	Elective X ●Bioinformatics Algorithms ●Advance Database Techniques ●Distributed Operating System	IT501, IT502 IT501 IT403,IT503	03	-	-	20	10	10	60	-	-	03
6	IT701L	Information Security Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT702L	Software Testing Lab	Nil	-	-	02	-	30	-	-	10	10	01
8	IT706	Project Phase I	Nil	-	-	04	-	-	-	-	-	-	06
9	IT607	Industrial Training Assessment	Nil	-	-	-	-	-	-	-	-	-	02
Total				15	Nil	08	100	160	300	20	20	25	

Table 10: Eighth Semester

Sr. No.	Course Code	Title of the Course	Prerequisite	Teaching Scheme			Credit Scheme						Credit
				L	T	P	Mid Test	CA-I	CA-II	ESE	TW	PR	
1	IT801	Ethical Hacking and Digital Forensics	IT503, IT701	03	-	-	20	10	10	60	-	-	03
2	IT802	Big Data	IT501, IT703	03	-	-	20	10	10	60	-	-	03
3	IT803	Elective XI ● Parallel Computing ● Grid Computing ● Mobile Computing	IT301, IT403 IT403, IT503 IT401, IT503, IT603	03	-	-	20	10	10	60	-	-	03
4	IT804	Elective XII ● Biometrics ● Cloud Computing and Security ● Reinforcement Learning	IT402 IT503, IT701 Nil	03	-	-	20	10	10	60	-	-	03
5	IT801L	Ethical Hacking and Digital Forensic Lab	Nil	-	-	02	-	30	-	-	10	10	01
6	IT802L	Big Data Lab	Nil	-	-	02	-	30	-	-	10	10	01
7	IT805	Project Phase II	Nil	-	-	04	-	-	-	-	-	-	08
Total				12	Nil	08	80	140	240	20	20	22	

Abbreviations

CA	: Continue Assessment
ESE	: End Semester Examination
Mid Test	: Middle Semester Test
L	: Lecture Hours
P	: Practical Hours
PR	: Practical Marks
T	: Tutorial Hours
TW	: Term Work

List of Core Courses:

1)IT701; 2)IT702; 3)IT703; 4)IT801; 5)IT802;

Course Title:	Information Security	SEMESTER –VII
Course Code:	IT701	Credits: 03
Prerequisite:	IT503, IT603	

UNIT-I

Introduction: Need of security, Attributes of security, Active vs. passive attacks, OSI security architecture, Worms, Viruses, Trojans, One time passwords, A model for network security, Classical encryption techniques like substitution ciphers, Transposition ciphers, Stenography.

UNIT-II

Symmetric Key Encryption: Modular arithmetic, Euclid's algorithm, Block ciphers, Stream ciphers, Data encryption standard, AES, Triple DES, RC5, RC4 stream cipher.

UNIT-III

Public Key Cryptography: Introduction to number theory, Fermat's and Euler's theorem, The Chinese Remainder theorem, RSA, Key distribution and management, Diffie-Hellman key exchange, Elliptic Curve cryptography, Message authentication and hash functions, Hash algorithms: MD5 message digest algorithm, Secure hash algorithm, HMAC.

UNIT-IV

Authentication and email security: Digital Signatures, Authentication protocols, Digital signature standards, Kerberos, X.509, Authentication service, Pretty good privacy, S/MIME.

UNIT-V

IP and web security: Internetworking and Internet protocols, IPv4, IPv6, IP security architecture, Authentication header, Encapsulating security payload, Key management, Web security considerations, Secure socket layer and transport layer security, Secure electronic transaction.

UNIT-VI

System security: Intruders, Intrusion detection, Password management, Viruses, Virus counter measures, Firewalls, Firewall design principles, Trusted systems.

TEXT/REFERENCE BOOKS

Text Books:

1. William Stallings, "*Cryptography and Network Security, Principles and Practices*", Prentice Hall, 7th edition, 2011.
2. Charlie Kaufman, Radia Perlman and Mike speciner, "*Network security, Private communication in a Public World*", Prentice Hall, 2nd edition, 2002.

Reference Book:

1. Christopher M. King, "*Security architecture, design deployment and operations*", Osborn McGraw-Hill, 2nd edition, 2001.

Course Title: Software Testing	SEMESTER –VII
Course Code: IT702	Credits: 03
Prerequisite: IT602	

UNIT-I

Principles of Testing Software development life cycle model: Phases of software project, Quality, Quality assurance and quality control, Testing, Verification and validation, Process models to represent various phases, Life cycle models, Software testing life cycle.

UNIT-II

White Box Testing (WBT) and Black Box Testing: Static testing, Structural testing, Challenges in WBT. Black box testing: Black box testing process.

UNIT-III

Integration Testing: Definition, As a type of testing: Top-down integration, Bottom-up integration, Bi-directional integration, System integration, Choosing integration method, As a phase of testing, Scenario testing: System scenarios, Use case scenarios, Defect bash.

UNIT-IV

System and Acceptance Testing, Functional Vs non Functional, Functional system testing, Non- functional system testing, Acceptance testing.

UNIT-V

Performance testing, Regression testing, Internationalization testing, Adhoc testing. Factors governing performance of testing, Methodology, tools and process for performance testing. Regression Testing: Introduction, Types of Regression testing, Regression testing process. Adhoc testing: Introduction, Buddy testing, Pair testing, Exploratory testing, Iterative testing, Agile and Extreme testing, XP work flow, Defect seeding.

UNIT-VI

Testing Object Oriented Software: Introduction, Comparison of object oriented and procedural software, System testing example, Unit testing of classes, Tools for testing object oriented software, Testing web applications.

TEXT/REFERENCE BOOKS

Text Book:

1. Srinivasan Desikan, Gopalaswamy Ramesh, “*Software Testing: Principles and Practices*”, Pearson publication, 2nd edition, 2006.

Reference Books:

1. Loise Tamres, “*Introducing Software Testing*”, Pearson publication, 2002.
2. Boris Beizer, “*Software Testing Techniques*”, 2nd edition, Dreamtech press, 2014

Course Title:	Data Warehouse and Data mining	SEMESTER –VII
Course Code:	IT703	Credits: 03
Prerequisite:	IT501	

UNIT-I

Introduction to data mining and data warehousing, Data warehouse: Definition, Multidimensional data model, OLAP operations, Warehouse schema, Data warehouse architecture, Warehouse server, Metadata, OLAP engine, Data warehouse backend process, Data mining: Definitions, KDD, DBMS and data mining, Other related areas, DM techniques, Other mining problem, Issues and challenges in DM, Applications.

UNIT-II

Association rules: Introduction, Methods to discover association rules, A priori algorithm, Partition algorithm, Pincer-search algorithm, Dynamic item set counting algorithm, FP-tree growth algorithm, Eclat and dEclat, Rapid association rule mining, Incremental algorithm, Border algorithm, Generalized association rule, Association rules with item constraints.

UNIT-III

Clustering techniques: Introduction, Clustering paradigms, Partitioning algorithms, K-Medoid algorithms, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE, Categorical clustering algorithms, STIRR, ROCK, CACTUS.

UNIT-IV

Decision trees and other techniques: Introduction to decision tree, Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction algorithms, CART, ID3, C4.5, CHAID, Decision tree construction with presorting, Rainforest, Approximate methods, CLOUDS, BOAT, Pruning techniques, Integration of pruning and construction.

UNIT-V

Web mining: Introduction to web mining, Web content mining, Web structure mining, Web usage mining, Text mining, Unstructured text, Episode rule discovery for texts, Hierarchy of categories, Text clustering.

UNIT-VI

Temporal and spatial data mining, Introduction to temporal data mining, Temporal association rules, Sequence mining, The GSP algorithm, SPADE, SPIRIT, WUM, Episode discovery, Event prediction problem, Time- series analysis, Spatial mining, Spatial mining tasks, Spatial clustering, Spatial trends.

TEXT/REFERENCE BOOKS

Text Books:

1. Arun K Pujari, “*Data Mining Techniques*”, 2nd edition, University Press India Publication, 2010.
2. Margaret H. Dunham, “*Data mining: Introductory and Advanced Topics*”, Pearson Education Publication, 2006.

Reference Books:

1. Jiawei Ham, Micheline Kamber, Jian Pei, “*Data Mining: Concepts and Techniques*”, 3rd edition Morgan Kaufmann Publishing, 2012.
2. Bing Liu, “*Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data*”, 2nd edition, Springer Science and Business Media, 2011.
3. M. A. Russell, “*21 Recipes of Mining Twitter*”, O’Reilly Publication, 2011.
4. M. A. Russell, “*Mining The Social Web*”, 2nd edition, O’Reilly Publication, 2013.

Course Title:	Natural language Processing (Elective IX)	SEMESTER –VII
Course Code:	IT704	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction, Machine learning and NLP, ArgMax computation, Word Sense Disambiguation : WordNet, Wordnet application in query expansion, Wiktionary semantic relatedness, Measures of WordNet similarity.

UNIT-II

Similarity measures, Resnick's work on WordNet similarity, Coordinators, Evidence for deeper structure, Top down parsing algorithms, Noun structure, Non-noun structure and parsing algorithms, Probabilistic parsing, sequence labeling, PCFG.

UNIT-III

Probabilistic Parsing: PCFG, Sequencing labeling, Training issues, Arguments and adjuncts, Inside-outside probabilities, Speech: Phonetics, HMM, Morphology.

UNIT-IV

Graphical models for sequence labelling in NLP, Phonetics, Consonants (place and manner of articulation) and vowels, Forward backward probability, Viterbi Algorithm, Phonology.

UNIT-V

Sentiment analysis and opinions on the web, Machine translation and MT tools: GIZA++ and Moses, Text entailment, POS tagging, Phonology, ASR, Speech synthesis, HMM and Viterbi.

UNIT-VI

Precision, Recall, F-score, Map, Semantic Relations, UNL, Towards dependency parsing, Universal networking language, Semantic role extraction, Baum Welch algorithm, HMM training.

TEXT/REFERENCE BOOKS

Text Books:

1. Allen, James, "*Natural Language Understanding*", 2nd edition, Benjamin/Cumming, 1995.

Reference Books:

1. Charniack , Eugene, "*Statistical Language Learning*", MIT Press, 1st edition, 1993.
2. Dan Jurafsky , James H. Martin , "*Speech and Language Processing*", Prentice Hall, Pearson Education International, 2nd edition, 2014.
3. Manning, Christopher and Heinrich, Schutze , "*Foundations of Statistical Natural Language Processing*", MIT Press, 1999.

Course Title:	Pattern Recognition (Elective IX)	SEMESTER –VII
Course Code:	IT704	Credits: 03
Prerequisite:	IT502	

UNIT-I

Introduction and mathematical preliminaries related to pattern recognition, Clustering vs. Classification, Applications, Linear algebra, Vector spaces, Probability theory, Estimation techniques.

UNIT-II

Classification: Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance, K-NN classifier, Linear discriminate functions and non-linear decision boundaries, Fisher's LDA, Single and multilayer perceptron, Training set and test sets, Standardization and normalization.

UNIT-III

Clustering: Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means clustering, Single linkage and complete linkage clustering, MST, Medoids, DBSCAN, Visualization of datasets, Existence of unique clusters or no clusters.

UNIT-IV

Fisher's LDA, Single and multilayer perceptron, Training set and test sets, Standardization and normalization.

UNIT-V

Feature selection: Problem statement and uses, Probabilistic separability based criterion functions, Interclass distance based criterion functions, Branch and bound algorithm, Sequential forward/backward selection algorithms, (l,r) algorithm.

UNIT-VI

Feature extraction: PCA, Kernel PCA, Recent advances in PR: Structural PR, SVMs, FCM, Soft-computing and neuro-fuzzy.

TEXT/REFERENCE BOOKS

Text Books:

1. R.O.Duda, P.E.Hart and D.G.Stork, "*Pattern Classification*", John Wiley, 2001.
2. K. Fukunaga, "*Statistical pattern Recognition*", Academic Press, 2000.

Reference Books:

1. S.Theodoridis and K.Koutroumbas, "*Pattern Recognition*", Academic Press, 4th edition, 2009.
2. C.M.Bishop, "*Pattern Recognition and Machine Learning*", Springer, 2006.

Course Title:	Machine Learning (Elective IX)	SEMESTER –VII
Course Code:	IT704	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction, Concept learning, Learning problems, Designing learning systems, Perspectives and issues, Concept learning, Version spaces and candidate elimination algorithm, Inductive bias.

UNIT-II

Decision Trees and Evaluating Hypothesis: Representation, Algorithms, Hypothesis space search in Decision tree learning, Induction bias in Decision Tree Learning, Issues in Decision tree learning, Estimating hypothesis accuracy, Sampling theory, Central limit theorem.

UNIT-III

Bayesian Learning: Bayes theorem, Concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes Classifier, Bayesian belief Network , EM Algorithm.

UNIT-IV

Computational Learning: Sample complexity for finite and infinite hypothesis spaces, Mistake bound model.

UNIT-V

Instant Based Learning and learning set of rules: K- Nearest Neighbor learning, Locally weighted regression, Radial basis functions, Case-based reasoning, Sequential covering algorithms, Learning rule sets, Learning first order rules, Learning sets of first order rules, Induction as Inverted deduction, Inverting resolution.

UNIT-VI

Analytical Learning: Perfect domain theories, Explanation based learning, Inductive analytical approaches, KBANN algorithm, TANGENTPROP algorithm, EBNN algorithm, FOCL algorithm.

TEXT/REFERENCE BOOKS

Text Book:

1. Tom M. Mitchell, “*Machine Learning*”, McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1. Ethem Alpaydin, “*Introduction to Machine Learning*”, PHI Learning Pvt. Ltd., 2nd edition, 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, “*The Elements of Statistical Learning*”, Springer, 1st edition, 2001.

Course Title:	Bioinformatics Algorithms (Elective X)	SEMESTER –VII
Course Code:	IT705	Credits: 03
Prerequisite:	IT501, IT502	

UNIT-I

Molecular Biology Primer: About Life, Genetic material, Role of genes, Molecule codes for Genes, Structure of DNA, Information carriers between DNA and proteins, Proteins structure, DNA analysis, Copying DNA, Cutting and pasting DNA, Measuring DNA length, Probing DNA, Difference between Individuals of a Species, Difference between Different Species, Introduction to Bioinformatics.

UNIT-II

Exhaustive search, Restriction mapping, Impractical restriction mapping algorithms, A practical restriction mapping algorithm, Regulatory Motifs in DNA sequences, profiles, The Motif finding problem, Search trees, Finding Motifs, Finding a median string.

UNIT-III

Greedy Algorithms: Genome rearrangements, Sorting by reversals, Approximation algorithms, Breakpoints: A different face of Greed, A Greedy approach to Motif finding.

UNIT-IV

Dynamic Programming Algorithms: The power of DNA sequence comparison, The change problem revisited, The Manhattan Tourist problem, Edit distance and alignments, Longest common subsequences, Global sequence alignment, Scoring alignments, Local sequence alignment, Alignment with gap penalties, Multiple alignment, Gene prediction, Statistical approaches to Gene prediction, Similarity based approaches to Gene prediction, Spliced alignment.

UNIT-V

Divide-and-Conquer Algorithms: Divide-and-Conquer approach to sorting, Space efficient sequence alignment, Block alignment and the Four-Russians speedup, Constructing alignments in subquadratic time.

UNIT-VI

Graph Algorithms: Graphs, Graphs and Genetics, DNA sequencing, Shortest Superstring Problem, DNA arrays as an alternative sequencing technique, Sequencing by hybridization, SBH as a Hamiltonian Path problem, SBH as an Eulerian Path problem, Fragment assembly in DNA sequencing, Protein sequencing and identification, The Peptide sequencing problem, Spectrum graphs, Protein Identification via database search, Spectral convolution, Spectral alignment.

TEXT/REFERENCE BOOKS

Text Book:

1. Jones, Pevzner, “*An Introduction to Bioinformatics Algorithms*” MIT Press, Illustrated edition, 2004.

Reference Books:

1. Durbin, Eddy, Krogh, Mitchison, “*Biological Sequence Analysis*”, Cambridge University Press, 1998.
2. Dan Gusfield, “*Algorithms on Strings, Trees and Sequences*”, Cambridge University Press, 1997.

Course Title:	Advance Database Techniques(Elective X)	SEMESTER –VII
Course Code:	IT705	Credits: 03
Prerequisite:	IT501	

UNIT-I

Transactions: Transaction concepts, A simple transaction model, Storage structure, Transaction atomicity and durability, Transaction isolation, Serializability, Transaction isolation and atomicity, Transaction isolation levels, Implementation of isolation levels, Transaction as SQL statements.

UNIT-II

Concurrency Control: Lock based protocols, Deadlock handling, Multiple granularity, Timestamp-Based protocols, Validation based protocols, Multiversion schemes, Snapshot isolation, Insert operations, Delete operations and predicate reads, Weak levels of consistency in practice.

UNIT-III

Recovery System: Failure classification, Storage, Recovery and atomicity, Recovery algorithm, Buffer management, Failure with loss of nonvolatile storage, Early lock release and logical Undo operations.

UNIT-IV

Database system architectures, Spatial and temporal data and mobility, Centralized and client– Server architectures, Server system architectures, Parallel systems, Distributed systems, Network types, motivation, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and personal databases.

UNIT-V

Parallel Databases: Introduction, I/O parallelism, Interquery parallelism, Intraquery parallelism, Intraoperation parallelism, Interoperation parallelism, Query optimization, Design of parallel systems, Parallelism on multicore processors.

UNIT-VI

Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in Distributed Databases, Availability, Distributed query processing, Heterogeneous Distributed Databases.

TEXT/REFERENCE BOOKS

Text Book:

1. Korth, Silberchatz, Sudarshan, “*Database System Concepts*” , McGraw-Hill Publication, 6th edition, 2011.

Reference Book:

1. Elmasri and Navathe, “*Fundamentals of Database Systems*”, Pearson Education publication, 7th edition, 2016.

Course Title:	Distributed Operating System (Elective X)	SEMESTER –VII
Course Code:	IT705	Credits: 03
Prerequisite:	IT403, IT503	

UNIT-I

Fundamentals: Distributed computing, System model, Distributed operating system, Advantages, Designing operating system, Introduction to DCE2, Message Passing: Desirable features message passing system, Issues in message passing, Synchronization, Buffering, Multidatagram messages, Encoding and decoding of message data, Process addressing, Failure handling, Group communication.

UNIT-II

Remote procedure call: RPC model, Transparency of RPC, Implementing RPC mechanism, Stub generation, Marshaling arguments and results, Server management, Parameter passing semantics, Call semantics, Communication protocols for RPCs, Complicated RPC, Client server binding, security, Special types of RPCs, RPCs in heterogeneous environments, Lightweight RPC, Optimizations for better performance.

UNIT-III

Distributed Shared Memory: General architecture of DSM systems, Design and implementation of DSM, Granularity, Structure of shared memory space, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM and advantages of DSM.

UNIT-IV

Synchronization: Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.

UNIT-V

Resource and Process Management: Desirable features of global scheduling algorithm, Task assignment approach, Load balancing approach, Load sharing approach, Introduction to process management, Process migration, Threads.

UNIT-VI

Distributed File Systems: Introduction, Good features of DFS, File models, File accessing models, File sharing semantics, File caching schemes, File replication, Fault tolerance, Atomic transactions and design principles.

TEXT/REFERENCE BOOKS

Text Books:

1. Pradeep K Sinha, “*Distributed Operating Systems: Concepts and design*” PHI Learning Pvt. Limited, 2011.
2. A. Tanenbaum, “*Distributed Operating System*”, Pearson Education India, Illustrated edition, 1997.

Reference Book:

1. Puder, Romer, “*Distributed Systems Architecture: Middleware approach*”, Elsevier publication, 2010.

Course Title: Information Security Lab
Course Code: IT701L

SEMESTER –VII
Credits: 01

List of Practical:

1. Implementation of different viruses and worms.
2. Implementation of following concepts: Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher.
3. Implementation of Data Encryption Standard (DES) modules
4. Implementation of International Data Encryption Algorithm (IDEA) submodules.
5. Implementation of Message Digests- MD4, MD5
6. Implementation of Block cipher modes: ECB, CBC, CFB, OFB.
7. Implementation of Cryptographic algorithms:
 - Advance Encryption Standard (AES).
 - RSA.
 - Diffie Hellman.
8. Demonstrate intrusion detection system using any tool (snort or any other s/w).
9. Use Packet sniffers like Wireshark for the following:
 - Detect network misuse by internal and external users.
 - Detect network intrusion attempts (like port scanning).
 - Filter suspect content from network traffic.
 - Gain information for effecting a network intrusion.
 - Spy on other network users and collect sensitive information such as passwords (depending on any content encryption methods which may be in use).

Course Title: Software Testing Lab
Course Code: IT702L

SEMESTER –VII
Credits: 01

List of Practical:

1. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
2. Design, develop, code and run the program in any suitable language to solve the NextDate problem. Analyze it from the perspective of decision table-based testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
3. Design, develop, code and run the program in any suitable object-oriented language to solve the calendar problem. Analyze it from the perspective of OO testing, derive test cases to test the method that increment the date and the method that increments the month., execute these test cases and discuss the test results.
4. Design, develop, code and run the program in any suitable object-oriented language to solve the currency converter problem. Analyze it from the perspective of use case-based system testing, derive appropriate system test cases, execute these test cases and discuss the test results.
5. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
6. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

Course Title: Project Phase I
Course Code: IT706

SEMESTER –VII
Credits: 06

The project should enable the students to combine the theoretical and practical concepts studied in his/her academics. The project work should enable the students to exhibit their ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

Project work

The project work is an implementation of learned technology. The knowledge gained by studying various subjects separately supposed to utilize as a single task. A group of 03/04 students will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipments, data, tools etc. should be arranged.

Project activity

The project groups should interact with guide, who in turn advises the group to carry various activities regarding project work on individual and group basis. The group should discuss the progress every week in the project hours and follow further advice of the guide to continue progress. Guide should closely monitor the work and help the students from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

Phase I

1. Background and motivation
2. Literature survey
3. System analysis and design (OOAD or Web engineering depending on the nature of project, it should contain analysis diagram and design for software architecture, Data structures, etc..)
4. Implementation (20 to 30%).

Course Title:	Ethical Hacking and Digital Forensics	SEMESTER –VIII
Course Code:	IT801	Credits: 03
Prerequisite:	IT503, IT701	

UNIT-I

Introduction: Hacking windows, Network hacking, Web hacking, Password hacking, A study on various attacks, Input validation attacks, SQL injection attacks, Buffer overflow attacks, Privacy attacks.

UNIT-II

Attacks and firewalls: TCP / IP, Checksums, IP spoofing port scanning, DNS spoofing, Dos attacks, SYN attacks, Smurf attacks, UDP flooding, DDOS models, Firewalls, Packet filter firewalls, Packet Inspection firewalls, Application proxy firewalls, Batch file, Programming.

UNIT-III

Threats: Fundamentals of computer fraud, Threat concepts, Framework for predicting inside attacks, Managing the threat: Strategic Planning Process, Architecture strategies for computer fraud Prevention, Protection of Web sites.

UNIT-IV

Penetration testing: Intrusion detection system: NIDS, HIDS, Penetrating testing process, Web Services: Reducing transaction risks, Key fraud indicator, Selection process, Customized taxonomies: Key fraud signature, selection process.

UNIT-V

Forensics: Accounting forensics, Computer forensics, Journaling and its requirements, Standardized logging criteria, Journal risk and control matrix, Neural networks misuse detection and novelty detection.

UNIT-VI

Current computer forensics tools, Software tools, Hardware tools, Validating and testing forensic software, Addressing data-hiding techniques, Performing remote acquisitions, E-Mail investigations: investigating email crime and violations, Understanding E-Mail servers, Specialized E-Mail forensics tool.

TEXT/REFERENCE BOOKS

Text Book:

1. Ankit Fadia, “ *Ethical Hacking*”, Macmillan India Ltd., 2nd edition, 2006.

Reference Book:

1. Kenneth C. Brancik, “*Insider Computer Fraud*”, CRC Press, Illustrated edition, 2007.

Course Title: Big Data
Course Code: IT802
Prerequisite: IT501, IT703

SEMESTER –VIII
Credits: 03

UNIT-I

Introduction to Big Data: Characteristics, Types, Traditional vs. Big Data business approach, Case study of Big Data solutions, Hadoop: core components, Hadoop ecosystem, Physical architecture, Limitations.

UNIT-II

NoSQL: NoSQL business drivers, Case studies, Data architecture patterns: Key-value stores, Graph stores, Column family (Big table) stores, Document stores, Variations of NoSQL architectural patterns, Using NoSQL to manage Big Data: a big data NoSQL solution, Types of Big Data problems, Analyzing Big Data with a shared-nothing architecture, Choosing distribution models: master-slave versus peer-to-peer, Four ways that NoSQL systems handle Big Data problems.

UNIT-III

MapReduce and the new software stack, Distributed File Systems: Physical organization of nodes, Large-scale file system organization, MapReduce: The map tasks, Grouping by key, The reduce tasks, Combiners, Details of MapReduce execution, Coping with node failures, Algorithms using MapReduce: Matrix-Vector multiplication by MapReduce, Relational algebra operations, Computing selections by MapReduce, Computing projections by MapReduce, Union, intersection and difference by MapReduce, Computing natural join by MapReduce, Grouping and aggregation by MapReduce, Matrix multiplication, Matrix multiplication with one MapReduce step.

UNIT-IV

Finding similar items: Applications of Near-Neighbour search, Jaccard similarity of sets, Similarity of documents, Collaborative filtering as a similar-sets problem, Distance measures: Definition of a distance measure, Euclidean distances, Jaccard distance, Cosine distance, Edit distance, Hamming distance.

UNIT-V

Mining Data Streams: The stream data model: A data-stream-management system, Examples of stream sources, Stream queries, Issues in stream processing, Sampling data in a stream: Obtaining a representative sample, The general sampling problem, Varying the sample size. The Bloom filter analysis, Counting distinct elements in a stream, Count-distinct problem, Flajolet-Martin algorithm, Combining estimates, Space requirements, Counting ones in a Window: The cost of exact counts, Datar-Gionis-Indyk-Motwani algorithm, Query answering in the DGIM algorithm, Decaying windows.

UNIT-VI

Link Analysis: Page rank definition, Structure of the web, Dead ends, Using page rank in a search engine, Efficient computation of page rank: Page rank iteration using MapReduce, Use of combiners to consolidate the result vector, Topic sensitive page rank, Link spam, Hubs and authorities.

TEXT/REFERENCE BOOKS

Text Books:

1. Anand Rajaraman, Jeffrey Ullman, “*Mining of Massive Datasets*”, Cambridge University Press, 2011.
2. Alex Holmes, “*Hadoop in Practice*”, Manning Publications Company, 2014.
3. Dan McCreary, Ann Kelly, “*Making Sense of NoSQL – A guide for managers and the rest of us*”, Manning Press, 2013.

Reference Books:

1. Bill Franks, “*Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams with Advanced Analytics*”, Wiley India, 2012.
2. Chuck Lam, Mark W. Davis, Ajit Gaddam, “*Hadoop in Action*”, Manning Publications Company, 2016.
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “*Big Data for Dummies*”, Wiley India, 2013.

Course Title:	Parallel Computing (Elective XI)	SEMESTER –VIII
Course Code:	IT803	Credits: 03
Prerequisite:	IT301, IT403	

UNIT-I

Introduction to Parallel Computing, Motivating parallelism, Scope of Parallel Computing, Parallel programming paradigms, Parallel architecture, Open MP.

UNIT-II

Open MP and PRAM model of computation, PRAM, Models of parallel computation, Complexity, Memory consistency, Memory consistency and performance issues.

UNIT-III

Parallel program design, Shared memory and message passing, MPI, Algorithmic techniques.

UNIT-IV

CUDA, Algorithms for merging and sorting.

UNIT-V

Lower bounds lock free synchronization, Load stealing.

UNIT-VI

Lock free synchronization, Graph algorithms.

TEXT/REFERENCE BOOKS

Text Book:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipil Kumar, “*Introduction to Parallel Computing*”, Pearson publication, 2nd edition, 2009.

Reference Book:

1. Fayez Gebali, “*Algoritms and Parallel Computing*”, Wiley Publication, 2nd edition, 2011.

Course Title:	Grid Computing (Elective XI)	SEMESTER –VIII
Course Code:	IT803	Credits: 03
Prerequisite:	IT403, IT503	

UNIT-I

Basic concepts in Distributed Systems, Notion of time, Distributed mutual exclusion, Consensus, Failure models, Paradigms for process interaction in distributed programs, Cluster computing models, System-independent parallel programming on distributed Systems, Anonymous remote computing model, Integrating task parallelism with data parallelism, Location independent intertask communication, Parallel programming on CORBA, Moset: An anonymous remote mobile cluster computing paradigm.

UNIT-II

Introduction to Grid Computing, Classification of Grids, Introduction to service oriented computing, Peer-to-peer (P2P) concepts in Grids, Introduction to P2P systems, Overlays, Unstructured P2P systems, Structured P2P systems (Distributed Hash Tables - Chord, Pastry) Integrating unstructured and structured P2P systems, Introduction to P2P security.

UNIT-III

Functions/Challenges of a Grid computing, Middleware, Globus: Open source software toolkit used for building Grid systems and applications, Vishwa: A reconfigurable P2P middleware for Grid computations.

UNIT-IV

Data/Object management in large scale Grids: JuxMem: An adaptive supportive platform for data sharing on the Grid, Virat: Scaling a shared object space to the Internet, Arogyasree: An Internetbased mobile telemedicine system.

UNIT-V

Introduction to Cloud computing, Volunteer clouds, Intercloud/Cloud bursting, NFS, AFS, Commodity hardware based file systems.

UNIT-VI

Hadoop Distributed File System (HDFS), Edge Node File System (ENFS) : A scalable DFS over Internet edge nodes, MapReduce: Simplified data processing on large clusters, Dryad.

TEXT/REFERENCE BOOKS

Text Book:

1. D. Janakiram, “ *Grid Computing*”, Tata Mcgraw-hill, 1st edition, 2005.

Reference Book:

1. Joshy Joseph, Craig Fellenstein, “*Grid Computing*”, Prentice Hall Professional Publication, 1st edition, 2004.

Course Title:	Mobile Computing (ElectiveXI)	SEMESTER –VIII
Course Code:	IT803	Credits: 03
Prerequisite:	IT401, IT503, IT603	

UNIT-I

Introduction to mobile computing, Convergence of Internet, digital communication and computer networks, Sharing of wireless channels: FDMA, TDMA, CDMA, MAC layer issues in wireless communication.

UNIT-II

Impacts of mobility and portability in computational model and algorithms for mobile environment.

UNIT-III

Disconnected operation, Handling handoffs, Analysis of algorithms and termination detection.

UNIT-IV

Types of Mobility, Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management, IP mobility: Mobile IP and IDMP

UNIT-V

Wireless LAN, Personal Area Network: Bluetooth and ZigBee, Network layer issues, ad hoc and sensor networks, Data delivery models: push and pull, Data dissemination in wireless channels, Broadcast disks, Effects of caching.

UNIT-VI

Indexing in air, Mobile databases and transaction, Distributed file system for mobile environment, Mobile agents.

TEXT/REFERENCE BOOKS

Text Book:

1. T. Rappaport, “*Wireless Communication: Principles and Practice*”, Pearson Education, 2009.

Reference Books:

1. Paolo Bellavista and Antonio Corradi, “*Handbook of Mobile Middleware*”, Auerbach Publication, 2016.
2. Reza B’Far, “*Mobile Computing Principles*”, Cambridge University Press, 2004.

Course Title:	Biometrics (Elective XII)	SEMESTER	–VIII
Course Code:	IT804	Credits:	03
Prerequisite:	IT402		

UNIT-I

Introduction of biometric traits and its aim, Image processing/pattern recognition/statistics, Error types, Image processing basic: Definition of image, acquisition, type, point operations, Geometric transformations.

UNIT-II

Basic image operations: Convolution, Linear/non-linear filtering, Guassian, Median, Min, gray level reduction, Special filters, Enhancement filter, Edge detection, Derivatives, Laplacian, Unsharp masking, High boot filtering, Sharpening special filtering, Edge detection, First and second derivative, Steps in edge detection, Smoothing, Enhancement, Thresholding, Localization, Robert's method, Sobal's method, Pervitt and sobal, Laplacian of Gaussian, Zero crossing.

UNIT-III

Canny edge detection, Fourier Series, DFT, Inverse of DFT, Biometric system, Authentication, Physiological and behavioral properties, PCA, Eigen vectors and values, 2D-PCA, Generalization to p-dim, Covariance and correlation, Algebra of PCA, Projection of data, Identification/verification, Threshold, Score distribution, FAR/FRR, System design issues.

UNIT-IV

Positive/negative identification, Biometric system security, Authentication protocols, Authentication methods, Matching, Null and alternative hypothesis h_0 , h_1 , Error type I/II, Matching score distribution, FM/FNM, ROC curve, DET curve, FAR/FRR curve, Comparing two systems using ROC curve, Expected overall error, EER, Available best error rates, Cost function, Biometric myths and misrepresentations, Negative authentication, Trade-offs between security and convenience.

UNIT-V

Selection of suitable biometric, Biometric attributes, Zephyr charts, Types of multi biometrics Verification on multimodel system, Normalization strategy, Fusion methods, Multimodel identification, Biometric system security, Biometric system vulnerabilities, Circumvention, Covert acquisition, Quality control, Template generation, Interoperability, Data storage.

UNIT-VI

Signature recognition system, Cropping, Enhancement, Signature parameters, Matching and decision, Recognition, Discrete Harr wavelet transform, Face detection, Feature template, Matching, Fingerprint recognition, Enhancement, Thinning, Minutiae, CN number, Matching, Ear and Iris recognition, Image acquisition, Cropping ear and iris, Normalization, Matching and decision.

TEXT/REFERENCE BOOKS

Text Books:

1. Rafael C. Gonzalez, Richard Eugene “*Digital Image Processing using MATLAB*”, Tata McGraw- Hill Education, 2nd edition, 2010.
2. Ruud M. Bolle, Sharath Pankanti, Nalini K. Ratha, Andrew W. Senior, Jonathan H. Connell, “*Guide to Biometrics*”, Springer, 2nd edition, 2009.

Reference Book:

1. Richard O. Duda, David G. Stork, Peter E. Hart, “ *Pattern Classification*”, John Wiley & Sons, 2nd edition, 2012.

Course Title:	Cloud Computing and Security (Elective XII)	SEMESTER –VIII
Course Code:	IT804	Credits: 03
Prerequisite:	IT503, IT701	

UNIT-I

History of Centralized and Distributed Computing, Overview of Distributed Computing, Cluster computing, Grid computing, Technologies for network based systems, System models for distributed and cloud computing, Software environments for distributed systems and clouds.

UNIT-II

Introduction to Cloud Computing, Cloud issues and challenges, Properties, Characteristics, Service models, Deployment models, Cloud resources: Network and API, Virtual and physical computational resources, Data-storage, Virtualization concepts, Types of Virtualization, Introduction to various hypervisors, High Availability (HA)/Disaster Recovery (DR) using virtualization, Moving VMs .

UNIT-III

Service models: Infrastructure as a Service (IaaS), Resource Virtualization: Server, Storage, Network, Case studies, Platform as a Service (PaaS), Cloud platform and Management: Computation, Storage, Case studies, Software as a Service (SaaS), Web services: Web 2.0 - Web OS, Case studies, Anything as a service (XaaS).

UNIT-IV

Cloud programming and software environments, Parallel and distributed Programming paradigms, Programming on Amazon AWS and Microsoft Azure, Programming support of Google App Engine, Emerging Cloud software Environment.

UNIT-V

Introduction to Information Security and its need, Basics principles of confidentiality, Integrity, Availability concepts, Policies, Procedures, Guidelines, Standards, Administrative Measures and Technical Measures, People, Process, Technology.

UNIT-VI

Current trends in information Security, Cloud computing: benefits and issues related to information Security, Standards available for InfoSec: Cobit, Cadbury, ISO 27001, OWASP, OSSTMM, An overview, Certifiable standards: How, What, When, Who.

TEXT/REFERENCE BOOKS

Text Books:

1. Kailash Jayaswal, Jagganaath Kallakurchi, Donald Houde, Dr. Deven Shah, “*Cloud Computing Black Book*”, Dreamtech Press, 2016.
2. Barrie Sosinsky, “ *Cloud Computing Bible*”, Wiley India Pvt. Limited, 2011.

Reference Books:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “*Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance*”, “O’Reilly Media, Inc.”, Revised edition, 2009.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “*Distributed and cloud computing from Parallel Processing to the Internet of Things*”, Morgan Kaufmann, 2013.

Course Title:	Reinforcement Learning (Elective XII)	SEMESTER –VIII
Course Code:	IT804	Credits: 03
Prerequisite:	Nil	

UNIT-I

Introduction, Bandit algorithms – UCB, PAC.

UNIT-II

Bandit algorithms –Median Elimination, Policy Gradient Full RL & MDPs.

UNIT-III

Bellman Optimality, Dynamic Programming and TD Methods.

UNIT-IV

Eligibility Traces, Function Approximation.

UNIT-V

Least Squares Methods, Fitted Q, DQN and policy gradient for full RL.

UNIT-VI

Hierarchical RL, POMDPs.

TEXT/REFERENCE BOOKS

Text Book:

1. R. S. Sutton and A. G. Barto, “*Reinforcement Learning*”, MIT Press, 1st edition, 2012.

Reference Book:

1. Marco Wiering, Martijn van Otterlo, “*Reinforcement Learning: State-of-the-Art*”, Springer Science & Business Media, Illustrated edition, 2012.

Course Title: Ethical Hacking and Digital Forensic Lab
Course Code: IT801L

SEMESTER –VIII
Credits: 01

List of Practical:

1. Study of Firewalls, Packet analyzers, Filtering methods.
2. Working with Trojans, Backdoors and sniffer for monitoring network communication.
3. Study of denial of service and session hijacking using tear drop, DDOS attack
4. Study of penetration testing and justification of penetration testing through risk analysis
5. Study of Password guessing and password cracking
6. Study of Wireless Network attacks, Bluetooth attacks
7. Study of Firwalls, Intrusion detection and Honeypots
8. Study of Malware – Keylogger, Keylogger countermeasures
9. Study of Data Packet Sniffers
10. Study of Windows Hacking – NT LAN Manager, Secure one password recovery
11. Implementing Web Data Extractor and Web site watcher
12. Study of E-mail Tracking

Course Title: Big Data Lab
Course Code: IT802L

SEMESTER –VIII
Credits: 01

List of Practical:

1. Study of Hadoop ecosystem
2. Two programming exercises on Hadoop
3. Two programming exercises in No SQL
4. Implementing simple algorithms in MapReduce: Matrix multiplication, Aggregates, joins, sorting, searching
5. Implementing any one frequent item set algorithm using MapReduce
6. Implementing any one clustering algorithm using MapReduce
7. Implementing any one data streaming algorithm using MapReduce
8. Mini Project: one real life large data application to be implemented (use standard datasets available on the web)

Course Title: Project Phase II
Course Code: IT805

SEMESTER –VIII
Credits: 08

This is continuous work to the project phase I. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II

1. Remaining Coding/Implementation.
2. Testing/Trouble shooting.
3. Conclusion and future directions
4. Data dictionary/ Documentation.
5. Paper published on projects.

Project report copies: 01 Personal copy and 01 Departmental copy.