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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA101BS	Linear Algebra and Calculus	3	1	0	4	30	70	100
2	AP102BS	Applied Physics	3	1	0	4	30	70	100
3	CS105ES	Programming for Problem Solving	3	1	0	4	30	70	100
4	ME106ES	Engineering Graphics	1	0	4	3	30	70	100
5	AP103BS	Applied Physics Lab	0	0	3	1.5	30	70	100
6	CS107ES	Programming for Problem Solving Lab	0	0	3	1.5	30	70	100
		Total	**10**	**3**	**10**	**18**	**180**	**420**	**600**
Mandatory Course (Non-Credit)									
7	*ES104BS	Environmental Science	3	0	0	-	100	-	100
8	*TS109	Technical Seminar	0	0	2	-	100	-	100
		Induction Programme							

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA201BS	Advanced Calculus	3	1	0	4	30	70	100
2	CH202BS	Engineering Chemistry	3	1	0	4	30	70	100
3	EE206ES	Basic Electrical Engineering	3	0	0	3	30	70	100
4	ME207ES	Engineering Workshop	1	0	3	2.5	30	70	100
5	EN203HS	Professional English	2	0	0	2	30	70	100
6	CH204BS	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
7	EN205HS	English Language and Communication Skills Lab	0	0	2	1	30	70	100
8	EE208ES	Basic Electrical Engineering Lab	0	0	2	1	30	70	100
		Total	**12**	**2**	**10**	**19**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*MP209	Micro Project	0	0	2	-	100	-	100

***MC – Satisfactory/ Unsatisfactory**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	CSM301PC	Discrete Mathematics	3	0	0	3	30	70	100
2	CSM302PC	Data Structures	3	1	0	4	30	70	100
3	MA301BS	Mathematical and Statistical Foundations	3	0	0	3	30	70	100
4	CSM304PC	Computer Architecture and Organization	3	0	0	3	30	70	100
5	CSM305PC	Python Programming	2	0	0	2	30	70	100
6	BE304MS	Business Economics and Financial Analysis	3	0	0	3	30	70	100
7	CSM307PC	Data Structures Lab	0	0	3	1.5	30	70	100
8	CSM308PC	Python Programming Lab	0	0	3	1.5	30	70	100
Total			**17**	**1**	**6**	**21**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*GS309MC	Gender Sensitization Lab	0	0	2	-	100	-	100

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	CSM401PC	Formal Language and Automata Theory	3	0	0	3	30	70	100
2	CSM402PC	Introduction to Artificial Intelligence	3	0	0	3	30	70	100
3	CSM403PC	Operating Systems	3	0	0	3	30	70	100
4	CSM404PC	Database Management Systems	3	1	0	4	30	70	100
5	CSM405PC	Object Oriented Programming using Java	3	1	0	4	30	70	100
6	CSM406PC	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
7	CSM407PC	Database Management Systems Lab	0	0	3	1.5	30	70	100
8	CSM408PC	Java Programming Lab	0	0	2	1	30	70	100
Total			**15**	**2**	**8**	**21**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*CI409MC	Constitution of India	3	0	0	-	100	-	100

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III YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	CSM501PC	Advanced Artificial Intelligence	3	0	0	3	30	70	100
2	CSM502PC	Data Warehousing and Data Mining	3	0	0	3	30	70	100
3	CSM503PC	Design and Analysis of Algorithms	3	0	0	3	30	70	100
4	CSM504PC	Computer Networks	3	0	0	3	30	70	100
5		Professional Elective-I/MOOCs	3	0	0	3	30	70	100
6		Professional Elective-II	3	0	0	3	30	70	100
7	CSM505PC	Data Warehousing and Data Mining Lab	0	0	3	1.5	30	70	100
8	CSM506PC	Design and Analysis of Algorithms Lab	0	0	3	1.5	30	70	100
9	CSM507PC	Computer Networks Lab	0	0	2	1	30	70	100
		Total	**18**	**0**	**8**	**22**	**270**	**630**	**900**
Mandatory Course (Non-Credit)									
10	*IP510MC	Intellectual Property Rights	3	0	0	-	100	-	100

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	CSM601PC	Machine Learning	3	1	0	4	30	70	100
2	CSM602PC	Natural Language Processing	3	1	0	4	30	70	100
3	CSM603PC	Software Engineering	3	1	0	4	30	70	100
4		Professional Elective - III/MOOCs	3	0	0	3	30	70	100
5		Open Elective-I	3	0	0	3	30	70	100
6	CSM604PC	Machine Learning and Natural Language Processing Lab	0	0	3	1.5	30	70	100
7	CSM605PC	Software Engineering Lab	0	0	3	1.5	30	70	100
8	EN606HS	Advanced Communication Skills Lab	0	0	2	1	30	70	100
		Total	**15**	**3**	**8**	**22**	**270**	**630**	**900**
Mandatory Course (Non-Credit)									
9	*ES604BS	Environmental Science	3	0	0	-	100	-	100

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Note:-Environmental Science should be registered by lateral entry students only

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IV YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	CSM701PC	Deep Learning	3	0	0	3	30	70	100
2	CSM702PC	Robotics	2	0	0	2	30	70	100
3		Professional Elective - IV	3	0	0	3	30	70	100
4		Professional Elective - V	3	0	0	3	30	70	100
5		Open Elective - II	3	0	0	3	30	70	100
6	CSM703PC	Deep Learning Lab	0	0	2	1	30	70	100
7	CSM704PC	Industry Oriented Mini Project / Summer Internship	0	0	0	2	--	100	100
8	CSM705PC	Seminar	0	0	2	1	100	--	100
9	CSM706 PC	Project Stage - I	0	0	6	3	30	70	100
Total			**14**	**0**	**10**	**21**	**310**	**590**	**900**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	SM801MS	Organizational Behaviour	3	0	0	3	30	70	100
2		Professional Elective - VI	3	0	0	3	30	70	100
3		Open Elective - III	3	0	0	3	30	70	100
4	CSM802PC	Project Stage - II	0	0	14	7	30	70	100
Total			**9**	**0**	**14**	**16**	**120**	**280**	**400**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

LINEAR ALGEBRA AND CALCULUS

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA101BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix which is used to know the consistency of system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4. Determine the maxima and minima of functions of several variables by using partial differential coefficients.
5. Evaluation of improper integrals using Beta and Gamma functions.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigen vectors , reduce the quadratic form to canonical form using orthogonal transformations.
3. Apply the Mean value theorems for the single variable functions.
4. Apply maxima and minima for functions of several variables and Lagrange's method of multipliers.
5. Evaluate the improper integrals using Beta and Gamma functions.

UNIT-I	MATRICES	Classes: 12

Matrices: Types of Matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, orthogonal matrices, Unitary Matrices, rank of a matrix by Echelon form and Normal form, Inverse of Non-singular Matrices by Gauss-Jordan method, System of linear equations, solving system of Homogeneous and Non- Homogeneous equations. Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II	EIGEN VALUES AND EIGEN VECTORS	Classes:12

Linear Transformation and Orthogonal Transformation, Eigen values and Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III	MEAN VALUE THEOREMS	Classes:12

Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications: Finding areas, volumes of revolutions of curves (Only in Cartesian coordinates)

UNIT-IV	FUNCTIONS OF SEVERAL VARIABLES	Classes: 12

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative, Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers. Application: Errors and approximations.

UNIT-V	FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS	Classes: 12

First Order linear and nonlinear Partial Differential Equations, Method of separation of variables. Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2017.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

REFERENCE BOOKS

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
2. B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-
2. booksdirectory.com/listing.php?category=4https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

APPLIED PHYSICS

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP102BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The fundamental postulates of quantum mechanics.
2. The concepts related to semiconductors.
3. The concepts related to PN Junction diode and its applications.
4. The basic concepts of laser and optical fiber and its applications.
5. The fundamentals of dielectrics and magnetic materials.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

1. Demonstrate the fundamental concepts on Quantum behavior of matter in its microstate.
2. Understand the knowledge of fundamentals of Semiconductor physics.
3. Design and explain the characteristics of Optoelectronic devices.
4. Analyze the properties of Laser and Optical Fibers and its application in engineering fields.
5. Design, characterize and prepare new materials for various engineering applications by using dielectric and magnetic materials.

UNIT-I	QUANTUM MECHANICS	Classes: 12

Introduction to quantum physics, Black body radiation, Planck's Law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II	SEMICONDUCTOR PHYSICS	Classes: 14

Intrinsic and Extrinsic semiconductors, Carrier Concentration in Intrinsic and Extrinsic semiconductors Dependence of Fermi level on Temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics.

UNIT-III	OPTOELECTRONICS	Classes: 10

Radiative and non-radiative recombination mechanisms in semiconductors and LED: Device structure, Materials, Characteristics and figures of merit, Semiconductor photo detectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV	LASERS AND FIBRE OPTICS	Classes: 12

Lasers: Introduction to interaction of radiation with matter, Characteristics, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, He-Ne laser and Semiconductor laser, Applications of laser. Fibre Optics: Introduction, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres in Communication System and Sensors.

UNIT-V	Dielectric and Magnetic Properties of Materials	Classes: 12

Introduction to Dielectrics, Polarization, Permittivity and Dielectric constant, Types of Polarization (Qualitative), Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezo electrics. Magnetization, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and Domain theory of ferromagnetism – Hysteresis curve based on domain theory, Applications of magnetic materials.

TEXT BOOKS

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learning.
2. Halliday and Resnick, Physics-Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar- S.Chand.
4. Introduction to Solid State Physics by Charles Kittel (Publishers: JohnWiley&Sons)

REFERENCE BOOKS

1. Richard Robinett ,Quantum Mechanics.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hillinc.(1995).
3. Online Course: "Optoelectronics Materials and Devices" by Monica Katiyar andDeepak GuptaNPTEL.

WEB REFERENCES

1. Introductory Quantum Mechanics: https://nptel.ac.in/courses/115104096/
2. Fundamental concepts of semiconductor s: https://nptel.ac.in/courses/115102025/
3. Semi conductor Optoelectronics: https://nptel.ac.in/courses/115102103/
4. Fibre Optics: https://nptel.ac.in/courses/115107095/

E -TEXT BOOKS

1. library genesis: https://libgen.is/

MOOCS COURSE

1. Swayam: https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison: https://alison.com/courses?&category=physics

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

PROGRAMMING FOR PROBLEM SOLVING

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS105ES	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able
1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C Programs.
3. To code and test, a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs
6. Searching and sorting problems

UNIT-I	INTRODUCTION TO C PROGRAMMING LANGUAGE	Classes: 16

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc. Number systems Introduction to Algorithms: steps to solve logical and numerical problems, Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.
Introduction to C Programming Language: I/O: Simple input and output with scanf and printf, variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion

UNIT-II	CONDITIONAL BRANCHING, LOOPS, ARRAY AND STRINGS	Classes: 14

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops.

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.

UNIT-III	STRUCTURE AND POINTER	Classes:10

Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self-referential structures in linked list (no implementation), Enumeration data type.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT-IV	FUNCTION AND STORAGE CLASSES	Classes: 12

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Storage classes (auto, extern, static and register)

UNIT-V	FILES AND PRE-PROCESSOR	Classes: 12

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions

TEXT BOOKS

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988,PHI
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Public publications, Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, New Delhi.

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, Reema Theraja, Oxford
2. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998,TMH
3. Theory and problem of programming with C, Byron CGottfried, TMH

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E -TEXT BOOKS

1. https://fresh2refresh.com/c-programming/
2. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
3. https://www.sanfoundry.com/simple-c-programs/

MOOCS Course
1. nptel.ac.in/courses/106105085/4 2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENGINEERING GRAPHICS

I B. TECH- I SEMESTER								
Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME106ES	B. Tech	1	0	4	3	30	70	100

COURSE OBJECTIVES

To learn

1. The course aims at empowering the students with drafting skills and enhancing their visualization capacity in order to draw different views of the given object.
2. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
3. To expose them to existing national standards related to technical drawings.
4. To impart knowledge about standard principles of orthographic projection of objects.
5. It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Familiarize with the fundamentals and standards of Engineering graphics Project orthographic projections of lines and plane surfaces.
2. Convert orthographic views to isometric views and vice-versa and know the basics of AutoCAD.
3. Preparing working drawings to communicate the ideas and information.
4. Know and use common drafting tools with the knowledge of drafting standards.

UNIT-I	INTRODUCTION TO ENGINEERING DRAWING	Classes: 15

Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloids and Involutes.

Scales: Plain & Diagonal Scales.

UNIT-II	ORTHOGRAPHIC PROJECTIONS	Classes:15

Projections of points: Principles of orthographic projections – conventions – first and third angle projections. Projection of points in all quadrants.

Projection Of Lines – lines inclined to single plane, lines inclined to both the planes.

Projection of Planes: Projection of regular planes – planes inclined to one plane, planes inclined to both planes.

UNIT-III	PROJECTION OF SOLIDS & SECTION OF SOLIDS	Classes:12

Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone. Axis inclined to both the reference planes.
Section of Solids: Sectioning of above solids in simple vertical position with the cutting plane is inclined to the one plane and perpendicular to the other–true shape of section.

UNIT-IV	DEVELOPMENT OF SURFACES & ISOMETRIC PROJECTIONS	Classes: 15

Development of Surfaces: Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids.

UNIT-V	TRANSFORMATION OF PROJECTIONS & INTRODUCTION AUTO CAD	Classes: 15

Transformation of Projections: Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.
Introduction to Auto CAD: Introduction, Salient features of AutoCAD software, Basic Commands, construction, editing and dimensioning, two dimensional drawings.

TEXT BOOKS

1 Engineering Drawing - N.D. Bhatt & V.M. Panchal, 50th edition, 2013-Charotar Publishing House, Gujarat.
2 Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3 K.L.Narayana, P. Kannaiah, "Engineering Drawing", SciTech Publishers. 2nd Edition, 2013
4 Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

REFERENCE BOOKS

1 Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011.
2 K. V. Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2015.
3 Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4 Trymbaka Murthy, "Computer Aided Engineering Drawing", I.K. international Publishing House, 3rd Edition, 2011.

WEB REFERENCES

1 http://freevideolectures.com/Course/3420/Engineering-Drawing
2 https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3 https://www.wiziq.com/tutorials/engineering-drawing
4 http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics

E -TEXT BOOKS

1 http://rgpv-ed.blogspot.com/2009/09/development-of-surfaces.html
2 http://www.techdrawingtools.com/12/l1201.htm

MOOCS Course

1 https://nptel.ac.in/course.php
2 https://swayam.gov.in/explorer

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

APPLIED PHYSICS LAB

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP103BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To study semiconductor devices.
2. To verify the Biot –Savart law.
3. To experience resonance phenomena.
4. To compare the experimental results with the class room learning.
5. The basic experimental skills which are very essential for an engineering student.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Learn the working principles of PN Junction diode.
2. Examine the electrical and magnetic properties of materials.
3. Determine the characteristics of Opto-Electronic devices.
4. Understand the basic principles of Optical Fibers.
5. Analyze the basic electronic circuits.

LIST OF EXPERIMENTS

1. **Energy gap of P-N junction diode**: To determine the energy gap of a semiconductor diode.
2. **Solar Cell**: To study the V-I Characteristics of solar cell.
3. **Light emitting diode**: Plot V-I and P-I characteristics of light emitting diode.
4. **Stewart – Gee's experiment**: Determination of magnetic field along axis of the current carrying coil.
5. **Hall Effect**: To determine Hall co-efficient of given semiconductor.
6. **Photoelectric effect**: To determine work function of a given material.
7. **LASER**: To study the characteristics of LASER sources.
8. **Optical Fibre**: To determine the Numerical aperture and bending losses of optical fibres.
9. **LCR Circuit**: To determine the Quality factor of LCR circuit.
10. **RC Circuit**: To determine the Time constant of RC circuit.

NOTE: Any 8 experiments are to be performed

TEXT BOOKS

1. Engineering Physics, B.K. Pandey, S. Chaturvedi –CengageLearning.
2. Halliday and Resnick, Physics-Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar-S.Chand.

REFERENCE BOOKS

1. Main, I. G., Vibrations and Waves in Physics. 2nd. edition. Cambridge University Press,1984.
2. Eugene Hecht, "Optics" , 5thEdition,AdelphiUnioversity,2016

WEB REFERENCES

1. Fundamental concepts of semi conductor s: https://nptel.ac.in/courses/115102025/
2. Semi conductor Optoelectronics:https://nptel.ac.in/courses/115102103/

E -TEXT BOOKS

1. http://www.lehman.edu/faculty/kabat/F2019-166168.pdf
2. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB-MANUAL

MOOCS COURSE

1. Swayam: https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison: https://alison.com/courses?&category=physics

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

PROGRAMMING FOR PROBLEM SOLVING LAB

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS107ES	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems

LIST OF EXPERIMENTS

1. Write a simple program that prints the results of all the operators available in C
2. Write a simple program to convert the temperature from Fahrenheit to Celsius
3. Write a program for find the max and min from the three numbers using if else statement
4. Write a C program to find the roots of a Quadratic equation.
5. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators+,-,*, /, % and use Switch Statement)
6. Write a program that finds if a given number is a prime number
7. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
8. Write a C program to generate the Fibonacci sequence of numbers.
9. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
10. Write a C program to find the minimum, maximum and average in an array of integers
11. Write a C program that uses functions to perform the following:1) Addition of Two Matrices 2) Multiplication of Two Matrices
12. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba,

etc.)

13. To insert a sub- string into a given main string from a given position. e.ii. To delete n Characters from a given position in a given string
14. WriteaCprogramthatdisplaysthepositionofacharacterchinthestring Sor – 1ifSdoesn‘tcontainch
15. Write a C program to count the lines, words and characters in a given text.
16. Define a structure student to store the details like Roll Number, Name, and Marks in three subjects of a student and display the same.
17. Write a C program to perform specified operation on complex numbers.
18. Write a C program to store the information about three students.
19. Write a C Program to illustrate the use of nested structures.
20. Write a C Program to perform arithmetic operations using pointers.
21. Write a C Program to display the array elements in reverse order using pointer.
22. Write a C Program to find factorial of a number using functions.
23. Write a C Program to find factorial of a number using recursive functions.
24. Write a C Program to implement call by value and call by reference.
25. Write a C Program to copy the data from one file to another
26. Write a C Program to append data to the file
27. Write a C Program to merge the two files
28. Write a C Program to display the file content on reverse order.
29. Write a C Program to count number of vowels, consonants, digits, words in a given file

TEXT BOOKS

1. The C Programming Language by Dennis MRitchie, Brian W.Kernigham, 1988, PHI Publications, 2010,NewDelhi.
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Public publications, Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, ReemaTheraja,Oxford
2. Information technology, DennisP. Curtin, KimFoley, Kunal Sen, Cathleen Morin,1998,TMH
3. Theory and problem of programming with C, Byron CGottfried,TMH.

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.w3schools.in/c-tutorial/
3. https://www.cprogramming.com/tutorial/c-tutorial.html
4. www.studytonight.com/c/

E-BOOKS

1. https://nptel.ac.in/courses/106105085/4
2. https://www.coursera.org/courses?query=c%20programming

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENVIRONMENTAL SCIENCE

I B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*ES104BS	B. Tech	3	0	0	-	100	-	100

COURSE OBJECTIVES

To learn

1. Analyze the inter relationship between living organism and environment
2. Describe various types of natural resources available on the earth surface
3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity
4. Explain the causes, effects and control measures of various types of environmental pollutions
5. Understand the importance of environment by assessing its impact on the human world

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Differentiate between various biotic and abiotic components of ecosystem
2. Describe the various types of natural resources
3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India
4. Illustrate causes, effects, and control measures of various types of environmental pollutions
5. Understand technologies on the basis of ecological principles environmental regulations which in turn helps in sustainable development

UNIT-I	ECOSYSTEMS	Classes: 8

Definition, Scope, and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification.

UNIT-II	NATURAL RESOURCES	Classes: 8

Classification of Resources: Living and Non-Living resources.
Water resources: use and overutilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
Land resources: Forest resources.
Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 7
Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic, optional values and hotspots of biodiversity. Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.		
UNIT-IV	**ENVIRONMENTAL POLLUTION**	**Classes: 9**
Types of pollution, Causes, effects and prevention and control measures of air, water, soil, noise and thermal pollution. Solid waste and e-waste management.		
UNIT-V	**ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPEMENT**	**Classes: 10**
Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion- crazy consumerism. Green building concept. Water conservation, Rainwater harvesting, watershed management. Environmental Policies and Legislations: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Forest (conservation) Act, 1980. Wildlife Protection Act.		

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi,12th Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, New Delhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, New Delhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition

WEB REFERENCES

1. https://www.britannica.com/science/ecosystem
2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXT BOOKS

1. P N Palanisamy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Second edition
2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413,9788131806418.

MOOCS COURSE

1. https://nptel.ac.in/courses/122103039/38
2. https://nptel.ac.in/courses/106105151/12

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ADVANCED CALCULUS

I B. TECH- II SEMESTER								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
MA201BS	**B. Tech**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. Methods of solving the differential equations of first and higher order
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions
4. The basic properties of vector valued functions and their applications
5. Vector point functions and scalar point functions

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify whether the given differential equation of first order is exact or not.
2. Solve higher order differential equation and apply the concept of differential equation to real problems.
3. Evaluate the multiple integrals and apply the concept to find areas and volumes.
4. Is able to find gradient, directional derivative, divergence and curl.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I	**FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS**	**Classes: 10**

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Applications: Newton's law of cooling, Law of natural growth and decay, Simple Harmonic Motion

UNIT-II	**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**	**Classes: 12**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sinax, cosax, polynomial in x^m, $e^{ax}V(x)$ and xV(x),method of variation of parameters, Applications: LCR Circuit.

UNIT-III	MULTIPLE INTEGRATION	Classes:12
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals)		
UNIT-IV	**VECTOR DIFFERENTIATION**	**Classes: 12**
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors		
UNIT-V	**VECTOR INTEGRATION**	**Classes: 12**
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications		

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCE BOOKS

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENGINEERING CHEMISTRY

I B. TECH- II SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH202BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To provide basic knowledge on atomic, molecular orbitals and the bonding interaction between atoms
2. To analyze the impact of water hardness and its various methods for removal of hardness of water, numerical problems to calculate the hardness of water in a given sample
3. To discover the importance of electrical energy which originates from chemical reactions essential for industrial needs
4. Tounderstandthebasicconceptsofspectroscopyanddrugmoleculestoextrapolatetheir chemical knowledge in day to day life
5. To enable the students to understand the use of engineering materials such as polymers, lubricants and study the industrial applications in the field of engineering and technology

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Achieve the basic concepts of atomic, molecular and electronic changes related to molecular bonding and magnetism
2. Familiarize with fundamentals of treatment technologies and considerations for its design and implementation in water treatment plants
3. To extrapolate the knowledge of cell, electrode, electrolysis, electromotive force. To analyze and develop a technical solution to corrosion problems related to engineering materials
4. Acquire the significant knowledge about basic concepts of spectroscopy and synthesis of drug molecules would be known to the students
5. Comprehended and explore engineering applications of polymers and lubricants

UNIT-I	MOLECULAR STRUCTURE AND THEORIES OF BONDING	Classes: 10

Introduction to VBT, Postulates and draw backs of VBT- Atomic and Molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Introduction to Crystal Field Theory (CFT): Salient featuresofCFT-CrystalFieldSplittingoftransitionmetaliond-orbitals in tetrahedral, octahedral and square planar geometries. Applications of CFT- color and magnetic properties.

Postulates of MOT, molecular orbitals of diatomic molecules-molecular orbital energy level diagrams of N_2, O_2 and CO molecules.

UNIT-II	WATER AND ITS TREATMENT	Classes: 12

Introduction-hardness of water-causes of hardness. Types of harness: Temporary and Permanent. Expression and units of hardness. Estimation of hardness of water by complex metric method (EDTA method), Numerical problems. Boiler troubles- scales, sludges, carryover and caustic embrittlement. Internal treatment- Calgon conditioning, phosphate conditioning and colloidal conditioning. External treatment of water- Ion exchange process. Desalination of brackish water- Reverse osmosis. Potable water and its specifications. Steps involved in the treatment of water by chlorination and ozonization.

UNIT-III	ELECTROCHEMISTRY AND CORROSION	Classes: 14

Electrochemical cells- electrode potential, standard electrode potential, Galvanic cell, Nernst equation- Applications. EMF of a cell. Types of electrodes-standard hydrogen electrode, calomel and glass electrode- construction and working. Numerical problems.

Batteries - Primary (Lithium cell) and secondary batteries (Lithium ion, Lead acid storage cell)- Applications.

Corrosion: Introduction, Causes and effects of corrosion- theories of chemical and electrochemical corrosion- mechanism of electrochemical corrosion. Corrosion control methods- Cathodic protection-sacrificial anode and impressed current cathodic methods. Metallic coatings- Methods of preparation of surface- Hot dipping- Galvanization and tinning. Electro plating and electro less plating.

UNIT-IV	SPECTROSCOPY AND SYNTHESIS OF DRUG MOLECULES	Classes: 08

Spectroscopy- Introduction, electromagnetic spectrum, principles of UV-visible, IR spectroscopy- selection rules and applications. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift, spin-spin splitting. Magnetic resonance imaging.

Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT-V	MATERIAL CHEMISTRY	Classes: 12

Polymers: Introduction, Classification of polymers with examples. Types of polymerization: Addition and Condensation polymerization with examples.

Plastics: Introduction, Characteristics. Thermoplastic and thermosetting plastics. Compounding and fabrication of plastics (compression and injection molding). Preparation, properties and engineering applications of PVC, Teflon and Bakelite.

Lubricants: Introduction, Characteristics, mechanism-thick film, thin film, extreme pressure lubrication, properties- flash point, fire point, cloud point, pour point, mechanical stability and their significance- applications of lubricants.

TEXT BOOKS

1. P. C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,18th edition(2018)
2. Prasanta Rath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, "A Text book of Engineering Chemistry", Cengage publications(2019)
3. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai & Co. Publishers., New Delhi,15thedition(2015)
4. C.N. Banwell, "Fundamentals of MolecularSpectroscopy"

REFERENCE BOOKS

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013)
2. B.R.Puri,L.R.SharmaandM.S.Pathania,"PrinciplesofPhysicalChemistry",S.Nagin Chand & Company Ltd., 46th edition(2013)
3. J.D. Lee, "Concise Inorganic Chemistry", Willey Publications, 5th edition(2008)
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition(2006)
5. G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C. Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad(2007)

WEB REFERENCES

1. Chemistry: foundations and applications. J. J. Lagowski, editor in chief. New York, Macmillan Reference USA, c2004. 4v
2. Polymer data handbook. Edited by James E. Mark. 2nd ed. Oxford, New York, Oxford University Press, 2009
3. https://www.wyzant.com/resources/lessons/science/chemistry
4. http://www.chem1.com/acad/webtext/virtualtextbook.html

E -TEXT BOOKS

1. Krishnamurthy, N., Vallinayagam, P., Madhavan, D., Engineering Chemistry, ISBN: 9789389347005, eBook ISBN: 9789389347012, Edition: FourthEdition
2. Vijayasarathy, P. R., Engineering Chemistry, Print Book ISBN : 9789387472778, eBook ISBN : 9789387472785, Edition : Third Edition

MOOCS COURSE

1. https://onlinecourses-archive.nptel.ac.in
2. https://www.mooc-list.com/tags/chemistry

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

BASIC ELECTRICAL ENGINEERING

I B. TECH- II SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE206ES	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. To analyze and solve electrical circuits using network laws.
2. To analyze and solve electrical circuits using theorems.
3. To understand and analyze basic Electric and Magnetic circuits.
4. To study the working principles of Electrical Machines.
5. To introduce components of Low Voltage Electrical Installations.

UNIT-I	D.C.CIRCUITS	Classes:15

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, The venin's and Nortons Theorems.

Time-domain analysis of first-order RL and RC circuits.

UNIT-II	A.C.CIRCUITS	Classes:10

Representationofsinusoidalwaveforms,peakandrmsvalues,phasorrepresentation,realpower, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L,C,RL,RC,RLCcombinations(seriesandparallel),resonanceinseriesRL-Ccircuit.

UNIT-III	TRANSFORMERS	Classes:15

Ideal and practical transformer, EMF equation, operation on no load and on load, OC and SC tests, phasor diagrams equivalent circuit, losses in transformers, regulation, Efficiency and condition for maximum efficiency, Auto-transformer.

UNIT-IV	ELECTRICALMACHINES	Classes:15
Generation of rotating magnetic fields, Construction and working of a three-phase induction Motor, Significance of torque-slip characteristics. Loss components and efficiency. Construction, working, Torque-speed characteristics of separately excited, shunt, series, compound dc motors.		
UNIT-V	**ELECTRICALINSTALLATIONS**	**Classes:10**
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.		

TEXTBOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010,Tata, McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009.
3. L.S.Bobrow,FundamentalsofElectricalEngineering",OxfordUniversityPress,2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCEBOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
2. P. V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1stEdition,2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice Hall India, 1989.

WEBREFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-
4. resistance/a/ee-voltage-and-current
5. https://circuitglobe.com/

E -TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCSCOURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENGINEERING WORKSHOP

I B. TECH- II SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME207ES	B.Tech	1	0	3	2.5	30	70	100

COURSE OBJECTIVES

To learn

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at workplace.
5. It explains the construction, function, use and application of different working tools, equipment and machines.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including Fitting, Carpentry, Foundry, Tin-smithy, House Wiring and Welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

TRADES FOR EXERCISES (Any two exercises from each trade)

1. Tin-Smithy – (Square Tin, Cone and Cylinder)
2. Carpentry – (T-Lap Joint, Planning Sawing & Dovetail Joint)
3. Welding Practice – (Arc Welding-Butt Joint, Lap Joint & T-Joint)
4. Black Smithy – (Round to Square, S-Hook & U-Clamp)
5. Foundry – (Mould using Single Piece and Split Pattern)
6. Fitting – (V-Fit, Square Filing & Semi-circular fit)
7. House-wiring – (Two-way Switch and one-way switch inseries)

TRADES FOR DEMONSTRATION

8. Plumbing, Machine Shop, Power tools in construction, Wood turning lathe and Casting Process.

Note: At least perform 10 Exercises out of 14 Exercises.

TEXT BOOKS

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ ScitechPublishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/SixthEdition
3. Workshop Technology byChapman
4. A Textbook Of Workshop Technology : Manufacturing Processes/J. KGUPTA

REFERENCE BOOKS

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Technology byHazra-Chowdhary
4. Production Engineering byR.K.Jain

WEB REFERENCES

1. https://nptel.ac.in/courses/112105126/
2. https://nptel.ac.in/downloads/112105127/
3. https://nptel.ac.in/courses/112107145/
4. https://nptel.ac.in/courses/122104015/

E -TEXT BOOKS

1. http://103.135.169.82:81/fdScript/RootOfEBooks/MED/Introduction Workshop%20Technology
2. https://www.quora.com/Download-free-mechanical-engineering-ebooks-sites

MOOCS Course

1. http://www.nits.ac.in/workshops/Workshop_on_MOOCS_26082017.pdf
2. https://www.nitttrc.ac.in/swayam/index.html

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

PROFESSIONAL ENGLISH

I B. TECH- II SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN203HS	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES:

To enable students

1. To enhance their vocabulary and basic grammar rules for communicative competence.
2. To hone their comprehensive skills through various reading techniques.
3. To develop the professional writing with the practice of formal letters, e-mails, reports, resumes, etc.
4. To use various sentence structures effectively in formal and informal on texts.
5. To improve scientific and technical communication skills through technical vocabulary and appropriate prose texts.

COURSE OUTCOMES:

Upon successful completion of the course, the students are able to

1. Use vocabulary effectively and syntactically.
2. Translate the reading techniques and apply them in literary texts.
3. Demonstrate enhanced competence in standard Written English.
4. Develop the competence in writing professional documents.
5. Exhibit appropriate communicative approaches to suit various contexts.

UNIT-I	THE RAMAN EFFECT	Classes:7

Vocabulary: Word Formation, Use of affixes, Grammar: Articles, Prepositions

Writing: Paragraph Writing, Organizing principles of Paragraphs in documents

UNIT-II	THE LOST CHILD	Classes:9

Vocabulary: Synonyms and Antonyms.

Grammar: Noun – Pronoun Agreement and Concord.

Reading: Significance & Techniques of reading; Skimming – Reading for the gist of a text; Scanning– Reading for specific information; Intensive; Extensive reading; SQ3R Technique; Reading Comprehension; Reading Poetry -The Road Not Taken Writing: Narrative Writing

UNIT-III	SATYA NADELLA'S EMAIL TO HIS EMPLOYEES	Classes:10

Vocabulary: Homonyms-Homophones-Homographs Grammar: Tenses Writing : Significance & Effectiveness of Writing; Writing Descriptions; Letter writing; E-mail writing

UNIT-IV	WHAT SHOULD YOU BE EATING?	Classes:10
Vocabulary: Technical vocabulary; Words from Foreign Languages; abbreviations and acronyms Grammar: Misplaced Modifiers; Redundancies and Cliches. Writing: Information Transfer, Note Making, Writing an Abstract and Report Writing		
UNIT-V	**HOW A CHINESE BILLIONAIRE BUILT HER FORTUNE**	**Classes:9**
Vocabulary: Words often Confused; Idioms and Phrasal verbs, One- word Substitutes; Grammar: Conditional Sentences; Degrees of Comparison; Simple-Complex- Compound Sentences and Common errors Writing: Essay writing		

TEXT BOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
2. Education for Life and Work – English Workbook prepared by English Faculty of St. Martin's Engineering College.

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Zinsser, William. (2001). On Writing Well. Harper Resource Book.

WEB REFERENCES:

1. www.edufind.com
2. www.myenglishpages.com
3. http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E –TEXTBOOKS:

1. http://bookboon.com/en/communication-ebooks-zip
2. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamlespdf.pdf

MOOCS COURSE:

1. https://mooec.com/courses/grammar-guru-1
2. https://mooec.com/courses/learning-styles

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENGINEERING CHEMISTRY LAB

I B. TECH- II SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH204BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose
2. To find the concentration of ions present in an unknown solution
3. To know the handling procedure of colorimetric and conduc to metric instruments
4. The fundamentals of drug synthesis
5. The measurement of physical properties like surface tension, viscosity and acid value

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the total dissolved salts present in a sample of water
2. Determine the concentration of ions existing in a solution
3. Find the strength of an acid by conduct to metric methods
4. Acquire basic knowledge on the chemical reaction used to synthesize drug molecules like aspirin and Paracetamol
5. Select lubricants for various purposes such as to reduce the friction between two movable surfaces and to determine the surface tension of a given liquid

LIST OF EXPERIMENTS

Volumetric Analysis

1. Determination of total hardness of water by complex metric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Determination of acid value of coconut oil.

Potentiometry

4. Determination of Fe^{2+} ions present in the given sample by Potentiometric titration.

Conductometry

5. Estimation of HCl by conductometric titration.
6. Estimation of acetic acid by conductometric titration.

Colorimetry

7. Estimation of Copper by colorimetric method.

Synthesis of Drugs

8. Synthesis of aspirin and Paracetamol.

Physical constants

1. Determination of viscosity of the given sample by using Ostwald's Viscometer.
2. Determination of surface tension of a given liquid using stalagmometer.

TEXT BOOKS

1. Senior practical physical chemistry, B. D. Khosla, A. Gulati and V. Garg (R. Chand and Co.,Delhi)
2. Prasanta Rath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, "A Text book of Engineering Chemistry", Cengage publications(2019)
3. An introduction to practical; chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, NewDelhi)
4. Vogel's text book of practical organic chemistry, 5edition
5. S. S. Dhara, Text book on experiments and calculations in engineering chemistry, B.S Publications

REFERENCE BOOKS

1. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis"
2. O. P. Vermani & Narula, "Theory and Practice in Applied Chemistry", New Age International Publishers
3. Gary D. Christian, "Analytical chemistry", 6th Edition, Wiley India.

WEB REFERENCES

1. Phillip E. Savage, Industrial & Engineering Chemistry: At the Forefront of Chemical Engineering Research since 1909, *Ind. Eng.Chem.Res.*20195811
2. Elias, AI. Sundar Manoharan S. and Raj, H. "Laboratory Experiments for General Chemistry", I.I.T. Kanpur,1997

E -TEXT BOOKS

1. Payal B Joshi, Experiments In Engineering Chemistry, Edition: First, ISBN:978-93- 85909-13-9, Publisher: I.K. International Publishing House Pvt. Ltd
2. Mohapatra, Ranjan Kumar, Engineering Chemistry With Laboratory Experiments, ISBN: 978- 81-203-5158-5, PHI Learning Private Limited

MOOCS COURSE

1. https://sce.ethz.ch/en/programmes-and-courses/sucheangebote.html?polycourseId=1299
2. https://www.classcentral.com/course/open2study-chemistry-building-blocks-of-the-world-1297

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I B. TECH- II SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN205HS	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES:

To train students

1. To use accurate and appropriate pronunciation through the practice of phonetic sounds, symbols, word accent and intonation.
2. To improve their fluency in spoken English and neutralize their mother tongue influence through JAM Sessions, Role-play, etc.
3. To comprehend the speech of people of various regions through Listening practice exercises.
4. To enable students to transfer information verbally with the right usage of Body language through individual and group activities.
5. To understand nuances of English language by practicing various exercises at Multi-media lab.

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

1. Differentiate the speech sounds in English and demonstrate accurate pronunciation.
2. Communicate with others in clear and confident manner.
3. Improve their effective and empathetic listening ability.
4. Show the zeal to participate in Public Speaking Sessions.
5. Neutralize the Mother tongue influence in day to communication.

LIST OF EXPERIMENTS:

EXERCISE: I CALL

LAB:

Introduction to Phonetics – Speech sounds - vowels and consonants

ICS LAB:

Ice-breaking Activity – Non-verbal Communication

EXERCISE: II

CALL LAB:

Minimal Pairs – Consonant Clusters – Past Tense Marker and Plural Marker Rules

ICS LAB:

Role Play – Expressions in various Situations – Making Requests and Seeking Permissions

EXERCISE: III

CALL LAB:

Structure of Syllables – Word Accent –Stress shift–Intonation

ICS LAB:

Telephone Communication –Etiquette

EXERCISE: IV CALL

LAB:

Listening Comprehension Tests

ICS LAB:

Presentations Skills & JAM Session

EXERCISE: V CALL

LAB:

Mother Tongue Interference – Differences in British and American Pronunciation

ICS LAB:

Interview Skills – Mock Interviews

TEXTBOOKS:

1. ELCS Lab Manual prepared by English faculty of St. Martin's Engineering College.
2. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

REFERENCE BOOKS:

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students,Macmillan,2008
2. J Sethi et al. A Practical Course in English Pronunciation, Prentice Hall India,2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press PvtLtd2011.
4. Arun Koneru, Professional Speaking Skills, Oxford UniversityPress,2016.

WEB REFERENCES:

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References
2. Argyle, Michael F., Alkema, Florisse, & Gilmour, Robin."The communication of friendly and hostile attitudes: Verbal and nonverbal signals." European Journal of Social Psychology, 1, 385-402:1971
3. Blumer, Herbert. Symbolic interaction: Perspective and method. Engle wood Cliffs; NJ: PrenticeHall.1969

E –TEXTBOOKS:

1. Mc corry Laurie Kelly Mc Corry Jeff Mason, Communication Skills forthe Healthcare Professional, 1st edition,ISBN:1582558140, ISBN-13:9781582558141
2. Robert Eowens, Jr, Language Development, 9th edition, ISBN:0133810364,9780133810363

MOOCS COURSE:

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

BASIC ELECTRICAL ENGINEERING LABORATORY

I B. TECH- II SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE208ES	B. Tech	0	0	2	1	30	70	100

COURSEOBJECTIVES:

To learn
1. To analyze a given network by applying various electrical laws
2. To analyze a given network by applying various network theorems
3. To know the response of electrical circuits for different excitations
4. To calculate, measure and know the relation between basic electrical parameters.
5. To analyze the performance characteristics of DC and AC electrical machines

COURSEOUTCOMES:

Upon successful completion of the course, the student is able to
1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits
3. Understand the response of different types of electrical Theorems
4. Understand different types of Excitations.
5. Understand the basic characteristics of transformers and electrical machines.

LIST OFEXPERIMENTS

PART-A

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit.
6. Verification of Super position theorem.
7. Verification of Thevenin's Theorem.
8. Verification of Norton's Theorem.

PART-B

9. O.C. & S.C. Tests on Single Phase Transformer.
10. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor

*Note: Any five experiments from Part-A and Part-B.

TEXT BOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rdedition2010,Tata
2. McGraw Hill.
3. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009.
4. L.S.Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
5. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCE BOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India,1989.
2. P.V.Prasad, S.sivanagaraju, R.Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice Hall India,1989.

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/a/ee-voltage-and-current
4. https://circuitglobe.com/

E -TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCS Course

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

DISCRETE MATHEMATICS

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM301PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn
1. The elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Understand and construct precise mathematical proofs.
2. Use logic and set theory to formulate precise statements.
3. Analyze and solve counting problems on finite and discrete structures.
4. Describe and manipulate sequences.
5. Apply graph theory in solving computing problems.

UNIT-I	FOUNDATIONS	Classes: 11

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II	SETS AND RELATIONS	Classes: 11

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations, Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT-III	INDUCTION AND RECURSION	Classes: 12

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms
Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness

UNIT-IV	DISCRETE PROBABILITY AND ADVANCED COUNTING TECHNIQUES	Classes: 11

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion

UNIT-V	GRAPHS AND TREES	Classes: 11

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

TEXT BOOKS

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, TMH.

REFERENCE BOOKS

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R.Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed, Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7Th Edn., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

WEB REFERENCES

1. https://math.dartmouth.edu/archive/m19f03/public_html/
2. https://nptel.ac.in/courses/106/106/106106094/

E -TEXT BOOKS

1. Discrete Mathematics, An Open Introduction, Oscar Levin.

MOOCS COURSES

1. https://www.edx.org/learn/discrete-mathematics
2. https://www.udemy.com/course/discrete-math/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

DATA STRUCTURES

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM302PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Exploring basic data structures such as stacks and queues.
2. A variety of data structures such as hash tables, search trees, tries, heaps, graphs
3. Sorting and pattern matching algorithms

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Select the data structures that efficiently model the information in a Problem.
2. Assess efficiency trade-offs among different data structure Implementations or combinations.
3. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
4. Implement and know the application of algorithms for sorting and pattern matching
5. Implement and know the application of algorithms in Graph Traversal methods.

UNIT-I	INTRODUCTION TO DATA STRUCTURES	Classes: 12

Introduction to Data Structures: Abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

UNIT-II	DICTIONARIES AND HASH TABLE	Classes: 12

Dictionaries: Linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash Table Representation: Hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III	SEARCH TREES	Classes: 10

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red - Black, Splay Trees.		
UNIT-IV	**GRAPHS AND SORTING**	**Classes: 12**
Graphs: Graph Implementation Methods. Graph Traversal Methods. **Sorting**: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Heap Sort, External Sorting-Model for external sorting, Merge Sort.		
UNIT-V	**PATTERN MATCHING AND TRIES**	**Classes: 12**
Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.		

TEXT BOOKS

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOKS

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
2. Classic Data Structures, D. Samanta, 2nd edition, PHI.

WEB REFERENCES

1. Alfred Aho, John Hopcroft, and Jeffrey Ullman, Data Structures and Algorithms, Addison-Wesley, 1983, ISBN 0-201-00023-7.
2. https://www.studytonight.com/data-structures/introduction-to-data-structures
3. https://nptel.ac.in/courses/106/102/106102064/

E -TEXT BOOKS

1. Peter Brass, Advanced Data Structures, Cambridge University Press, 2008, ISBN 978-0521880374
2. G. H. Gonnet and R. Baeza-Yates, Handbook of Algorithms and Data Structures - in Pascal and C, second edition, Addison-Wesley, 1991, ISBN 0-201-41607-7.

MOOCS COURSES

1. https://www.udemy.com/data-structures-and-algorithms
2. https://onlinecourses.swayam2.ac.in/cec21_cs02/preview

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

MATHEMATICAL AND STATISTICAL FOUNDATIONS

II B. TECH-I SEMESTER								
Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA301BS	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. The Number Theory basic concepts useful for cryptography etc
2. The theory of Probability and probability distributions of single and multiple random variables
3. The sampling theory and Estimating Parameters
4. Testing of hypothesis and making inferences
5. Stochastic process and Markov chains.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Apply the number theory concepts to cryptography domain.
2. Apply the concepts of probability and distributions to some case studies.
3. Correlate the material of one unit to the material in other units.
4. Estimating a Proportion of single mean and difference of means
5. Resolve the potential misconceptions and hazards in each topic of study.

UNIT-I	GREATEST COMMON DIVISORS AND PRIME FACTORIZATION	Classes: 8

Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers, Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

UNIT-II	SIMPLE LINEAR REGRESSION AND CORRELATION AND RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS	Classes: 8

Simple Linear Regression and Correlation: Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete

Probability Distributions, Continuous Probability Distributions, Statistical Independence. Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT-III	CONTINUOUS PROBABILITY DISTRIBUTIONS AND FUNDAMENTAL SAMPLING DISTRIBUTIONS	Classes:8

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial

Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t–Distribution, F- Distribution.

UNIT-IV	ESTIMATION & TESTS OF HYPOTHESES	Classes: 8

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean , Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

UNIT-V	STOCHASTIC PROCESSES AND MARKOV CHAINS	Classes: 8

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, nstep transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison- Wesley, ISBN 978-0-321-50031-1.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

REFERENCE BOOKS

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
2. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4 2. https://www.e-booksdirectory.com/details.php?ebook=10830
MOOCS COURSE
1. https://swayam.gov.in/ 2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

COMPUTER ARCHITECTURE AND ORGANIZATION

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM304PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn
1. The principles of computer organization and the basic architectural concepts.
2. The basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

UNIT-I	BASIC OPERATIONS	Classes: 14

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-II	CPU & MICRO PROGRAMMED CONTROL	Classes: 13

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT-III	DATA REPRESENTATION AND COMPUTER ARTIHMETIC	Classes: 12

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-IV	INPUT-OUTPUT AND MEMORY ORGANIZATION	Classes: 11

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT-V	PIPELINE PROCESSING AND MULTI PROCESSORS	Classes: 11

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor arbitration, Inter processor communication and synchronization, Cache Coherence.

TEXT BOOKS

1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4thEdition, PHI/Pearson.

WEB REFERENCES

1. "Computer Organization and Design: The Hardware/Software Interface" by David A Patterson and John L Hennessy
2. "Computer Organization" by Zvonco Vranesic and SafwatZaky"
3. Computer Architecture and Organization" by John P Hayes.

E -TEXT BOOKS

1. Fundamentals of Computer organization and Design by Shivarama Dandamudi
2. Computer Architecture: Complexity and Correctness by Mueller and Paul

MOOCS COURSES

1. https://www.mooc-list.com › tags ›computer-architecture
2. https://www.edx.org › course ›computation-structures-3-computer-mitx-6

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

PYTHON PROGRAMMING

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM305PC	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

To learn
1. Learn Syntax and Semantics and create Functions in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python.
3. Handle Strings and Files in Python.
4. Implement Object Oriented Programming and graphics concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming and graphics as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT-I	INTRODUCTION TO PYTHON	Classes: 13

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types
Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules
Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT-II	FILES, EXCEPTIONS AND MODULES	Classes: 12

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management,
Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Why Exceptions?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules
Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT-III	FUNCTIONS AND OBJECT-ORIENTED PROGRAMMING	Classes: 12

Functions: What are functions? Calling Functions, Creating Functions, Passing Functions, Formal Arguments, Variable-Length Arguments, Functional Programming, Recursion.
Object Oriented Programming: Introduction, Classes, Instances, Binding and Method Invocation, Inheritance, Built-in Functions, Customizing Classes, Privacy, Delegation and Wrapping.

UNIT-IV	REGULAR EXPRESSIONS AND MULTITHREADING	Classes: 12

Regular Expressions: Introduction, Special Symbols and Characters, re Module.
Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT-V	GUI AND WEB PROGRAMMING	Classes: 12

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs
WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers

TEXT BOOKS

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Learning Python, Mark Lutz, O'Reilly.

WEB REFERENCES

1. https://www.tutorialspoint.com/python3/
2. https://www.geeksforgeeks.org/cgi-programming-python/
3. https://realpython.com/python-beginner-tips/
4. https://www.python.org/

E -TEXT BOOKS

1. https://www.tutorialspoint.com/python3/
2. https://books.goalkicker.com/PythonBook/

MOOCS COURSES

1. https://www.coursera.org/learn/python-programming
2. https://www.edx.org/professional-certificate/python-data-science
3. https://swayam.gov.in/nd1_noc19_cs41/preview
4. https://swayam.gov.in/nd1_noc19_mg47/preview
5. https://swayam.gov.in/nd1_noc19_cs40/preview

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
BE304MS	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To learn the basic Business types, impact of the Economy on Business and firms specifically.
2. To analyze the Business from the Financial Perspective.
3. To Plan production and cost concepts for maximizing profit.
4. To construct financial statement in accordance with generally accepted accounting principles.
5. To Analyze the Financial performance of business through Ratios
6. To Estimate investment proposals through Capital Budgeting Methods

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand Business with the use of economic theories and business structure
2. Learn Production and cost concepts for maximizing profit
3. Construct financial statement in accordance with generally accepted accounting principles.
4. Analyze the Financial performance of business through Ratios.
5. Estimate investment proposals through Capital Budgeting Methods

UNIT-I	INTRODUCTION TO BUSINESS AND ECONOMICS	Classes: 10

Business: Characteristic features of Business, Features and evaluation of Private Enterprises and Public Enterprises.
Economics: Significance of Economics, types, Concepts and Importance of National Income, Inflation, Nature and Scope of Business Economics.
Demand Analysis: Demand Definition, Types of Demand, Demand Function, Law of Demand, Elasticity of Demand, Types of Elasticity of Demand, Demand Forecasting Methods.

UNIT-II	THEORY OF PRODUCTION AND COST ANALYSIS	Classes:8

Theory of Production: Factors of Production, Production Function, Production Function with one variable input, Production function with two variable inputs (ISO Quants and ISO Costs), Scale of Production with Law of Returns , Cobb-Douglas Production Function.
Cost Analysis: Types of Costs, Short run and Long run Cost Functions, Break Even Analysis.

UNIT-III	MARKET STRUCTURES, PRICING & FINANCIAL ACCOUNTING	Classes: 10

Market Structures, Pricing: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition, Types of Pricing. Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.		
UNIT-IV	**FINANCIAL ANALYSIS THROUGH RATIOS**	**Classes: 8**
Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Capital Structure Ratios and Profitability Ratios, (simple problems), Cash Flow Statement (simple problems) and Funds Flow Statement (simple problems)		
UNIT-V	**CAPITAL BUDGETING**	**Classes: 8**
Capital, significance, Types of Capital, Methods and sources of raising finance. Nature of Capital Budgeting, features of Capital Budgeting proposals, Methods of Capital Budgeting: Pay Back Period Method (PBP), Accounting Rate of Return (ARR), Net Present Value Method (NPV) Simple problems.		

TEXT BOOKS

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

WEB REFERENCES

1. https://nptel.ac.in/courses/110106050/17
2. https://nptel.ac.in/courses/110106050/39
3. https://nptel.ac.in/courses/110106050/38

E -TEXT BOOKS

1. https://www.sciencedirect.com/book/9780750644549/business-economics
2. http://www.freebookcentre.net/Business/Economics-Books.html

MOOCS COURSE

1. https://nptel.ac.in/courses/110106050/
2. https://nptel.ac.in/courses/110106050/11

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

DATA STRUCTURES LAB

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM307PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. It introduces searching and sorting algorithms
2. It provides an understanding of data structures such as stacks and queues.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Able to identify the appropriate data structures and algorithms for solving real World problems.
2. Able to implement various kinds of searching and sorting techniques.
3. Able to implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.

LIST OF EXPERIMENTS

1. Write a program that uses functions to perform the following operations on singly linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal

4. Write a program that implement Stack operations using Arrays and Pointers.
5. Write a program that implement Queue operations using Arrays and Pointers.
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order

   i) Bubble sort ii) Selection sort iii) Insertion sort iv) Quick sort v) Merge sort
7. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers:

   i) Linear search ii) Binary search
8. Write a program to implement the tree traversal methods.
9. Write a program to implement the graph traversal methods.

TEXT BOOKS

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOKS

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

WEB REFERENCES

1. "Python Data Structures and Algorithms" by Benjamin Baka.

E -TEXT BOOKS

1. Data Structures in C Nair, Achuthsankar S. Mahalakshmi,T.

MOOCS COURSES

1. https://nptel.ac.in/courses/106/106/106106127/
2. https://nptel.ac.in/courses/106/106/106106145/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

PYTHON PROGRAMMING LAB

II B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM308PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Core programming basics and program design with functions using Python programming language.
2. A range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. The high-performance programs designed to strengthen the practical expertise.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write, test, and debug simple Python programs.
2. Implement Python pattern programs with conditionals and loops.
3. Develop Python programs step-wise by defining functions and calling them, Read and write data from/to files in Python.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Design a gaming.

LIST OF EXPERIMENTS

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23IST 2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula : c/5 = f-32/9]

10. Write a Python program to construct the following pattern, using a nested for loop

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.

TEXT BOOKS

1. A Practical Introduction to Python Programming, Brian Heinold.
2. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
3. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. Think Python First Edition, by Allen B. Downey, Orielly publishing.

REFERENCE BOOKS

1. Learn Python in 1 Day: Complete Python Guide with Examples Kindle Edition
2. Python Crash Course Paperback – 8 Dec 2015 by Eric Matthes
3. Python Cookbook: Recipes for Mastering Python 33rd Edition, Kindle Edition

WEB REFERENCES

1. Python Programming (Edit): An Introduction to Computer Science Paperback– 7 May 2010
2. Programming Python 4e Paperback – 14 Jan 2011 by Mark Lutz
3. Introduction to Machine Learning with Python Paperback – 7 Oct 2016 by Andreas C. Mueller (Author), Sarah Guido

E -TEXT BOOKS

1. http://www.oreilly.com/programming/free/a-whirlwind-tour-of-python.csp
2. http://www.oreilly.com/programming/free/20-python-libraries-you-arent-using- but-should.csp
3. http://www.oreilly.com/programming/free/hadoop-with-python.csp
4. http://www.oreilly.com/programming/free/how-to-make-mistakes-in-python.csp

MOOCS COURSES
1. https://www.mooc-list.com › tags › python-programming 2. https://www.mooc-list.com › tags › python 3. https://www.edx.org › learn › python 4. https://www.udacity.com › course › introduction-to-python--ud1110

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

GENDER SENSITIZATION LAB

II B. TECH- I SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*GS309MC	B. Tech	0	0	2	0	100	-	100

COURSEOBJECTIVES:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.

COURSEOUTCOMES:

Upon successful completion of the course

1. Students will have developed a better understanding of vital issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from various knowledge sources.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
5. Men and women students and professionals will be better equipped with impartiality to work and live together as equals and develop a sense of appreciations of women.

UNIT-I	UNDERSTANDING GENDER	Classes:8

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men-Preparing for Womanhood. Growing up Male.

UNIT-II	GENDER ROLE AND RELATIONS	Classes:8

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

UNIT-III	GENDER AND LABOUR	Classes:8
Division and Valuation of Labor-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming		
UNIT-IV	**GENDER BASED VIOLENCE**	**Classes:8**
The Concept of Violence-Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: "*Chupulu"*. Domestic Violence: Speaking Out: Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."		
UNIT-V	**GENDER AND CULTURE**	**Classes:8**
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues -Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals-Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart)		

TEXT BOOKS:

1. A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu, The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by published by Telugu Akademi, Telangana Government (2015).
2. Raj Pal Singh, Anupama Sihag, "Gender Sensitization: A World of Equals", Raj Publications (Dist.), ISBN: 9789386695123, 938669512X (2019)

REFERENCE BOOKS:

1. S. Benhabib. Situating the Self: Gender, Community, Gender and Post modernism in Contemporary Ethics, London; Routledge, 1992.

WEB REFERENCES:

1. https://www.researchgate.net/publication/329541569_EMPOWERING_WOMEN_THROUGH_GENDER_SENSITIZATION
2. https://eige.europa.eu/gender-mainstreaming/toolkits/gender-sensitive-parliaments/references-and-resources

E –TEXTBOOKS:

1. https://harpercollins.co.in/BookDetail.asp?BookCode=3732
2. https://unesdoc.unesco.org/ark:/48223/pf0000158897_eng

MOOCS COURSE:

1. https://www.mooc-list.com/course/sustainable-development-goal-5-gender-equality-canopylab
2. https://www.coursera.org/learn/gender-sexuality

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

FORMAL LANGUAGE AND AUTOMATA THEORY

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM401PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Central ideas of theoretical computer science from the perspective of formal languages.
2. The fundamental concepts of formal languages, grammars and automata theory.
3. Classify machines by their power to recognize languages.
4. Employ finite state machines to solve problems in computing.
5. The differences between decidability and undecidability

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept of abstract machines and their power to recognize the languages.
2. Employ finite state machines for modeling and solving computing problems.
3. Design context free grammars for formal languages.
4. Distinguish between decidability and undecidability.
5. Gain proficiency with mathematical tools and formal methods.

UNIT-I	FINITE AUTOMATA	Classes: 15

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

UNIT-II	REGULAR EXPRESSIONS AND REGULAR LANGUAGES	Classes: 11

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT-III	CONTEXT FREE GRAMMAR AND AUTOMATA	Classes: 10

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. **Push Down Automata**: Definition of the Pushdown Automaton, the Languages of a PDA, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. Equivalence of PDA's and CFG's, From CFG to PDA, From PDA to CFG.

UNIT-IV	PROPERTIES OF CFG AND TURING MACHINES	Classes: 11

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form, Griebech Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications **Closure Properties of Context-Free Languages**: Closure properties of CFL's, Decision Properties of CFL's

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine, Turing machines and halting problems.

UNIT-V	UNDECIDABILITY	Classes: 11

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems,

TEXT BOOKS

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.

REFERENCE BOOKS

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

WEB REFERENCES
1. https://www.ics.uci.edu/~goodrich/teach/cs162/notes/ 2. http://www.cse.iitd.ac.in/~sak/courses/toc/2011-12.index.html 3. https://web.cs.hacettepe.edu.tr/~ilyas/Courses/BBM401/
E -TEXT BOOKS
1. https://www.cis.upenn.edu/~cis262/notes/tcbook-u.pdf 2. http://people.math.sc.edu/mlevet/Lecture_Notes.pdf 3. https://www.cs.utexas.edu/~ear/cs341/automatabook/AutomataTheoryBook.pdf
MOOCS COURSES
1. https://www.udemy.com/course/formal-languages-and-automata-theory/ 2. https://nptel.ac.in/courses/106/106/106106049/ 3. https://www.udemy.com/course/theory-of-automata/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM402PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. The distinction between optimal reasoning Vs. human like reasoning
2. The concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. Different knowledge representation techniques.
4. The applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT-I	BASICS OF ARTIFICIAL INTELLIGENCE	Classes: 11

Introduction: Foundations of AI, History of AI, Intelligent Agents, Agents and Environments, The Nature of Environments, The structure of Agents, Problem-Solving Agents.

Basic Search Strategies: Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions.

UNIT-II	SEARCH STRATEGIES	Classes: 11

Basic Search Strategies: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

Advanced Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

UNIT-III	CONSTRAINT SATISFACTION PROBLEMS AND PROPOSITIONAL LOGIC	Classes: 12

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic,
Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT-IV	LOGIC CONCEPTS	Classes: 12

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT-V	KNOWLEDGE REPRESENTATION	Classes: 12

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

TEXT BOOKS

1. Stuart Russell and Peter Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Third Edition. 2010

REFERENCE BOOKS

1. Artificial Intelligence, 3rd Edition, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rd Edition., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

WEB REFERENCES

1. https://eecs.wsu.edu/~cook/ai/lectures/p.html
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
3. http://web.cs.iastate.edu/~cs572/studyguide.html
4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html

E -TEXT BOOKS

1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

MOOCS COURSES

1. https://www.udacity.com/course/intro-to-artificial-intelligence--cs271
2. https://www.classcentral.com/course/edx-artificial-intelligence-ai-7230
3. https://www.my-mooc.com/en/mooc/intro-to-artificial-intelligence/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

OPERATING SYSTEMS

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM403PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
2. The issues to be considered in the design and development of operating system
3. Basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computer and their respective roles in computing.
3. Recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT-I	OPERATING SYSTEM INTRODUCTION	Classes: 12

Introduction: Operating system objectives, User view, System view, Operating system Definition, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating Systems services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT-II	PROCESS AND CPU SCHEDULING	Classes: 14

Process and CPU Scheduling - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

System call interface for process management-fork, exit, wait, waitpid, exec

UNIT-III	DEADLOCKS AND PROCESS SYNCHRONIZATION	Classes: 11

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock
Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT-IV	MEMORY MANAGEMENT AND VIRTUAL MEMORY	Classes: 12

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT-V	FILE SYSTEM INTERFACE AND OPERATIONS	Classes: 13

File System Interface and Operations: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, seek system calls.

TEXT BOOKS

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI.
2. Operating Systems: A concept-based Approach, 2nd Edition, D.M.Dhamdhere, TMH.
3. Operating System A Design Approach- Crowley, TMH.
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

WEB REFERENCES

1. http://www.dreamcss.com/2009/07/-operating-system-applications.html
2. http://www.cornelios.org/
3. http://www.yousaytoo.com/best--operating-systems/247122
4. http://www.masternewmedia.org/operating_systems/web-operating-systems-vi...
5. http://desizntech.info/2009/08/top-5-web-operating-systems/

E -TEXT BOOKS

1. An Introduction To Operating Systems: Concepts And Practice (Gnu/Linux and Windows) Bhatt, Pramod ChandraP.
2. Operating Systems : Principles And Design Choudhury, Pabitra Pal
3. Operating Systems Mohan, I.Chandra
4. Understanding Unix Srirengan,K.

MOOCS COURSES

1. https://www.udacity.com › course ›introduction-to-operating-systems--ud.
2. https://www.classcentral.com › tag ›operating-systems
3. https://www.my-mooc.com›mooc›introduction-to-operating-systems-ucs140.stanford.edu

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

DATABASE MANAGEMENT SYSTEMS

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM404PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn
1. The basic concepts and the applications of database systems.
2. The basics of SQL and construct queries using SQL.
3. Data models, design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiar with database storage structures and access techniques

UNIT-I	DATABASE SYSTEM APPLICATIONS AND INTRODUCTION	Classes: 13

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II	RELATIONAL MODEL	Classes: 12

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III	SQL AND NORMAL FORMS	Classes: 12

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT-IV	TRANSACTION PROCESSING	Classes: 12

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT-V	STORAGE STRUCTURE	Classes: 13

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V Edition.

REFERENCE BOOKS

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navathe, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

WEB REFERENCES

1. https://www.edx.org/learn/databases
2. https://www.youtube.com/playlist?list=PLyvBGMFYV3auVdxQ1-88ivNFpmUEy-U3M
3. https://www.youtube.com/watch?v=bGyHqvQW6JY&list=PLRFPL_aa_SLVjQn93cUGZaKZVGr_80vYv&index=1

E -TEXT BOOKS

1. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://www.coursera.org/learn/database-management
3. https://www.udemy.com/course/database-management-system-from-scratch-part-1/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

OBJECT ORIENTED PROGRAMMING USING JAVA

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM405PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn
1. The object-oriented programming concepts.
2. Object-oriented programming concepts, and apply them in solving problems.
3. The principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
4. The implementation of packages and interfaces
5. The concepts of exception handling and multithreading.
6. To introduce the design of Graphical User Interface using applets and swing controls.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Solve real world problems using OOP techniques.
2. Understand the use of abstract classes.
3. Solve problems using java collection framework and I/O classes.
4. Develop multithreaded applications with synchronization.
5. Develop applets for web applications and GUI based applications.

UNIT-I	OBJECT-ORIENTED THINKING AND INHERITANCE	Classes: 13

Object-Oriented Thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies-Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance-specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance

UNIT-II	PACKAGES AND STREAM BASED I/O	Classes: 12

Packages - Defining a Package, CLASSPATH, Access protection, importing packages. Interfaces - defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O(java.io)–The Stream classes -Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes: 12

Exception handling - Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

Multithreading - Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads; inter thread communication.

UNIT-IV	COLLECTIONS FRAMEWORK AND INTERFACES	Classes: 12

The Collections Framework (java.util)- Collections overview, Collection Interfaces The Collection classes-Array List, Linked List ,Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector

More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT-V	GUI PROGRAMMING WITH SWING	Classes: 13

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling-The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons-JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS

1. Java The complete reference, 11th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd,2018.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

WEB REFERENCES

1. http://www.developer.com/icom_includes/feeds/developer/dev-25.xml
2. http://www.ibm.com/developerworks/views/java/rss/libraryview.jsp
3. http://www.javaworld.com/rss/index.html
4. http://feeds.feedburner.com/DevxLatestJavaArticles

E -TEXT BOOKS

1. HTTP Programming Recipes for Java Bots by Jeff Heaton - Heaton Research, Inc.
2. Java Distributed Computing by Jim Farley - O'Reilly Media
3. Java Precisely by Peter Sestoft - IT University of Copenhagen
4. Java for Absolute Beginners: Learn to Program the Fundamentals the Java9+ Way
5. Fundamentals of the Java Programming Language, Java SE6
6. JAVA: Easy Java Programming for Beginners, Your Step-By-Step Guide.

MOOCS COURSES

1. https://www.mooc-list.com › tags ›java-programming
2. https://www.mooc-list.com › tags ›java
3. https://www.edx.org › learn ›java
4. https://www.udacity.com › course ›java-programming-basics--ud282
5. https://www.futurelearn.com › courses ›begin-programming.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ARTIFICIAL INTELLIGENCE LAB

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM406PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. Advanced topics of AI such as planning, Bayes networks and Natural Language Processing

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify problems that are amenable to solution by AI method.
2. Understand and analyze working of an AI technique.
3. Formalize a given problem in the language/framework of different AI methods.
4. Apply AI techniques to real-world problems to develop intelligent systems.

LIST OF EXPERIMENTS

1. Write a program to implement A* algorithm .
2. Write a program to implement Hill Climbing algorithm.
3. Write a program to implement depth first search.
4. Write a program to implement breadth first search.
5. Write a program to implement Water Jug Problem.
6. Write a program to implement Tic-Tac-Toe game.
7. Write a program to implement Simulated Annealing Algorithm
8. Write a program to find the solution for wumpus world problem
9. Write a program to solve 8-Queens problem.
10. Write a program to implement search problems of 3 x 3 puzzle.
11. Write a program to find solution for travelling salesman problem.

TEXT BOOKS
1. Stuart Russell and Peter Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Third Edition. 2010
REFERENCE BOOKS
1. Artificial Intelligence, 3rd Edition, E. Rich and K.Knight (TMH) 2. Artificial Intelligence, 3rd Edition., Patrick Henny Winston, Pearson Education. 3. Artificial Intelligence, Shivani Goel, Pearson Education. 4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.
WEB REFERENCES
1. https://eecs.wsu.edu/~cook/ai/lectures/p.html 2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html 3. http://web.cs.iastate.edu/~cs572/studyguide.html 4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html
E -TEXT BOOKS
1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
MOOCS COURSES
1. https://onlinecourses.swayam2.ac.in/cec21_cs08/preview 2. https://onlinecourses.nptel.ac.in/noc21_cs42/preview 3. https://www.coursera.org/learn/introduction-to-ai

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

DATABASE MANGEMENT SYSTEMS LAB

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM407PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. ER data model, database design and normalization
2. SQL basics for data definition and data manipulation

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers

LIST OF EXPERIMENTS

1. Concept design with E-R Model (Library Management System and Employee Management System)
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Practicing DCL commands
7. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
8. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
9. Queries using Joins (NATURAL, INNER, OUTER, LEFT, RIGHT)
10. Triggers (Creation of insert trigger, delete trigger, update trigger)
11. Procedures
12. Usage of Cursors

TEXT BOOKS

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCE BOOKS

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

WEB REFERENCES

1. https://www.edx.org/learn/databases
2. https://www.youtube.com/playlist?list=PLyvBGMFYV3auVdxQ1-88ivNFpmUEy-U3M
3. https://www.youtube.com/watch?v=bGyHqvQW6JY&list=PLRFPL_aa_SLVjQn93cUGZaKZVGr_80vYv&index=1

E -TEXT BOOKS

1. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://www.coursera.org/learn/database-management
3. https://www.udemy.com/course/database-management-system-from-scratch-part-1/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

JAVA PROGRAMMING LAB

II B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM408PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

To learn

1. To build software development skills using java programming for real-world applications.
2. To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing.
3. To write programs using abstract classes.
4. To write programs for solving real world problems using java collection frame work and multithreaded programs.
5. To write GUI programs using swing controls in Java.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Able to write programs for solving real world problems using java collection frame work.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.
4. Able to write GUI programs using swing controls in Java.

LIST OF EXPERIMENTS

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. a) Develop an applet in Java that displays a simple message.
   b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
4. Write a Java program that creates a user interface to perform integer divisions.

The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.
7. Write a Java program for the following:
   - Create a doubly linked list of elements.
   - Delete a given element from the above list
   - Display the contents of the list after deletion.
8. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Write a Java program that correctly implements the producer – consumer problem using the concept of interthread communication.
13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.
14. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.
15. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.
16. Write a Java program to design a registration form for creating a new email account.

TEXT BOOKS

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.

REFERENCE BOOKS

1. "The Java Programming Language" by Arnold
2. "Java: The Complete Reference" by Herbert Schildt
3. "Core Java: An Integrated Approach, New: Includes All Versions upto Java 8" by R Nageswara Rao and DT Editorial Services
4. "Java Programming Interviews Exposed (WROX)" by Noel Markham
5. "Advanced Java Programming" by Uttam Roy
6. "Cracking the C, C++ and Java Interview" by S G Ganesh and K U Subhash

WEB REFERENCES

1. Head First Java: A Brain-Friendly Guide 2nd Edition, Kindle Edition by Kathy Sierra.
2. Effective Java: A Programming Language Guide (Java Series) 2nd Edition, Kindle Edition by Joshua Bloch.
3. AI Algorithms, Data Structures, and Idioms in Prolog, Lisp, and Java Paperback – Import, 25 Aug 2008 by George F. Luger (Author), William A Stubblefield (Author).

E -TEXT BOOKS

1. Introduction to Java Programming and Data Structures, Comprehensive Version (11th Edition) 11th Edition by Y. Daniel Liang.
2. Java How to Program, Early Objects (11th Edition) (Deitel: How to

MOOCS COURSES

1. https://www.mooc-list.com › tags › java-programming
2. https://www.mooc-list.com › tags › java
3. https://www.edx.org › learn › java
4. https://onlinecourses.nptel.ac.in/noc21_cs03/preview

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

CONSTITUTION OF INDIA

II B. TECH II SEMESTER								
Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*CI409MC	B. Tech	3	0	0	0	100	-	100

COURSE OBJECTIVES

To learn
Objective of the constitution of India is very well written in its preamble and that is to create a state which will be

This Course deals with Fundamentals and Structures of Indian Government; it is specifically designed to give a complete overview and in-depth knowledge regarding the concerns and challenges faced by the modern constitutional governments and elaborately discusses the structure, procedures, powers and duties of governmental institutions. The Course analyses in detail the basic functions of a written constitution. Also, the theories and concepts relating to constitutionalism, federalism, judicial review, constitutional interpretation, etc. are reviewed. All the discussions in the Course are updated according to the latest position and the modifications made by judicial intervention

1.Sovereign -independent to conduct internal as well as external affairs
2.Socialist - preventing concentration of wealth into few hands
3.Secular - respecting all religions equally
4.Democratic- government by the people, of the people, for the people
5.Republic - Head of the state will be elected not hereditary

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. To understand the basic concepts of democracy, republicanism, constitutionalism and to know about the constitutional theories, virtues and constitutional interpretation
2. To study and analyse the quasi-federal nature of Indian Constitution and the basic function of a written constitution regarding the allocation of State power, the functions, powers and limits of the organs of state
3. To analyse elaborately regarding the emergency and amendment procedures; the need for granting of special status or special provisions to some states
4. To know about Panchayats, Municipalities, Scheduled and Tribal areas
5. To utilize Judiciary System of India

UNIT-I	INTERDUCTION TO INDIAN CONSTITUTION	Classes: 6

Meaning and importance of Constitution, Making of Indian Constitution, Salient features and the Preamble, Fundamental rights, Fundamental duties, Directive Principles.

UNIT-II	THE AMENDMENT OF THE CONSTITUTION	Classes: 6
Need for Amendment, Types of Amendment, Judicial Review of Constituent Power, Doctrine of Basic Structure, Major Amendments and their Constitutional Values.		
UNIT-III	**UNION & STATE EXECUTIVE AND LEGISLATURE**	**Classes:8**
Lok Sabha & Rajya Sabha (Composition, Powers & Functions), President & Prime Minister (Powers, Functions, position), Supreme Court-Composition, Powers & Functions, The President: Powers, Functions and Procedure for Impeachment, Judicial Review of Presidents Actions, Governor: Powers, Functions ,Legislative Power of the Executive – Ordinance, Parliament and State Legislature ,Privileges of Legislature ,Council of Ministers - Prime Minister.		
UNIT-IV	**MAJOR FUNCTIONARIES & EMERGENCY POWERS**	**Classes: 6**
Union Public Service Commission , Election Commission, Planning Commission (NITI) , Significance of Emergency Powers , National Emergency – Grounds – Suspension of Fundamental Rights ,State Emergency – Grounds – Judicial Review , Financial Emergency.		
UNIT-V	**INDIAN JUDICIARY**	**Classes: 6**
Supreme Court of India – Appointment of Judges – Composition , Jurisdiction: Original, Appellate and Writ Jurisdiction , Prospective Overruling and Judge - Made Laws in India (Art. 141), Review of Supreme Court Decision , High Courts – Judges - Constitution , Jurisdiction: Original, Appellate, Writ Jurisdiction and Supervisory Jurisdiction		

TEXT BOOKS

1. H.M. Seervai: Constitutional Law of India
2. M.P. Jain: Indian Constitutional Law
3. Mahendra P. Singh: V. N. Shukla's Constitution of India
4. Granville Austin: The Indian Constitution: Cornerstone of a Nation

REFERENCE BOOKS

1. An Introduction to the Constitution of India by Dr.Durga Das Basu
2. An Introduction to the Constitution of India by M.V.Pylee
3. Indian Constitutional Law by M.P. Jain

WEB REFERENCES

1. https://www.wdl.org/en/item/2672/
2. https://nptel.ac.in/courses/109103135/24

E -TEXT BOOKS

1. https://iasexamportal.com/ebook/the-constitution-of-india
2. https://www.india.gov.in/my-government/documents/e-books

MOOCS COURSES

1. http://nludelhi.ac.in/images/moocs/moocs-courses.pdf
2. https://www.classcentral.com/tag/constitutional-law

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING

ADVANCED ARTIFICIAL INTELLIGENCE

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM501PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To know the underlying structure behind intelligence mathematically.
2. To know the logical implications in probabilistic Reasoning.
3. To know the automated learning techniques.
4. To explore the techniques in Reinforcement Learning.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Apply the concept of planning to solve problems.
2. Apply appropriate Probabilistic reasoning techniques for solving uncertainty problems.
3. Explain use of temporal models for solving problems.
4. Explain and apply probabilistic models for various use cases.
5. Apply the Reinforcement Learning for solving problems.

UNIT-I	PLANNING	Classes: 9

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.
Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, ning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-II	UNCERTAINTY AND PROBABILISTIC REASONING I	Classes: 9

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its use
Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

UNIT-III	PROBABILISTIC REASONING II	Classes: 9

Probabilistic reasoning over time – time and uncertainty – inference in temporal models – Hidden Markov Models – Kalman filters – Dynamic Bayesian networks - Probabilistic programming

UNIT-IV	LEARNING PROBABILISTIC MODELS	Classes: 9

Statistical learning theory – maximum-likelihood parameter learning – naïve bayes models – generative and descriptive models – continuous models – Bayesisn parameter learning – Bayesian linear regression – learning Bayesian net structures – density estimation Algorithm – unsupervised clustering – Gaussian mixture models – Learning Bayes net parameters – Learning HMM – Learning Bayes net structures with hidden variables		
UNIT-V	**REINFORCEMENT LEARNING**	**Classes: 9**
Learning from rewards – Passive reinforcement learning – Active reinforcement learning – Generalization in reinforcement learning – Policy search – Inverse reinforcement learning – Applications.		

TEXT BOOKS

1. Stuart Russell and Peter Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Third Edition.2010

REFERENCE BOOKS

1. Artificial Intelligence, 3rd Edition, E. Richand K. Knight(TMH)
2. Artificial Intelligence,3rd Edition., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems –Patterson, Pearson Education.

WEB REFERENCES

1. https://eecs.wsu.edu/~cook/ai/lectures/p.html
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
3. http://web.cs.iastate.edu/~cs572/studyguide.html
4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html

E -TEXT BOOKS

1. George F.Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

MOOCS COURSES

1. https://nptel.ac.in/courses/106/106/106106140/
2. https://nptel.ac.in/courses/106/105/106105077/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

DATA WAREHOUSING AND DATA MINING

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM502PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To present methods for mining frequent patterns, associations, and correlations.
2. To describe methods for data classification and prediction, and data-clustering approaches.
3. To cover mining various types of data stores such as spatial, textual, multimedia, streams.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Demonstrate the functionalities of data mining and the need of data warehouse.
2. Extract interesting patterns from large amounts of data.
3. Explain various classification algorithms
4. Apply clustering algorithm for mining applications.
5. Describe complex types of data and applications of data mining.

UNIT-I	DATA MINING AND DATA WAREHOUSE	Classes: 14

Data–Types of Data–, Data Mining Functionalities–Interestingness Patterns–Classification of Data Mining systems–Data mining Task primitives–Integration of Data mining system with a Data ware house–Major issues in Data Mining–Data Pre-processing. Introduction to Data warehousing, Difference between operational Database Systems and Data Warehouses, A Multidimensional Data Model, Data warehouse Architecture.

UNIT-II	ASSOCIATION RULE MINING	Classes: 12

Mining Frequent Patterns–Associations and correlations–Mining Methods– Mining Various kinds of Association Rules – Correlation Analysis–Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT-III	CLASSIFICATION	Classes: 10

Classification and Prediction– Basic concepts– Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner, Support vector Machines.

UNIT-IV	CLUSTERING AND APPLICATIONS	Classes: 12

Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Outlier

Analysis.		
UNIT-V	**MINING COMPLEX TYPES OF DATA**	**Classes: 12**
Mining Time-Series and Sequence Data, Mining Spatial Data mining, Mining Multimedia, Mining Text Databases, Mining the world wide web, Data Mining Applications, Trends in Data Mining.		

TEXT BOOKS

1. Data Mining– Concepts and Techniques–Jiawei Han & Micheline Kamber, 3rd Edition Elsevier, 2012.

REFERENCE BOOKS

1. Data Mining Introductory and Advanced topics– Margaret H Dunham, Pearson Education, 2006.
2. Amitesh Sinha, Data Warehousing, Thomson Learning, 2007,India
3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.

WEB REFERENCES

1. https://en.wikipedia.org/wiki/Web_mining

E -TEXT BOOKS

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber
2. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeff Ullman

MOOCS COURSES

1. https://www.coursera.org/specializations/data-mining
2. https://www.mooc-list.com/tags/data-mining

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DESIGN AND ANALYSIS OF ALGORITHMS

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM503PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets.
3. Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
4. Describes how to evaluate and compare different algorithms using worst-, average-, and best case analysis.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Analyze the performance of algorithms.
2. Apply backtracking approach to solve classical problems.
3. Demonstrate the dynamic programming concept to solve problems.
4. Apply greedy method to solve the problems.
5. Describe NP-Hard and NP-Complete Problems.

UNIT-I	INTRODUCTION ALGORITHM NOTATIONS AND DIVIDE AND CONQUER	Classes: 12

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation. Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT-II	DISJOINT SETS AND BACKTRACKING	Classes: 12

Disjoint Sets: Disjoint set operations, union and find algorithms Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT-III	DYNAMIC PROGRAMMING	Classes: 10

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT-IV	GREEDY METHOD	Classes: 12
Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem		
UNIT-V	**BRANCH AND BOUND, NP-HARD AND NP-COMPLETE PROBLEMS**	**Classes: 12**
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem		

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharan, University Press.

REFERENCE BOOKS

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

WEB REFERENCES

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015

E -TEXT BOOKS

1. https://www.kopykitab.com/Design-and-Analysis-of-Algorithms-eBook-By-V-K-Pallaw-isbn-9788184121681
2. https://freecomputerbooks.com/Introduction-to-Design-Analysis-of-Algorithms.html
3. https://www.ebooknetworking.net/ebooks/design-analysis-of-algorithm-book.html

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2. https://nptel.ac.in/courses/106/104/106104123/
3. https://nptel.ac.in/courses/106/105/106105190/
4. https://nptel.ac.in/courses/106/104/106104072/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

COMPUTER NETWORKS

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM504PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To equip the students with a general overview of the concepts and fundamentals of computer.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
2. Explain the functionalities of Data link layer
3. Obtain the skills of sub netting and routing mechanisms.
4. Apply the TCP and UDP protocol for data communication.
5. Describe various application layer protocols.

UNIT-I	INTRODUCTION OF COMPUTER NETWORKS	Classes: 12

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fibre optics, Wireless transmission. Wireless Networks – Packet Radio Network, Wireless LAN: IEEE 802.11b, Wireless Application Protocols (WAP) & WML and Virtual Private Network VPN Technology.

UNIT-II	DATA LINK LAYER	Classes: 12

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT-III	NETWORK LAYER	Classes: 10

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet, Transmission from IPV4 to IPV6.

UNIT-IV	TRANSPORT LAYER	Classes: 12
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.		
UNIT-V	**APPLICATION LAYER**	**Classes: 12**
Application Layer –Domain name system, SNMP, Protocols - TELNET & SSH, Electronic Mail; the World WEB, HTTP, Streaming audio and video.		

TEXT BOOKS

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI,2011.

REFERENCE BOOKS

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

WEB REFERENCES

1. https://www.geeksforgeeks.org/what-is-Computer-Networks/
2. https://searchsecurity.techtarget.com/definition/Computer-Networksinfosec
3. https://www.cisco.com › Products & Services › Networks

E -TEXT BOOKS

1. http://study-ccna.com/

MOOCS COURSES

1. https://nptel.ac.in/courses/106105081/
2. https://www.geeksforgeeks.org/computer- network-routing-protocols-set-1-distance- vector-routing/
3. https://www.tutorialspoint.com/errorcontrol-in-data-link-layer

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DATA WAREHOUSING AND DATA MINING LAB

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM505PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. Learn to perform data mining tasks using a data mining toolkit.
2. Emphasize hands-on experience working with all real data sets.

COURSE OUTCOMES

1. Emphasize hands-on experience working with all real data sets.
2. Familiar with the preprocessing of data set.
3. Examine the insights of Apriori algorithm.
4. Implement the classification algorithms.
5. Demonstrate the clustering algorithms.

LIST OF EXPERIMENTS

1. Explore data mining tool WEKA.
2. Demonstration of preprocessing of data set.
3. Demonstration of association rule mining using Apriori algorithm
4. Demonstration of classification using j48 algorithm.
5. Demonstration of classification using id3 algorithm.
6. Demonstration of classification using naïve bayes algorithm.
7. Demonstration of classification using support vector machine.
8. Demonstration of clustering rule using k-means algorithm.
9. Demonstration of clustering rule using hierarchical clustering.
10. Case Study on real time application
    - Healthcare system
    - Credit Scoring analysis
    - Crime Rate Prediction
    - Weather forecasting
    - Movie success prediction

TEXT BOOKS

1. Data Mining– Concepts and Techniques–Jiawei Han & Micheline Kamber, 3rd Edition Elsevier, 2012.

REFERENCE BOOKS

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

WEB REFERENCES
1. https://www.cs.waikato.ac.nz/ml/weka/ 2. https://waikato.github.io/weka-wiki/downloading_weka/
E -TEXT BOOKS
1. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf
MOOCS COURSES
1. https://www.coursera.org/specializations/data-mining 2. https://www.mooc-list.com/tags/data-mining

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DESIGN AND ANALYSIS OF ALGORITHMS LAB

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM506PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To write programs in java to solve problems using divide and conquer strategy.
2. To write programs in java to solve problems using backtracking strategy.
3. To write programs in java to solve problems using greedy and dynamic programming techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Choose appropriate data structures and algorithm design methods for a specified Application.
2. Understand how the choice of data structures and the algorithm design methods impact the performance of programs

LIST OF EXPERIMENTS

1. Write program to implement Quick sort algorithm for sorting a list of integers in ascending order
2. Write a program to implement Merge sort algorithm for sorting a list of integers in ascending order.
3. Write a program to implement back tracking algorithm for the N-queens problem.
4. Write a program to implement the backtracking algorithm for the sum of subsets problem.
5. Write a program to implement the backtracking algorithm for the Hamiltonian Circuits problem.
6. Write a program to implement greedy algorithm for job sequencing with deadlines.
7. Write a program to implement Dijkstra's algorithm for the Single source shortest path problem.
8. Write a program that implements Prim's algorithm to generate minimum cost spanning tree.
9. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree
10. Write a program to implement Floyd's algorithm for the all pairs shortest path

problem.

11. Write a program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
12. Write a program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharan, University Press.

REFERENCE BOOKS

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

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2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015

E -TEXT BOOKS

1. https://www.kopykitab.com/Design-and-Analysis-of-Algorithms-eBook-By-V-K-Pallaw-isbn-9788184121681
2. https://freecomputerbooks.com/Introduction-to-Design-Analysis-of-Algorithms.html
3. https://www.ebooknetworking.net/ebooks/design-analysis-of-algorithm-book.html

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2. https://nptel.ac.in/courses/106/104/106104123/
3. https://nptel.ac.in/courses/106/105/106105190/
4. https://nptel.ac.in/courses/106/104/106104072/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

COMPUTER NETWORKS LAB

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM507PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance.
3. To analyse the traffic flow and the contents of protocol frames.

COURSE OUTCOMES

1. Implement data link layer framing methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

LIST OF EXPERIMENTS

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Wire shark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.

11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOKS

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

WEB REFERENCES

1. https://www.geeksforgeeks.org/what-is-Computer-Networks/
2. https://searchsecurity.techtarget.com/definition/Computer-Networksinfosec
3. https://www.isi.edu/nsnam/ns/

E -TEXT BOOKS

1. http://study-ccna.com/
2. https://www.cs.ucf.edu/~czou/CDA6530-12/NS2-tutorial.pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/106105081/
2. https://www.geeksforgeeks.org/computer- network-routing-protocols-set-1-distance-vector-routing/
3. https://www.tutorialspoint.com/errorcontrol-in-data-link-layer

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

INTELLECTUAL PROPERTY RIGHTS

III B. TECH – I SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*IP510MC	B. Tech	3	0	0	0	100	-	100

COURSEOBJECTIVES:

1. To acquaint the learners with the basic concepts of Intellectual Property Rights.
2. To develop expertise in the learners in IPR related issues and sensitize the learners with the emerging issues in IPR and the rationale for the protection of IPR.

COURSEOUTCOMES:

Upon successful completion of the course

1. Gain knowledge on Intellectual Property assets and generate economic wealth.
2. Assist individuals and organizations in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of Intellectual Property & knowledge.
3. Gather knowledge about Intellectual Property Rights which is important for students of engineering in particular as they are tomorrow's technocrats and creator of new technology.
4. Discover how IPR are regarded as a source of national wealth and mark of an economic leadership in context of global market scenario.
5. Study the national & International IP system.
6. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social

UNIT-I	INTRODUCTION TO INTELLECTUALPROPERTY	Classes:7

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II	TRADE MARKS	Classes:8

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III	LAW OF COPY RIGHTS	Classes:6
Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer		
UNIT-IV	**TRADE SECRETS**	**Classes:7**
Trade secrete law, determination of trade secrete status, liability for mis appropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.		
UNIT-V	**NEW DEVELOPMENT OF INTELLECTUAL PROPERTY**	**Classes:6**
New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law and international development in trade secrets law.		

TEXT BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd

REFERENCE BOOKS:

1. R Radha Krishnan & S Balasubramanian, "Intellectual Property Rights", 1st Edition, Excel Books, 2012.
2. M Ashok Kumar & Mohd Iqbal Ali, "Intellectual Property Rights", 2nd Edition, Serial publications, 2011.

WEB REFERENCES:

1. http://libgen.rs/book/index.php?md5=C4A6559ECCAEFC767CE71BD91A1BAD41
2. http://libgen.rs/book/index.php?md5=6463CAD16544B347B19335FB19D6917C

E –TEXTBOOKS:

1. http://libgen.rs/book/index.php?md5=13C4B3A45B1C95B4A388F94729CCCFBC
2. https://maklaw.in/intellectual-property-rights/?gclid=EAIaIQobChMIsprsv_WI7QIVilVgCh29HwPzEAAYASAAEgK5YvD_BwE

MOOCS COURSE:

1. https://nptel.ac.in/courses/110/105/110105139/
2. https://nptel.ac.in/courses/109/106/109106137/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

MACHINE LEARNING

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM601PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concepts of computational intelligence like machine learning.
2. Describe the Neural Networks and its usage in machine learning application.
3. Employ the supervised learning methods to address the real time problems in different areas
4. Understand genetic algorithm and reinforcement learning algorithms
5. Understand different types of analytic learning.

UNIT-I	INTRODUCTION TO MACHINE LEARNING	Classes: 12

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning. Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias. Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT-II	ARTIFICIAL NEURAL NETWORKS	Classes: 12

Artificial Neural Networks-1: Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm. Artificial Neural Networks-2: Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks. Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms

UNIT-III	BAYESIAN LEARNING	Classes: 10

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm. Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT-IV	GENETIC ALGORITHMS	Classes: 12

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms. Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution. Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V	ANALYTICAL LEARNING AND COMBINING INDUCTIVE	Classes: 12

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge. Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators. Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

WEB REFERENCES

1. https://www.coursera.org/learn/machine-learning
2. https://www.ibm.com/in-en/cloud/learn/machine-learning
3. https://www.geeksforgeeks.org/machine-learning/
4. https://www.expert.ai/blog/machine-learning-definition/

E -TEXT BOOKS

1. https://machinelearningmastery.com/products/
2. https://www.kdnuggets.com/2020/03/24-best-free-books-understand-machine-learning.html
3. https://www.analyticsinsight.net/10-popular-must-read-free-ebooks-on-machine-learning/

MOOCS COURSES

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs29/

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI&ML)

NATURAL LANGUAGE PROCESSING

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM602PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.
2. They will also be able to propose extension of existing NLP techniques for solving a range of problems.
3. They will be able to comprehend the state-of-the-art advanced NLP research articles and present them to an audience.
4. the graduate students will be able to appreciate the theoretical formulation of the natural language processing techniques
5. They will also be able to demonstrate required design skills for large collection sets.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper word level analysis on empirical NLP systems.
3. Implement syntax analysis for NLP
4. Differentiate semantic and discourse in terms of NLP
5. Design different language modelling Techniques.

UNIT-I	INTRODUCTION	Classes: 15

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT-II	SYNTAX ANALYSIS	Classes: 11

Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issue

UNIT-III	SEMANTIC PARSING	Classes: 10

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT-IV	PREDICATE-ARGUMENT STRUCTURE	Classes: 11
Predicate-Argument Structure, Meaning Representation Systems, Software.		
UNIT-V	**DISCOURSE PROCESSING**	**Classes: 11**
Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure **Language Modelling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling		

TEXT BOOKS

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, Pearson Publication
2. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publication, 2008.

REFERENCE BOOKS

1. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

WEB REFERENCES

1. https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf
2. https://nptel.ac.in/courses/106/101/106101007/https://web.cs.hacettepe.edu.tr/~ilyas/Courses/BBM401/

E -TEXT BOOKS

1. https://freecontent.manning.com/free-ebook-exploring-natural-language-processing/
2. https://www.ebooksdirectory.com/listing.php?category=281
3. https://www.packtpub.com/free-ebook/hands-on-natural-language-processing-with-python/9781789139495

MOOCS COURSES

1. https://www.mooc-list.com/course/natural-language-processing-and-capstone-assignment-coursera
2. https://www.edx.org/learn/natural-language-processing/
3. https://www.udemy.com/topic/natural-language-processing/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

SOFTWARE ENGINEERING

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM603PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. Student will be able to learn fundamental aspects of Software Engineering and analyze various process models.
2. To identify various types of requirements and the process for Requirements Engineering.
3. To make use of various System Models to conceptualize and construct a system.
4. To demonstrate different testing tactics and define metrics for software measurement.
5. To classify and mitigate the Software Risks and learn to achieve quality standards.

COURSE OUTCOMES

1. To understand software process models such as water fall and evolutionary models.
2. To understand software requirements and SRS document.
3. Ability to translate end user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
4. To understand software testing approaches such as unit testing and integrationtesting.
5. To understand quality control and how to ensure good quality software through quality assurance.

UNIT-I	INTRODUCTION TO SOFTWARE ENGINEERING	Classes: 12

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

UNIT-II	SOFTWARE REQUIREMENTS	Classes: 12

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models

UNIT-III	DESIGN ENGINEERING	Classes: 12

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: Software architecture, data design, architectural styles

and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, usecase diagrams, component diagrams.

UNIT-IV	TESTING STRATEGIES	Classes: 14

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, Unit Testing, Integration Testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

Metrics for Process and Products: Software measurement, metrics for software quality

UNIT-V	RISK MANAGEMENT	Classes: 10

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill,2008
3. Fundamentals of Software Engineering, Rajib Mall, PHI,2005

WEB REFERENCES

1. https://en.wikipedia.org/wiki/Software_engineering

E -TEXT BOOKS

1. https://books.google.co.in/books?id=bL7QZHtWvaUC&printsec=frontcover&dq=software+engineering+by+roger+pressman+vth+edition+free+download&hl=en&sa=X&ved=0ahUKEwiLkOz-pL_TAhWIuI8KHZSxD2cQ6AEIMDAC#v=onepage&q&f=false

MOOC COURSES

1. https://www.coursera.org/specializations/software-development-lifecycle
2. https://www.mooc-list.com/tags/software-engineering

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING LAB

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM604PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. To understand machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand the process involved in computing with natural language specifically: Texts and Words.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Apply Text Classification techniques used in NLP.
2. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
3. Be capable of performing experiments in Machine Learning using real-world data.

LIST OF EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on training data.
2. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result.
3. Extract the data from database using python
4. Implement k-nearest neighbours classification using python.
5. Implement linear regression using python.
6. Implement an algorithm to demonstrate the significance of genetic algorithm
7. Implement the finite words classification system using Back-propagation algorithm.
8. Write a program to remove stop words for a given passage from a text file using Natural Language Toolkit (NLTK).
9. Write a program to implement Lemmatization using NLTK.
10. Write a program for Text Classification in a given sentence using NLTK.
11. Write a program to implement stemming for a given sentence using NLTK.

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, - MGH
2. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publication, 2008.

REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

WEB REFERENCES

1. https://www.coursera.org/learn/machine-learning
2. https://www.ibm.com/in-en/cloud/learn/machine-learning

E -TEXT BOOKS

1. https://www.kdnuggets.com/2020/03/24-best-free-books-understand-machine-learning.html

MOOCS COURSES

1. https://www.mooc-list.com/course/natural-language-processing-and-capstone-assignment-coursera
2. https://www.edx.org/learn/natural-language-processing.
3. https://www.udemy.com/topic/natural-language-processing/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

SOFTWARE ENGINEERING LAB

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM605PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Ability to translate end-user requirements into system and software requirements
2. Ability to generate a high-level design of the system from the software requirements
3. Will have experience and/ or awareness of testing problems and will be able to develop a simple testing report

LIST OF EXPERIMENTS

Do the following 8 exercises for any two projects given in the list of sample projects or any other projects:

1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Online course reservation system
5. E-ticketing
6. Software Personnel Management System
7. E-book management System.
8. Recruitment system

TEXT BOOKS

1. Software Engineering, A practitioner's Approach RogerS. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville,7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill,2008

WEB REFERENCES

1. https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering

E -TEXT BOOKS

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-170-laboratory-in-software-engineering-fall-2005/

MOOCS COURSES

1. https://www.mooc-list.com/tags/software-engineering
2. https://www.coursera.org/courses?query=software%20engineering

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

ADVANCED COMMUNICATION SKILLS LABORATORY

III B. TECH- II SEMESTER

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN606HS	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES:

To train students

1. To use relevant words through the practice of vocabulary and responding appropriately.
2. To improve Reading Comprehension Skills and Techniques, to read and infer for meanings.
3. To enable to write and improve writing skills to present different types of writing.
4. To enable students to perform presentation skills with the right usage of Body language through seminars, posters, etc.
5. To prepare students for placements by practicing various activates like group discussions, mock interviews, etc.

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

1. Gather ideas and information to organize ideas relevantly and coherently.
2. Participate in group discussions.
3. Face interviews.
4. Write project/research reports/technical reports.
5. Make oral presentations and written presentations.

LIST OF EXPERIMENTS:

EXERCISE: I

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly –using right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

EXERCISE: II

Activities on Reading Comprehension – General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

EXERCISE: III

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/ Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

EXERCISE: IV

Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ emails/ assignments, etc.

EXERCISE: V

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, Intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation - Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

TEXT BOOKS

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.

WEB REFERENCES:

1. http://www.skillsyouneed.com/ips/interpersonal-communication.html#ixzz3Zo3C60Js
2. http://en.wikipedia.org/wiki/Conversation
3. http://www.wikihow.com/Start-a-Conversation-When-You-Have-Nothing-to-Talk-About
   10 Sure-Fire Strategies to Improve Your Vocabulary
4. https://litemind.com/top-3-reasons-to-improve-your-vocabulary/

E –TEXTBOOKS:

1. Mc corry Laurie Kelly Mc Corry Jeff Mason, Communication Skills fortheHealthcare Professional, 1 edition,ISBN:1582558140, ISBN-13:9781582558141
2. Robert E Owens ,Jr ,Language Development, 9th edition, ISBN:0133810364,9780133810363

MOOCS Course:

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

DEEP LEARNING

IV B. TECH- I SEMESTER								
Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM701PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce the foundations of Artificial Neural Networks
2. To acquire the knowledge on Deep Learning Concepts
3. To learn various types of Artificial Neural Networks
4. To gain knowledge to apply optimization strategies

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concepts of Neural Networks
2. Apply unsupervised learning Networks in modeling real world systems
3. Use an efficient algorithm for Deep Models
4. Employ regularization on deep learning
5. Apply optimization strategies for large scale applications

UNIT-I	ARTIFICIAL NEURAL NETWORKS	Classes: 12

Introduction: Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II	UNSUPERVISED LEARNING NETWORK	Classes:12

Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT-III	INTRODUCTION TO DEEP LEARNING	Classes:12
Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.		
UNIT-IV	**REGULARIZATION FOR DEEP LEARNING**	**Classes: 12**
Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier		
UNIT-V	**OPTIMIZATION FOR TRAIN DEEP MODELS**	**Classes: 12**
Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing		

TEXT BOOKS

1. Deep Learning: An MIT Press Book By Ian Good fellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

REFERENCE BOOKS

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press,2016.
2. Michael Nielsen, Neural Networks and Deep Learning, Determination Press,2015.

WEB REFERENCES

1. https://machinelearningmastery.com/what-is-deep-learning/
2. https://www.coursera.org/specializations/deep-learning
3. https://towardsdatascience.com/online-deep-learning-odl-and-hedge-back-propagation-277f338a14b2

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

ROBOTICS

IV B. TECH- I SEMESTER								
Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM702PC	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

1. To study the Robot Locomotion and types of robots.
2. To explore the kinematic models and constraints
3. To learn sensors of robots and image processing for robotics.
4. To understand the methods for mobile robot Localization
5. To study the Path planning and Navigation of Robots.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Explain the types of Robots
2. Narrate the kinematics of Robots
3. Implement image processing algorithms
4. Devise Localization algorithms
5. Devise Path planning methods for navigation

UNIT-I	ROBOT LOCOMOTION	Classes: 12

Introduction to AI and Robotics – robot locomotion – legged mobile robots – wheeled mobile robots – aerial mobile robots.

UNIT-II	MOBILE ROBOT KINEMATICS	Classes:12

Kinematic models and constraints – mobile robot maneuverability – mobile robot workspace – advanced kinematics – motion control.

UNIT-III	ROBOT PERCEPTION	Classes:12

Sensors for mobile robots – computer vision for robots – image processing for robotics – place recognition – range data.

UNIT-IV	MOBILE ROBOT LOCALIZATION	Classes: 12

Introduction to localization – noise and aliasing – localization-based navigation – belief representation – map representation – probabilistic map-based localization – autonomous map building.

UNIT-V	ROBOT PLANNING AND NAVIGATION	Classes: 12

Planning and navigation – planning and reacting – path planning – obstacle avoidance – navigation architectures.

TEXT BOOKS

1. R. Siegwart, I. R. Nourbaksh, and D. Scarramuzza, "Introduction to Autonomous Mobile Robots", Second Edition, MIT Press, 2011.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCE BOOKS

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010. 2
2. K. K.AppuKuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.

WEB REFERENCES

1. https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/lecture-notes/

E -TEXT BOOKS

1. http://engineering.nyu.edu/mechatronics/smart/Archive/intro_to_rob/Intro2Robotics.pdf

MOOCS COURSE

1. https://nptel.ac.in/courses/112/101/112101098/
2. https://nptel.ac.in/courses/107/106/107106090/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

DEEP LEARNING LAB

IV B. TECH- I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM703PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

1. To implement the basic machine learning techniques.
2. To implement the convolution neural network architecture.
3. To solve the challenging research problems in the area of Speech and Image processing.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. Apply deep neural network for simple problem
2. Apply Convolution Neural Network for image processing
3. Apply Recurrent Neural Network and its variants for text analysis
4. Apply LSTM for Time Series applications.
5. Develop a real-world application using suitable deep neural networks

LIST OF EXPERIMENTS

1. Classification using Back propagation neural network (BPNN).
2. Solving XOR problem using Multilayer Perceptron.
3. Implementation of feed forward neural networks.
4. Implement any of the ImageNet or GoogLeNet.
5. Implement character and digit recognition using ANN.
6. Develop a code to design object detection and classification using CNN.
7. Sequence prediction using recurrent neural network (RNN).
8. Implement LSTM neural network for Time series Prediction.

TEXT BOOKS

1. Deep Learning: An MIT Press Book By Ian Goodfellow and YoshuaBengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

REFERENCE BOOKS

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press,2016.
2. Michael Nielsen, Neural Networks and Deep Learning, Determination Press,2015.

WEB REFERENCES
1. https://machinelearningmastery.com/what-is-deep-learning/ 2. https://www.coursera.org/specializations/deep-learning 3. https://towardsdatascience.com/online-deep-learning-odl-and-hedge-back-propagation-277f338a14b2
E -TEXT BOOKS
1. https://www.e-booksdirectory.com/listing.php?category=4
MOOCS COURSE
1. https://swayam.gov.in/ 2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

ORGANIZATIONAL BEHAVIOUR

IV B. TECH II SEMESTER								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
SM801MS	**B. Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

1. To provide the students with the conceptual framework and the theories underlying Organisational Behaviour.

COURSE OUTCOMES

Upon the completion of the subject, the student will be able to

1. Analyse the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behaviour.
2. Assess the potential effects of organizational level factors (such as structure, culture and change) on organizational behaviour.
3. Critically evaluate the potential effects of important developments in the external environment (such as globalization and advances in technology) on organizational behaviour.
4. Analyse organizational behavioural issues in the context of organizational behavior theories, models and concepts.

UNIT-I	**INTRODUCTION TO OB**	**Classes: 12**

Definition, Nature and Scope –Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on OrganisationalBehaviour. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization - Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

UNIT-II	**COGNITIVE PROCESSES-II**	**Classes: 14**

Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organisational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation-Motivation across cultures- Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

UNIT-III	**DYNAMICS OF OB-I**	**Classes: 10**

Communication – types - interactive communication in organizations –barriers to communication and strategies to improve the follow of communication – Decision Making: Participative decision-making techniques – creativity and group decision making.

Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress andconflict.

UNIT-IV	DYNAMICS OF OB –III POWER AND POLITICS	Classes: 12

Meaning and types of power – empowerment -Groups Vs. Teams – Nature of groups –dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

UNIT-V	LEADING HIGH PERFORMANCE	Classes: 12

Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High-performance work practices – Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

TEXT BOOKS

1. Fred Luthans, Organizational Behavior, McGraw-Hill Education; 12th edition, 2018.
2. Stephen P. Robbins, Organizational Behaviour, Pearson, 18th Edition, 2018.
3. Stephen P. Robbins, Timothy A. Judge, Essentials of Organizational Behavior, Pearson, 14th Edition, 2019.

REFERENCE BOOKS

1. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
2. Hitt: Organizational Behaviour, Wiley, 2008
3. Aswathappa: OrganisationalBehaviour, Himalaya, 2009
4. Mullins: Management and OrganisationalBehaviour, Pearson, 2008.
5. McShane, Glinow: OrganisationalBehaviour--Essentials, TMH, 2009.
6. Ivancevich: OrganisationalBehaviour and Management, 7/e, TMH, 2008.

WEB REFERENCES

1. Organizational Behaviour: https://nptel.ac.in/courses/110/105/110105034/
2. Organizational culture: https://nptel.ac.in/courses/110/105/110105033/

E -TEXT BOOKS

1. library genesis: http://libgen.rs/book/index.php?md5=59EC38CD4DD8DB8517CF966E11C4F910
2. http://libgen.rs/book/index.php?md5=1122D0A4E660BF20DC7D77AF5B1BFEF8
3. http://libgen.rs/book/index.php?md5=C3F143F3AB18FDB3655D4F16EE19D718
4. http://libgen.rs/book/index.php?md5=6B8A4D77E54A79489DD71D5D2DEC49C5

MOOCS COURSE

1. https://nptel.ac.in/courses/110/106/110106145/
2. https://nptel.ac.in/courses/110/105/110105154/
3. https://nptel.ac.in/courses/110/105/110105033/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

List of Professional Electives

Professional Elective-I

CSM511PE	Computer Graphics
CSM512PE	Compiler Design
CSM513PE	Introduction to Data Science
CSM514PE	Graph Theory
CSM515PE	Web Technologies

Professional Elective–II

CSM521PE	Distributed Systems
CSM522PE	Image Processing
CSM523PE	Information Retrieval Systems
CSM524PE	Software Testing Methodologies
CSM525PE	Pattern Recognition

Professional Elective-III

CSM611PE	Mobile Computing
CSM612PE	Expert Systems
CSM613PE	Internet of Things
CSM614PE	Big Data Analytics
CSM615PE	Computer Vision

Professional Elective–IV

CSM711PE	Cloud Computing
CSM712PE	Cryptography & Network Security
CSM713PE	Data Visualization
CSM714PE	AI in Healthcare
CSM715PE	Mobile Application Development

Professional Elective-V

CSM721PE	Randomized Algorithms
CSM722PE	Federated Machine Learning
CSM723PE	Social Network Analysis
CSM724PE	Speech and Video Processing
CSM725PE	Blockchain Technology

Professional Elective-VI

CSM811PE	Ad-hoc & Sensor Networks
CSM812PE	Semantic Web
CSM813PE	Augmented Reality & Virtual Reality
CSM814PE	Quantum Computing
CSM815PE	Scripting Languages

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

COMPUTER GRAPHICS (PROFESSIONAL ELECTIVE-I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM511PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Apply 2D transformation on various objects.
3. Represent the 3D objects using different models
4. Demonstrate the 3D transformation and 3D viewing.
5. Describe the surface detection methods and various color models.

UNIT-I	BASICS OF COMPUTER GRAPHICS	Classes: 11

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint circle and ellipse algorithms Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT-II	2-D GEOMETRICAL TRANSFORMS	Classes: 11

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland – Hodgeman polygon clipping algorithm.

UNIT-III	3-D OBJECT REPRESENTATION	Classes: 12

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces.
Basic illumination models, polygon rendering methods.

UNIT-IV	3-D GEOMETRIC TRANSFORMATION	Classes: 12

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.
3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V	SURFACE DEDUCTION AND COLOR MODELS	Classes: 12

Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods
Color models: Color Model - Properties of Light XYZ RGB, YIQ, and CMY Color Models

TEXT BOOKS

1. Computer Graphics C version, Donald Hearn and M. Pauline Baker, Pearson Education,2002.

REFERENCE BOOKS

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.

WEB REFERENCES

1. https://eecs.wsu.edu/~cook/ai/lectures/p.html
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
3. http://web.cs.iastate.edu/~cs572/studyguide.html
4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html

E -TEXT BOOKS

1. https://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf

MOOCS COURSES

1. https://www.udacity.com/course/intro-to computer-graphics--cs271
2. https://www.classcentral.com/course/edx-computer-graphics-cg-7230
3. https://www.my-mooc.com/en/mooc/intro-to-computergraphics/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

COMPILER DESIGN (PROFESSIONAL ELECTIVE – I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM512PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce the major concept areas of language translation and compiler design.
2. To enrich the knowledge in various phases of compiler and its use.
3. To provide practical programming skills necessary for constructing a compiler.
4. To introduce the major concept of code optimization techniques.
5. To enrich the knowledge in parsing techniques, syntax directed translation, intermediate code generation, and data flow analysis.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Describe the phases of compiler and role of lexical analysis
2. Design and implement LL and LR parsers.
3. Generate the intermediate code for the statements.
4. Apply code optimization algorithms.
5. Design algorithms to generate machine code.

UNIT-I	INTRODUCTION TO COMPILING	Classes: 15

Introduction - Compilers, Analysis-synthesis model of compilation, Cousins of the Compiler, Phases of a compiler, Compiler construction tools.
Lexical Analysis – Token, lexeme and patterns, Role of Lexical Analyzer, Input Buffering Specification and Recognition of Tokens, Regular definition, Transition diagrams, LEX.

UNIT-II	SYNTAX ANALYSIS	Classes: 11

Syntax analysis: CFGs, ambiguity, associativity, precedence, Top Down parsing – Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing – Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser, Canonical LR Parser, LALR Parser, YACC.

UNIT-III	SYNTAX-DIRECTED TRANSLATION	Classes: 10

Syntax directed definitions: Syntax-Directed Translation Schemes, Construction of syntax trees, Inherited and synthesized attributes, Evaluation order of SDD's, Applications of Syntax-Directed Translation, Dependency graph, Type checking.
Intermediate Code Generation: Functions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Procedure calls.

UNIT-IV	CODE OPTIMIZATION	Classes: 11

Code Optimization: Introduction, The Principal Sources of Optimization, Optimization of basic Blocks, Loops in flow graphs and Introduction to Global Data Flow Analysis.
Run time Environments: Storage organization, Activation tree, Activation record, Parameter passing, Access to nonlocal Data on the stack, Heap Management, Symbol table, Introduction to Garbage collection.

UNIT-V	CODE GENERATION	Classes: 11

Code Generation: Issues in the design of code generator, The target machine, Basic Blocks and Flow Graphs, A simple Code generator, Register allocation and assignment, The DAG representation of Basic blocks, Peephole Optimization.

TEXT BOOKS

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman.

REFERENCE BOOKS

1. Lex &Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Louden, Thomson.
3. Allen I. Holub, "Compiler Design in C", Prentice Hall of India.
4. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003.
5. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI
6. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.

WEB REFERENCES

1. https://www.cs.cmu.edu/~aplatzer/course/Compilers/waitegoos.pdf
2. https://www.smartzworld.com/notes/compiler-design-notes-pdf-cd-2/
3. https://www.geektonight.com/compiler-design-notes/

E -TEXT BOOKS

1. https://learnengineering.in/pdf-principles-of-compiler-design-by-alfred-v-aho-j-d-ullman-free-download/
2. https://www.gatevidyalay.com/tag/compiler-design-by-aho-ullman-pdf/
3. https://learnengineering.in/compiler-design-books/

MOOCS COURSES

1. https://www.udemy.com/course/compiler-design-n/
2. https://nptel.ac.in/courses/106/105/106105190/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

INTRODUCTION TO DATA SCIENCE (PROFESSIONAL ELECTIVE-I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM513PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce a concepts related to the Data Science
2. To perform data analytics using R and Python

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the importance of data science in real world.
2. Do experiments using R programming.
3. Represent the data using Python.
4. Analyze data using Pandas Library.
5. Visualize data using Python.

UNIT-I	INTRODUCTION TO DATA SCIENCE	Classes: 12

Introduction to Data Science: Data-Information- characteristics of data, data munging-scraping-sampling-cleaning, importance of Data Science.

Getting to know your data: Data Objects & attribute types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.

UNIT-II	INTRODUCTION TO R	Classes: 11

Introduction to R: R installation, Basic operations in R using command line, use of IDE R Studio, "R help" feature in R, introduction to Data types, Variables in R, Control Structures, functions in R.

Data Structures in R: Scalars, Vectors, Matrices, Arrays, List, Data frames and Factors. Packages, data reshaping. Importing and Exporting Data.

UNIT-III	PYTHON FOR DATA SCIENCE	Classes: 10

Introduction to NumPy: NumPy standard data types, the basics of NumPy Arrays, Arrays, NumPy Array Attributes, Array Indexing: Accessing Single Creating NumPy Arrays, Structure and Content of Arrays, NumPy Array Attributes, Array Indexing: Accessing Single Elements, Array Slicing, Accessing Subarrays, Multidimensional Arrays, Reshaping of Arrays, M Array Concatenation and Splitting, Aggregations, Computations on Arrays, NumPy"s Structured arrays, Computation times in NumPy arrays and Standard Python List.

UNIT-IV	INTRODUCTION TO PANDAS	Classes: 14

Introduction to Pandas: Pandas Basics, Data Indexing and Selection, Operating on Data in Pandas, Merge and append, Grouping and Summarizing Data frames, Lambda functions& pivot tables, Data sorting, Hierarchical Indexing, Vectorized String Operations.

Data Acquisition: Gather information from different sources, Web APIs, Open Data Sources, Data APIs, Web Scrapping.

Data Cleaning and Preparation: Handling Missing Data, Data Transformation, String Manipulation, summarizing, Binning, classing and Standardization, outlier/Noise& Anomalies.

UNIT-V	DATA WRANGLING & VISUALIZATION	Classes: 10

Data Wrangling: Clean, Transform, Merge, Reshape: Combining and Merging Datasets, Merging on Index, Concatenate, Combining with overlap, Reshaping, Pivoting.

Customizing Plots: Introduction to Matplotlib, Plots, making subplots, controlling axes, Ticks, Labels & legends, annotations and Drawing on subplots, saving plots to files, matplotlib configuration using different plot styles.

Exploratory Data Analysis: Box plot, Histogram, Pie graph, Line chart, Bar plot, Scatter Plot.

TEXT BOOKS

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinny, O"Reilly Media,2017.
2. Practical Data Science with R, Nina Zumel, Jim Porzak, John Mount, Publisher: Dreamtech,2014.

REFERENCE BOOKS

1. An Introduction to Data Science, Jeffrey S. Saltz and Jeffrey M. Stanton, Sage Publication,2018.
2. Learning Python, Mark Lutz, O"Reilly Media, 5th Edition2017.
3. Data Science, John D. Kelleher and Brendan Tierney, MIT Press, 2018.
4. Principles of Data Science, Sinan Ozdemir, Second Edition, Packt Publishing,2018.
5. Data Analytics using R, Seema Acharya, 1st Edition, McGraw Hill India, 2018.

WEB REFERENCES

1. The Data Science Course 2020: Complete Data Science Bootcamphttps://www.udemy.com/course/the-data-science-course-complete- data-science-bootcamp/
2. Introduction to Data Science in Python. https://www.coursera.org/learn/python-data-analysis?specialization=data-science-python
3. Applied Plotting, Charting & Data Representation in Python https://www.coursera.org/learn/python-plotting?specialization=data-science-python

E -TEXT BOOKS
1. https://hastie.su.domains/ISLR2/ISLRv2_website.pdf 2. https://www.researchgate.net/publication/256438799_Data_Science_for_Business/link/5c7a0bda92851c69504c33e3/download 3. http://home.iitk.ac.in/~shalab/swayamprabha/esdar/sp-esdar-lect-1.pdf
MOOCS COURSES
1. Exploratory Statistical Data Analysis With R Software, Swayam Prabha Course http://home.iitk.ac.in/~shalab/spesda.htm 2. Python for Data Science, NPTEL https://nptel.ac.in/courses/106/106/106106212/ 3. Introduction to R Software, SwayamCourse https://onlinecourses.nptel.ac.in/noc20_ma53/preview

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI & ML)

GRAPH THEORY (PROFESSIONAL ELECTIVE-I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM514PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To Learn

1. classes of graph theoretic problems;
2. central theorems about trees, matching, connectivity, colouring and planar graphs;
3. Be able to describe and apply some basic algorithms for graphs;
4. Be able to use graph theory as a modelling tool

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Define the fundamentals about graphs;
2. Apply the shortest path algorithms for weighted graphs
3. Formulate and prove central theorems about trees, matching and connectivity
4. Explain the concept of colorings and theory
5. Describe and apply some basic algorithms for graphs;

UNIT-I	INTRODUCTION	Classes: 11

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence

UNIT-II	CONNECTED GRAPHS AND SHORTEST PATHS	Classes: 11

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra‟s shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT-III	TREES	Classes: 11

Trees- Definitions and characterizations, Number of trees, Cayley‟s formula, Kirchoff-matrix-tree theorem, Minimum spanning trees, Kruskal‟s algorithm, Prim‟s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury‟s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT-IV	INDEPENDENT SETS COVERINGS AND MATCHINGS	Classes: 11

Independent sets coverings and matchings– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT-V	VERTEX COLORINGS	Classes: 11

Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski‟s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH
4. Introduction to Graph Theory, Wilson Robin j, PHI
5. Graph Theory with Applications to Engineering And Computer Science, Narsing Deo, PHI
6. Graphs - An Introductory Approach, Wilson and Watkins

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2. https://medium.com/basecs/a-gentle-introduction-to-graph-theory-77969829ead8
3. https://www.britannica.com/topic/graph-theory
4. https://towardsdatascience.com/what-is-graph-theory-and-why-should-you-care-28d6a715a5c2

E -TEXT BOOKS

1. http://www.freebookcentre.net/Mathematics/Graph-Theory-Books.html
2. https://www.kobo.com/us/en/ebook/a-textbook-of-graph-theory
3. https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf
4. https://www.e-booksdirectory.com/listing.php?category=53

MOOCS COURSES

1. https://www.coursera.org/courses?query=graph%20theory
2. https://www.mooc-list.com/tags/graph-theory
3. https://www.classcentral.com/tag/graph-theory
4. https://www.edx.org/course/advanced-algorithmics-and-graph-theory-with-python

5.https://nptel.ac.in/courses/111/106/111106050/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

WEB TECHNOLOGIES (PROFESSIONAL ELECTIVE - I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM515PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Java script and AJAX

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Design a webpage by applying HTML and XML elements
2. Understand server-side scripting with PHP language
3. Implement Server-side programming with Java Servlets
4. Develop web pages using Java Server Pages
5. Demonstrate client-side scripting, validation of form.

UNIT-I	HTML	Classes: 14

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT-II	INTRODUCTION TO PHP AND FILE HANDLING IN PHP	Classes: 13

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT-III	INTRODUCTION TO SERVLETS	Classes: 13

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC

UNIT-IV	INTRODUCTION TO JSP	Classes: 14
Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP		
UNIT-V	**CLIENT-SIDE SCRIPTING**	**Classes: 12**
Client-side Scripting: Introduction to Java script, Java script language – declaring variables, scope of variables, functions. event handlers (on click, on submit etc.), Document Object Model, Form validation.		

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX

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1. http://bitbucket.org/ -
2. http://github.com/ -
3. http://www.codeplex.com/ -
4. http://sourceforge.net/

TEXT BOOKS

1. https://www.tutorialspoint.com/php/
2. https://www.tutorialspoint.com/php/php_tutorial.pdf
3. https://www.geeksforgeeks.org/web-technology/

MOOCS COURSES

1. https://nptel.ac.in/courses/106105084/14
2. https://nptel.ac.in/courses/nptel_download.php?subjectid=106105084
3. https://freevideolectures.com/course/3690/advanced-java/29 -servlets

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

DISTRIBUTED SYSTEMS (PROFESSIONAL ELECTIVE-II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM521PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This course provides an insight into Distributed systems.
2. Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Describe the fundamentals of distributed systems
2. Comprehend the operating system support for distributed systems.
3. Understand the peer to peer systems in Distributed shared memory.
4. Apply the transaction and concurrency concepts in basic level applications.
5. Employ replication to provide fault-tolerance services

UNIT-I	CHARACTERIZATIONOF DISTRIBUTED SYSTEMS	Classes: 18

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT-II	OPERATING SYSTEM SUPPORT	Classes: 14

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT-III	PEER TO PEER SYSTEMS	Classes: 13

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT-IV	TRANSACTIONS AND CONCURRENCY CONTROL	Classes: 11

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed

transactions, Distributed deadlocks, Transaction recovery.		
UNIT-V	**REPLICATION**	**Classes: 11**
Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models		

TEXT BOOKS

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

WEB REFERENCES

1. https://www.confluent.io/learn/distributed-systems/
2. https://www.educative.io/blog/distributed-systems-considerations-tradeoffs
3. https://www.freecodecamp.org/news/a-thorough-introduction-to-distributed-systems-3b91562c9b3c/

E -TEXT BOOKS

1. **https://www.cl.cam.ac.uk/teaching/2021/ConcDisSys/dist-sys-notes.pdf**

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1. https://nptel.ac.in/courses/106/106/106106168/
2. https://nptel.ac.in/courses/106/106/106106107/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

IMAGE PROCESSING (PROFESSIONAL ELECTIVE-II)

III B.TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	MaximumMarks		
		L	T	P	C	CIE	SEE	Total
CSM522PE	B.Tech	3	0	0	3	30	70	100

COURSEOBJECTIVES

To learn

1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
2. The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Demonstrate the knowledge of filtering techniques.
3. Demonstrate the knowledge of image restoration.
4. Demonstrate the knowledge of image segmentation.
5. Describe various image compression models

UNIT-I	DIGITAL IMAGE FUNDAMENTALS	Classes:9

Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations- DFT, DCT, KLT and SVD.

UNIT-II	IMAGE ENHANCEMENT	Classes:10

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT-III	IMAGE RESTORATION	Classes: 10

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV	IMAGE SEGMENTATION	Classes:11

	Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.	
UNIT-V	**IMAGE COMPRESSION**	**Classes:10**
Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.		

TEXT BOOKS

1. Digital Image Processing: R.C. Gonzalez & R.E. Woods, Addison Wesley/Pearson Education, 2nd Ed, 2004.

REFERENCEBOOKS

1. Fundamentals of Digital Image Processing: A.K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K .Pratt, JohnWilely,3rd Edition, 2004.

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2. https://iopscience.iop.org/article/10.1088/1742-6596/1087/5/052024/pdf
3. https://en.wikipedia.org/wiki/Digital_image_processing

E-TEXT BOOKS

1. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
2. https://sisu.ut.ee/imageprocessing/book/1

MOOCS COURSES

1. http://nptel.ac.in
2. https://www.coursera.org2.

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING

INFORMATION RETRIEVAL SYSTEMS (PROFESSIONAL ELECTIVE – II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM523PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Outline the concepts of Information Retrieval.
2. Comprehend the data structures used in information extraction.
3. Apply clustering and indexing for information retrieval.
4. Illustrate the search techniques and visualization.
5. Understand the multimedia information retrieval.

UNIT-I	INTRODUCTION	Classes: 10

A Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT-II	INDEXING AND DATA STRUCTURE	Classes: 10

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing,
Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT-III	AUTOMATIC INDEXING AND CLUSTERIG	Classes: 9

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages, Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT-IV	SEARCH TECHNIQUES AND VISUALIZATION	Classes: 9

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext Information Visualization: Introduction to Information Visualization, Cognition and Perception, rmation Visualization Technologies		
UNIT-V	**TEXT SEARCH AND MULTIMEDIA**	**Classes: 9**
Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval		

TEXT BOOKS

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

WEB REFERENCES

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2. https://medium.com/@soumya.vkshukla/information-retrieval-a-brief-overview-173bba8fe0e9
3. https://nios.ac.in/media/documents/SrSecLibrary/LCh-015B.pdf

E -TEXT BOOKS

1. https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf

MOOCS COURSES

1. https://www.mooc-list.com/course/text-retrieval-and-search-engines-coursera
2. https://www.udemy.com/course/information-retrieval-and-mining-massive-data-sets/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

SOFTWARE TESTING METHODOLOGIES (PROFESSIONAL ELECTIVE - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM524PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To develop skills in software test automation and management using latest tools.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Apply path testing on the software
2. Demonstrate dataflow testing on the developed code
3. Apply the regular expression on testing strategies
4. Design and develop the best test strategies in accordance to the development model using state graphs
5. Apply various testing tools for testing the software.

UNIT-I	INTRODUCTION	Classes: 15

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II	TRANSACTION FLOW TESTING	Classes: 12

Transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-III	PATH PRODUCTS AND REGULAR EXPRESSIONS	Classes: 12

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT-IV	STATE GRAPHS AND TRANSITION TESTING	Classes: 11

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips

UNIT-V	GRAPH MATRICES AND APPLICATION	Classes: 12
Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools.		

TEXT BOOKS

1. Software Testing techniques - BarisBeizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

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2.https://www.academia.edu/27915965/SOFTWARE_TESTING_METHODOLOGIES

E -TEXT BOOKS

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3. Software Testing in the Real World – Edward Kit, Pearson.
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

PATTERN RECOGNITION (PROFESSIONAL ELECTIVE - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM525PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To provide introduction to some of the fundamental concepts, theories, and algorithms for pattern recognition and machine learning
2. To introduce the fundamental concepts of Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classify.
3. Classify machines by their power to recognize languages.
4. Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering machines to solve problems in Computing.
5. To understand the differences between an application of hand-written digit recognition

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Describe the fundamentals of pattern recognition algorithms
2. Apply the concept of abstract machines and their pattern recognition algorithms
3. Employ the machine learning techniques in classification
4. Design pattern recognition problems using Hidden Markov model.
5. Apply clustering algorithms for pattern recognition and to distinguish between clustering and decision problems.

UNIT-I	PATTERN RECOGNITION	Classes: 11

Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, and Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT-II	NEAREST NEIGHBOR BASED CLASSIFIER	Classes: 11

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network

UNIT-III	HIDDEN MARKOV MODELS	Classes: 10
Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.		
UNIT-IV	**SUPPORT VECTOR MACHINES**	**Classes: 11**
Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.		
UNIT-V	**CLUSTERING**	**Classes: 11**
Clustering: Why are Clustering Important, Hierarchical Algorithms, Partitional Clustering, and Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results		

TEXT BOOKS

1. Bishop, Christopher M., "Pattern Recognition and Machine Learning", First Edition, Springer, 2009.
2. S. Theodoridis, K. Koutroumbas, "Pattern Recognition", Fourth Edition, Academic Press, 2009.

REFERENCE BOOKS

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub,1st Ed.
2. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
3. Fundamentals of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice Hall Pub

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1. https://viso.ai/deep-learning/pattern-recognition/
2. https://www.analyticsvidhya.com/blog/2020/12/an-overview-of-neural-approach-on-pattern-recognition/
3. https://www.educba.com/pattern-recognition-applications/
4. https://www.section.io/engineering-education/understanding-pattern-recognition-in-machine-learning/

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2. https://stuvera.com/pattern-recognition-book-pdf/
3. https://darmanto.akakom.ac.id/pengenalanpola/Pattern%20Recognition%204th%(2009).pdf
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

MOBILE COMPUTING (PROFESSIONAL ELECTIVE- III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM611PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To understand the basic concepts of mobile computing.
2. To learn the basics of mobile telecommunication system.
3. To be familiar with the network layer protocols and Ad-Hoc networks.
4. To know the basis of transport and application layer protocols.
5. To gain knowledge about different mobile platforms and application development.

COURSE OUTCOMES

Upon the completion of the subject, the student will be able to

1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I	INTRODUCTION	Classes: 12

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols –SDMA- TDMA- FDMA- CDMA.

UNIT-II	MOBILE TELECOMMUNICATION SYSTEM	Classes: 14

Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS UMTS – Architecture – Handover – Security.

UNIT-III	MOBILE NETWORK LAYER	Classes: 10

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks(VANET) –MANET Vs VANET – Security.

UNIT-IV	MOBILE TRANSPORT AND APPLICATION LAYER	Classes: 12

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.

UNIT-V	MOBILE PLATFORMS AND APPLICATIONS	Classes: 12

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

TEXT BOOKS

1. Jochen Schiller, ―Mobile Communications‖, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, ―Fundamentals of Mobile Computing‖, PHI Learning Pvt. Ltd, New Delhi – 2012

REFERENCE BOOKS

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, ―Principles of Mobile Computing‖, Springer, 2003.
3. William.C.Y.Lee,―Mobile Cellular Telecommunications-Analog and Digital Systems‖ Second Edition,Tata Mc Graw Hill Edition ,2006.
4. C.K.Toh, ―AdHoc Mobile Wireless Networks‖, First Edition, Pearson Education, 2002.

WEB REFERENCES

1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone Dev Center : http://developer.windowsphone.com
4. BlackBerry Developer :http://developer.blackberry.com
5. www.padeepz.net

MOOCS COURSE

1. https://nptel.ac.in/courses/106/106/106106147/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

EXPERT SYSTEMS (PROFESSIONAL ELECTIVE -III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM612PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. In this course the student will learn the methodology used to transfer the knowledge of a human expert into an intelligent program that can be used to solve problems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understands the basics of Artificial intelligence and the various searching techniques
2. Analyses the knowledge representation through forward and backward chaining techniques
3. Explains the various expert systems by applying appropriate rule base
4. Design a knowledge base and implement a rule-based expert system
5. Evaluates the architecture and frameworks of Truth Maintenance systems through machine Learning algorithms

UNIT-I	INTRODUCTION	Classes: 12

The AI problem–What is AI technology–Level of the Model – Criteria for Success problems, Problem Spaces & Searches &Heuristic Search Technology Problem as a State Space Search –Production Systems– production System Characteristics – Generate & Test– Hill Climbing–Best First Search–Constraint Satisfaction– Means End Analysis.

UNIT-II	KNOWLEDGE REPRESENTATION	Classes: 10

Issues in Knowledge Representation–Using Predicate Logic – Representing Simple Facts in Logic, Representing Instance &Isa Relationship – Computable Functions & Predicates–Representing Knowledge Using Rules: Procedural Vs. Declarative Knowledge–Forward Vs. Backward Reasoning.

UNIT-III	SLOT AND FILLERSTRUCTURES	Classes: 14

Slot-and-Filler Structures Semantic Nets, Frames, And Conceptual Dependency. Game Playing Overview, The Mini-max Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

UNIT-IV	EXPERT SYSTEMS	Classes: 13
What are Expert Systems – Knowledge Representation in Expert Systems–Symbolic Computation–Rule based Systems		
UNIT-V	**TOOLS FOR BUILDING EXPERT SYSTEMS**	**Classes: 12**
Using Domain Knowledge–Knowledge Acquisition–Design for Explanation–Black Board Architecture– Truth Maintenance Systems–Machine Learning–Case based Reasoning		

TEXT BOOKS

1. Rich, Elaine and Knight, Kevin, Artificial Intelligence, Tata McGraw-Hill publications, 2nd Edition, 2006
2. Peter Jackson, Introduction to Expert Systems, 3rd Edition, Addison Wesley, 1st Indian Reprint, 2000.

REFERENCE BOOKS

1. Eugene Charniak and Drew McDermott, Introduction to Artificial Intelligence, Addison Wesley, Pearson Education, 2005
2. George F Luger, Artificial Intelligence Structures and Strategies for Complex Problem Solving, Pearson Education Ltd., 2nd Edition, 2002.
3. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall of India, 2001
4. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman & Allanheld, New Jersey
5. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman

WEB REFERENCES

1. https://citationsy.com/styles/expert-systems-with-applications
2. https://www.cambridge.org/core/journals/knowledge-engineering-review/article/abs/webbased-expert-systems-and-services/580D1A617BAE4535A15CF37B2F41084E
3. https://onlinelibrary.wiley.com/toc/14680394/2021/38/7

E -TEXT BOOKS

1. http://www.worldcolleges.info/sites/default/files/enggnotes/07_expert_systems.pdf
2. http://www.sci.brooklyn.cuny.edu/~parsons/courses/32-fall-2003/notes/lect13.pdf

MOOCS COURSES

1. https://www.udemy.com/course/artificial-intelligence-exposed-future-10-extreme-edition/
2. https://infyniconnect.com/course/detail/65/courrency-amount-check/
3. http://www.openlearningworld.com/innerpages/Expert%20Systems.htm

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

INTERNET OF THINGS (PROFESSIONAL ELECTIVE-III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM613PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web based services on IoT devices

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Interpret the impact and challenges posed by IoT networks leading to new architectural Models.
2. Compare and contrast the deployment of smart objects and the technologies to connect them to network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Elaborate the physical devices used in IoT.
5. Illustrate the connection between cloud computing and IOT.

UNIT-I	INTRODUCTION TO INTERNET OF THINGS	Classes: 11

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT-II	IOT AND M2M	Classes: 11

IoT and M2M – Software defined networks, network function virtualization, difference between SDN andNFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMPNETOPEER.

Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT-III	INTRODUCTION TO PYTHON	Classes: 11

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib. Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests.

UNIT-IV	IOT PHYSICAL DEVICES AND ENDPOINTS	Classes: 11

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT-V	IOT PHYSICAL SERVERS AND CLOUD OFFERINGS	Classes: 11

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework Designing a REST ful web API

TEXT BOOKS

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,ISBN: 9789350239759
3. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, November 2013, John Wiley and Sons.

REFERENCE BOOKS

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
2. CunoPfister, Getting Started with the Internet of Things, O“Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

WEB REFERENCES

1. https://books.google.co.in/books/about/Internet_of_Things.html?id=JPKGBAAAQBAJ&printsec=frontcover&source=kp_read_button&redir_esc=y
2. http://202.62.95.70:8080/jspui/bitstream/123456789/12322/1/Internet%20of%20Things%20By%20Arshdeep%20Bahga.pdf

E -TEXT BOOKS

1. Internet of things security: principles and practices, quingaoTang,fan du.

MOOCS COURSES

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://nptel.ac.in/courses/106/105/106105195/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

BIG DATA ANALYTICS (PROFESSIONAL ELECTIVE-III)

III B.TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM614PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To introduce the terminology, technology and its applications
2. To introduce the concept of Analytics and Visualization
3. To demonstrate the usage of various Big Data tools and Data Visualization tools.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Compare various file systems and use an appropriate file system for storing different types of data.
2. Demonstrate the concepts of Hadoop ecosystem for storing and processing of unstructured data.
3. Apply the knowledge of programming to process the stored data using Hadoop tools and generate reports.
4. Connect to web data sources for data gathering, Integrate data sources with hadoop components to process streaming data.
5. Tabulate and examine the results generated using Hadoop components

UNIT-I	INTRODUCATION TO BIGDATA	Classes:13

Data and its importance, Big Data- definition, implications of Big Data, addressing Big Data implications using Hadoop, Hadoop Eco system.

HADOOP ARCHITECTURE: Hadoop Storage: HDFS, Hadoop Processing: Map Reduce Framework Hadoop Server Roles: Name Node, Secondary Name Node and Data Node, Job Tracker, Task Tracker

HDFS-HADOOP DISTRIBUTED FILE SYSTEM: Design of HDFS, HDFS Concepts, HDFS Daemons, HDFS High Availability, Block Abstraction, FUSE: File System in User Space. HDFS Command Line Interface (CLI), Concept of File Reading and Writing in HDFS.

UNIT-II	MAPREDUCEPROGRAMMINGMODEL	Classes:12

Introduction to Map Reduce Programming model to process Big Data, key features of Map Reduce, Map Reduce Job skeleton, Introduction to Map Reduce API, Hadoop Data Types, Develop Map Reduce Job using Eclipse, built a Map Reduce Job export it as a java archive (.jarfile).

MAP REDUCE JOB LIFE CYCLE: Understanding Mapper, Combiner, Partitioner, Shuffle & Sort and Reduce phases of Map Reduce Application, Developing Map Reduce Jobs based on the requirement using given datasets like weather dataset.

UNIT-III	INTRODUCTION TO PIG	Classes:12

INTRODUCTION TO PIG: Understanding pig and pig Platform, introduction to Pig Latin Language and Execution engine, running pig in different modes, Pig Grunt Shell and its usage.

PIG LATIN LANGUAGE– SEMANTICS– DATA TYPES IN PIG: Pig Latin Basics, Keywords, Pig Data types, Understanding Pig relation, bag, tuple and writing pig relations or statements using Grunt Shell, expressions, Data processing operators, using Built-in functions.

WRITING PIG SCRIPTS USING PIG LATIN: Writing pig scripts and saving them text editor, running pig scripts from command line.

UNIT-IV	INTRODUCTION TO HIVE	Classes:11

INTRODUCTION TO HIVE: Understanding Hive Shell, Running Hive, Understanding Schema on read and Schema on write.

HIVE QL DATA TYPES, SEMANTICS: Introduction to Hive QL (Query Language), Language semantics, Hive Data Types.

HIVE DDL, DML AND HIVE SCRIPTS: Hive Statements, Understanding and working with Hive Data Definition Languages and Manipulation Language statements, Creating Hive Scripts and running them from hive terminal and command line.

UNIT-V	SQOOP	Classes:12

Introduction to Sqoop tool, commands to connect databases and list databases and tables, command to import data from RDBMS into HDFS, Command to export data from HDFS into required tables of RDBMS.

FLUME: Introduction to Flumeagent, understanding Flume components Source, Channel And Sink. OOZIE: Introduction to Oozie, Understanding workflow Management.

TEXT BOOKS

1. Hadoop: The Definitive Guide, 4th Edition - O'Reilly Media
2. Chris Eaton, Dirk deroosetal. , “Understanding Big data ”, McGraw Hill, 2012.
3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

REFERENCE BOOKS

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
2. Paul Zikopoulos ,DirkDeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

WEB REFERENCES

1. www.edufind.com
2. https://lecturenotes.in/subject/884/big-data-analysis-bda/note

E -TEXT BOOKS

1. https://www.immagic.com/eLibrary/ARCHIVES/EBOOKS/I111025E.pdf

MOOCS COURSES

1 https://onlinecourses.nptel.ac.in/noc21_cs45/preview

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

COMPUTER VISION (PROFESSIONAL ELECTIVE-III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM615PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To review image processing techniques for computer vision.
2. To understand shape and region analysis.
3. To understand Hough, Transform and its applications to detect lines, circles, ellipses.
4. To understand three-dimensional image analysis techniques.
5. To understand motion analysis.
6. To study some applications of computer vision algorithms

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Implement fundamental image processing techniques required for computer vision.
2. Perform shape analysis and implement boundary tracking techniques.
3. Apply Hough Transform for line, circle, and ellipse detections.
4. Apply 3D vision and motion related techniques.
5. Develop applications using computer vision techniques.

UNIT-I	IMAGE PROCESSING FOUNDATIONS	Classes: 10

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT-II	SHAPES AND REGIONS	Classes: 13

Binary shape analysis – connectedness – object labelling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion –boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors moments.

UNIT-III	HOUGH TRANSFORM	Classes: 12

Line detection – Hough Transform (HT) for line detection – foot-of normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection– accurate centre location – speed problem – ellipse detection – Case study: Human Iris location– hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT-IV	3D VISION AND MOTION	Classes: 11

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT-V	APPLICATIONS	Classes: 11

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

TEXT BOOKS

1. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. E. R. Davies, ―Computer & Machine Vision, Fourth Edition, Academic Press, 2012.

REFERENCE BOOKS

1. D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packet Publishing, 2012.
2. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms For analysing images, O'Reilly Media, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.

WEB REFERENCES

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2. https://freecomputerbooks.com/Computer-Vision-Algorithms-and-Applications.html
3. https://www.kaggle.com/getting-started/185878
4. https://www.elsevier.com/books/advanced-methods-and-deep-learning-in-computer-vision/davies/978-0-12-822109-9

E –TEXT BOOKS

1. https://www.tutorialspoint.com/computer_vision_and_image_processing_web_app_developed_using_python_flask_machine_learning_and_deployed_in_cloud/index.asp
2. https://www.tutorialspoint.com/computer_vision_and_deep_learning_in_python_novice_to_expert/index.asp

MOOCS COURSES

1. https://www.udemy.com/courses/search/?src=ukw&q=computer+vision
2. https://www.edx.org/search?q=computer%20vision

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

CLOUD COMPUTING (PROFESSIONAL ELECTIVE- IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM711PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This course provides an insight into cloud computing
2. Topics covered include- distributed system models, different cloud service models, service- oriented architectures, cloud programming and software environments, resource management.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand various service delivery models of a cloud computing architecture.
2. Explain the basics of cloud computing
3. Understand the management of cloud and cloud migration.
4. Understand and differentiate various cloud computing models.
5. Understanding cloud service providers

UNIT-I	SYSTEM MODELING	Classes: 12

Clustering and Virtualization: Distributed system models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtualization machines an Virtualization of clusters and Data centers.

UNIT-II	CLOUD COMPUTING FUNDAMENTALS	Classes: 12

Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III	CLOUD COMPUTING ARCHITECTURE AND MANAGEMENT	Classes: 10

Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV	CLOUD SERVICE MODELS	Classes: 12

Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a

Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.		
UNIT-V	**CLOUD SERVICE PROVIDERS**	**Classes: 12**
Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided bySAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform		

TEXT BOOKS

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and AndrzejM. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

WEB REFERENCES

1. **https://www.ibm.com/in-en/cloud/learn/cloud-computing**
2. **https://azure.microsoft.com/en-in/overview/what-is-cloud-computing/**

E -TEXT BOOKS

2. https://livebook.manning.com/book/the-cloud-at-your-service/chapter-1/
3. https://phoenixnap.com/blog/what-is-cloud-computing

MOOCS COURSES

1. IIT Roorkee E&ICT Program- Cloud Computing Certification
2. Azure Certification Training –Cloud Computing

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

CRYPTOGRAPHY & NETWORK SECURITY (PROFESSIONAL ELECTIVE-IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM712PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Explain the objectives of information security.
2. Understand various cryptographic algorithms.
3. Understand the basic categories of threats to computers and networks.
4. Describe public-key cryptosystem.
5. Discuss the fundamental ideas of public-key cryptography.
6. Discuss Web security and Firewalls.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Explain the basic concepts in security.
2. Understand about various encryption techniques.
3. Apply message authentication and hash functions.
4. Describe wireless network security.
5. Comprehend the security features on email communication.

UNIT-I	INTRODUCTION	Classes: 12

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plaintext and ciphertext, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT-II	SYMMETRIC KEY CIPHERS, ASYMMETRIC KEY CIPHERS	Classes: 14

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers,RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Knapsack Algorithm.

UNIT-III	CRYPTOGRAPHIC HASH FUNCTIONS,MESSAGE AUTHENTICATION CODES	Classes: 13
Cryptographic Hash Functions: Message Authentication, Applications of cryptographic Hash functions, Secure Hash Algorithm (SHA-512),Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure		
UNIT-IV	**TRANSPORT LEVEL SECURITY,WIRELESS NETWORK SECURITY**	**Classes: 11**
Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH), Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security		
UNIT-V	**E-MAIL SECURITY**	**Classes: 12**
Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange, Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.		

TEXT BOOKS

1. Cryptography and Network Security-Principles and practices: Willings Stallings Pearson education, 6th Edition.
2. Cryptography and Network Security: Atulkahate, McGraw Hill 3rd Edition.

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1. Cryptography and Network Security: CK Shyamala, N Harini, Dr TR Padmanabhan, Wiley India,1st edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.

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1. https://www.williamstallings.com/crypto/Crypto4e.html
2. https://nptel.ac.in/courses/106/105/106105162/
3. https://nptel.ac.in/courses/106/106/106106221/
4. https://www.edx.org/learn/cryptography

E-TEXT BOOKS

1. http://williamstallings.com/Cryptography/

MOOCS COURSES

1. https://www.coursera.org/courses?query=cryptography
2. https://nptel.ac.in/courses/106/105/106105031/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DATA VISUALIZATION (PROFESSIONAL ELECTIVE-IV)

IV B. TECH I SEMESTER

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM713PE	B.Tech	3	0	0	3			

COURSE OBJECTIVES

1. To explore the fundamental concepts of data pre-processing, extraction, cleaning, annotation, integration.
2. To understand the various information visualization techniques.
3. An understanding of the key techniques and theory used in visualization, including data models, graphical perception and techniques for visual encoding and interaction.
4. Understand why visualization is an important part of data analysis
5. Understand the components involved in visualization design.

COURSE OUTCOMES

Students will be able to:

1. Design and create data visualizations.
2. Gain the knowledge about D3.
3. Use knowledge of chart library, generate chart and animate the graphs.
4. Apply the various operations on data source.
5. Understand and apply principles of data visualization.

UNIT-I	INTRODUCTION	Classes: 10

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. Mapping - Time series -Connections and correlations - Scatter plot maps - Trees, Hierarchies and Recursion – Networks and Graphs, Info graphics.

UNIT-II	VISUALIZATION WITH SVG	Classes: 10

Introduction to D3 - Fundamental Technology -Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts –Geomapping – Exporting- Data to create Visualization with SVG - SVG – Styling CSS –Shapes – SVG Properties – SVG Text - Drawing – Transformations – Building Chart with SVG (Scalable Vector Graphics) - Shaping Web Pages – Selections – Attributes – Chaining Methods–Data Joins - Sizing – scales – axes – Loading – Filtering – Interactive Charts – Buttons using Data Join – Transition using Key

UNIT-III	VISUALIZATION WITH D3	Classes:8

D3-BASED REUSABLE CHART LIBRARY: Introduction to D3 – Setup and Deployment – Generate Chart – Customize Chart – How to Use APIs – Customize Style – Building Real time and Live Updating animated graphs with C3.		
UNIT-IV	**TABLEAU INTRODUCTION**	**Classes: 8**
TABLEAU INTRODUCTION: Environment Setup – Navigation – File & Data Types. DATA SOURCE: Custom Data View – Extracting Data – Fields Operations – Editing Meta Data – Data Joining – Data Blending. Worksheets		
UNIT-V	**TABLEAU CHARTS**	**Classes: 8**
TABLEAU CHARTS: Bar Chart – Line Chart – Pie Chart – Scatter Plot – Bubble Chart –Gantt Chart – Histograms - Waterfall Charts. ADVANCED: Dashboard – Formatting –Forecasting – Trend Lines		

TEXT BOOKS

1. Ben Fry, "Visualizing Data", O"Reilly Media, Inc., 2007

REFERENCE BOOKS

1. Scott Murray, "Interactive data visualization for the web", O"Reilly Media, Inc., 2013.
2. Ritchie S. King - Visual Storytelling with D3 – An Introduction to Data Visualization with D3,Addison-Wesley-Data Analytic Series, ISBN 10: 0321933176
3. Elijah Meeks , D3.js in Action, Second Edition: Data visualization with JavaScript, Publisher: Manning Publications, 2017 , ISBN: 9781617294488

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1. https://www.sas.com/en_in/insights/big-data/data-visualization.html
2. https://searchbusinessanalytics.techtarget.com/definition/data-visualization

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1. https://www.datapine.com/blog/best-data-visualization-books/
2. https://www.amazon.in/Andy-Kirk/e/B00J39EBMW/ref=dp_byline_cont_pop_book_1

MOOCS COURSES

1. https://www.mooc-list.com/tags/data-visualization
2. https://www.coursera.org/learn/datavisualization

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

AI IN HEALTHCARE (PROFESSIONAL ELECTIVE – IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM714PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Understand the role of AI and its application in healthcare now and in the near future.
2. Understand the myths about AI applications in health care.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Outline the concepts of AI in healthcare.
2. Explain the potentials of AI in healthcare.
3. Use timelines and ethics in AI based healthcare systems
4. Illustrate future of healthcare in technological perspective
5. Adapt AI in healthcare management systems

UNIT-I	INTRODUCTION	Classes: 12

A multifaceted discipline - Examining Artificial Intelligence - Reactive Machines - Limited Memory—Systems That Think and Act Rationally - Think Like Humans - Self-Aware AI—Systems That Are Humans – Self-aware AI – Applications of AI in Healthcare – Prediction - Diagnosis

UNIT-II	REALIZING THE POTENTIAL OF AI IN HEALTHCARE	Classes: 14

Understanding Gap - Fragmented Data - Appropriate Security - Data Governance – Bias – Software – Types of data – Little and big use cases – Electronic health records - Healthcare IoT—Real-Time Notifications, Alerts, Automation - Movement Toward Evidence-Based Medicine

UNIT-III	TIMELINES AND ETHICS	Classes: 13

Timeliness of Analysis – Ethics - Data and Information Governance - Data Stewardship - Data Quality - Data Security - Data Availability - Data Content - Master Data Management (MDM) - Use Cases Ethics of Intelligence :Data Ethics - Informed Consent - Freedom of Choice - Public Understanding - Prioritizing Treatment - Determining New Treatments and Management Pathways - More real-world evidence

UNIT-IV	FUTURE OF HEALTHCARE	Classes: 11
Shifting from Volume to Value - Evidence-Based Medicine-Personalized Medicine-Vision of the Future-Connected Medicine-Disease and Condition Management-Virtual Assistants-Remote Monitoring-Medication Adherence-Accessible Diagnostic Tests-Smart Implantables - Digital Health and Therapeutics		
UNIT-V	**FUTURE OF AI IN HEALTHCARE**	**Classes: 12**
AI - Mining Records - Conversational AI - Making Better Doctors - Virtual and Augmented Reality :Virtual Reality - Augmented Reality - Merged Reality - Pain Management - Physical Therapy - Cognitive Rehabilitation - Nursing and Delivery of Medicine - Virtual Appointments and Classrooms , Blockchain - Verifying the Supply Chain - Incentivized Wellness - Patient Record Access		

TEXT BOOKS

1. Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health Outcomes, Apress, 2019.

REFERENCE BOOKS

1. Artificial Intelligence and it's Application in Healthcare, CRC Press 2020.

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1. https://healthitanalytics.com/news/top-12-ways-artificial-intelligence-will-impact-healthcare
2. https://www.pharmaceutical-technology.com/features/ai-in-healthcare-2021/

E -TEXT BOOKS

1. https://www.elsevier.com/books/artificial-intelligence-in-healthcare/bohr/978-0-12-818438-7

MOOCS COURSES

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/106/105/106105077/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

MOBILE APPLICATION DEVELOPMENT (PROFESSIONAL ELECTIVE - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM715PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the basics and components of Android application.
2. Employ the user interface components in Android application
3. Describe the significance of intents and broadcasts
4. Comprehend the need of persistent storage
5. Develop, deploy and maintain the Android Applications with database

UNIT-I	INTRODUCTION TO ANDROID OPERATING SYSTEM	Classes: 15

Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT-II	ANDROID USER INTERFACE	Classes: 12

Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III	INTENTS AND BROADCASTS	Classes: 12
Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts		
UNIT-IV	**PERSISTENT STORAGE**	**Classes: 11**
Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference		
UNIT-V	**DATABASE**	**Classes: 12**
Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)		

TEXT BOOKS

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOKS

1.Beginning Android4 Application Development, Wei-MengLee, Wiley India(Wrox),2013

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1.https://www.tutorialspoint.com/mobile_development_tutorials.htm
2.https://www.javatpoint.com/android-tutorial

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1.http://yuliana.lecturer.pens.ac.id/Android/Buku/professional_android_4_application_development.pdf

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2.https://swayam.gov.in/
3.https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

RANDOMIZED ALGORITHMS (PROFESSIONAL ELECTIVE-V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM721PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce randomization techniques and paradigms used in the development.
2. To introduce the power of randomization in the design and analysis of algorithms.
3. Probabilistic analysis of algorithms.
4. Argue the correctness of algorithms using inductive proofs and invariants.
5. Synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept of motivation for the design and use of randomized algorithms
2. Understand Markov's inequality, variance and Chebyshev's inequality.
3. Understand Chernoff- Hoeffding (CH) Bounds.
4. Describe Lovasz Local Lemma
5. Understand the need of Randomized rounding, Markov Chains applications

UNIT-I	Introduction, Events and probability	Classes: 12

Introduction: what randomized algorithms are, motivation for the design and use of randomized algorithms, types of randomized algorithms (Las Vegas and Monte Carlo), example randomized algorithm: polynomial identity testing.Events and probability, axioms of probability, the union bound, inclusion-exclusion principle, example: the balls and bins problem, conditional events, Bayes Law, example: Karger's randomized min-cut algorithm.

UNIT-II	Discrete Random Variables	Classes: 11

Discrete Random Variables (Bernoulli, Binomial, Geometric), expectation, linearity of expectation, example: coupon collector's problem, example: analysis of randomized quick sort, conditional expectation. Markov's inequality, variance and Chebyshev's inequality, example: randomized selection.

UNIT-III	Chernoff-Hoeffding (CH) Bounds	Classes: 13

Chernoff-Hoeffding (CH) Bounds: derivation and different versions, examples: load balancing, randomized quick sort, packet routing in networks, skip lists. The Probabilistic Method, the expectation argument, examples: max-cut, maxSAT, the sample and modify method, examples: independent sets, second moment method, example: threshold behavior in random graphs, derandomization: method of conditional expectations.

UNIT-IV	Lovasz Local Lemma	Classes: 10

Lovasz Local Lemma, derivation and the two versions, examples: edge disjoint paths, satisfiability. Algorithmic versions of the Lovasz Local Lemma: Beck's algorithm, the algorithm of Moser and Tardos, Distributed Maximal Independent Set (MIS) algorithms and the use of Beck's algorithm in this context.

UNIT-V	Randomized rounding, Markov Chains	Classes: 12

Randomized rounding to solve problems in combinatorial optimization, examples: maxSAT, max-cut, set cover. Randomized rounding of semi definite programs, introduction to semi definite programs, the Goemans-Williamson algorithm for finding large cuts.

Markov Chains, applications to 2-SAT and 3-SAT, random walks on Graphs, electrical networks, cover time, hitting time, s-t connectivity algorithm.

TEXT BOOKS

1. Rajeev Motwani, PrabhakarRaghavan, Randomized Algorithms, Cambridge University Press.
2. David Williamson, David Shmoys, The design of approximation algorithms, Cambridge University Press.
3. DevdattDubhashi, Alessandro Panconesi, Concentration of Measure for the analysis of randomized algorithms, Cambridge University Press.

REFERENCE BOOKS

1. Michael Mitzenmacher and Eli Upfal, *Probability and Computing: Randomized Algorithms and Probabilistic Analysis*, Cambridge University Press, ISBN 0521835402.
2. Feller W, An Introduction to Probability Theory and Its Applications, Volume 1, 3rd Edition, Wiley (1968).

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2. https://nptel.ac.in/courses/106/103/106103187/

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2. https://www.amazon.in/Randomized-Algorithms-Cambridge-International-Computation/dp/0521474655

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2. http://theory.stanford.edu/people/pragh/amstalk.pdf
3. https://www.cse.iitk.ac.in/users/sbaswana/randomized-algo.html
4. https://www.khanacademy.org/computing/computer-science/cryptography/random-algorithms-probability/v/randomized-algorithms-prime-adventure-part-8

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

FEDERATED MACHINE LEARNING (PROFESSIONAL ELECTIVE –V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM722PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concepts of computational intelligence like machine learning
2. Ability to get the skill on distributed machine learning
3. Understand the vertical federated learning
4. Apply federated learning for different applications
5. Comprehend the concept of federated reinforcement learning

UNIT-I	INTRODUCTION TO FEDERATED MACHINE LEARNING	Classes: 12

Introduction – Motivation-Federated Learning as a Solution- Current Development in Federated Learning – Background: Privacy-Preserving Machine Learning - PPML and Secure ML - Threat and Security Models - Privacy Preservation Techniques.

UNIT-II	DISTRIBUTED MACHINE LEARNING	Classes: 12

Distributed Machine Learning - Introduction to DML - Scalability-Motivated DML - Privacy-Motivated DML - Privacy-Preserving Gradient Descent - Horizontal Federated Learning - The Definition of HFL - Architecture of HFL - The Federated Averaging Algorithm- Improvement of the FedAvg Algorithm.

UNIT-III	VERTICAL FEDRATED LEARNING	Classes: 10

Vertical Federated Learning - The Definition of VFL - Architecture of VFL - Algorithms of VFL- Federated Transfer Learning - Heterogeneous Federated Learning -Federated Transfer Learning- The FTL Framework.

UNIT-IV	FEDERATED LEARNING: APPLICATIONS	Classes: 12

Incentive Mechanism Design for Federated Learning - Paying for Contributions - A Fairness-Aware Profit Sharing Framework - Federated Learning for Vision, Language, and Recommendation- Federated Learning for Computer Vision -

Federated Learning for NLP - Federated Learning for Recommendation Systems		
UNIT-V	**FEDRATED REINFORCEMENT LEARNING**	**Classes: 12**
Federated Reinforcement Learning - Introduction to Reinforcement Learning - Reinforcement Learning Algorithms - Distributed Reinforcement Learning - Federated Reinforcement Learning - Selected Applications – Finance – Healthcare – Education - Urban Computing and Smart City- Edge Computing and Internet of Things- Blockchain- 5G Mobile Networks.		

TEXT BOOKS

1. Qiang Yang, Yang Liu, Yong Cheng, Yan Kang and Tianjian Chen Han Yu, Federated Learning, Morgan & play pool publishers, 2019

REFERENCE BOOKS

1. Data LirongXia , Learning and Decision-Making from Rank, 2019
2. Zhiyuan Chen and Bing Liu, Lifelong Machine Learning, Second Edition 2018

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1. https://www.coursera.org/learn/machine-learning
2. https://www.ibm.com/in-en/cloud/learn/machine-learning
3. https://www.geeksforgeeks.org/machine-learning/
4. https://www.expert.ai/blog/machine-learning-definition/

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2. https://www.kdnuggets.com/2020/03/24-best-free-books-understand-machine-learning.html
3. https://www.analyticsinsight.net/10-popular-must-read-free-ebooks-on-machine-learning/
4. https://alex.smola.org/drafts/thebook.pdf

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2.https://nptel.ac.in/courses/106105087/pdf/m01L01.pdf
3.https://onlinecourses.nptel.ac.in/noc21_cs13/preview.
4.https://www.tutorialspoint.com/machine_engineering/index.htm

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

SOCIAL NETWORK ANALYSIS (PROFESSIONAL ELECTIVE - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM723PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To provide introduction to some of the of semantic web and related applications
2. To introduce the fundamental concepts of knowledge representation using ontology.
3. Classify web application by their power to recognize languages.
4. To understand human behaviour in social web and related communities.
5. To understand the differences between visualization of social networks

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept of abstract semantic web and related applications
2. Employ ontology techniques in classification
3. Apply mining techniques for web social networks.
4. Gain knowledge on handling privacy issues.
5. Apply the visualization in social networks

UNIT-I	INTRODUCTION TO SEMANTIC WEB	Classes: 11

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis

UNIT-II	MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION	Classes: 11

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations

UNIT-III	EXTRACTION AND MINING COMMUNITIES IN WEB	Classes: 10

	SOCIAL NETWORKS	
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.		
UNIT-IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**	**Classes: 11**
Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.		
UNIT-V	**VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**	**Classes: 11**
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.		

TEXT BOOKS

1. Peter Mika, ―Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010
3. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.

REFERENCE BOOKS

1. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
2. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling‖, IGI Global Snippet, 2009.
3. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web‖, Springer, 2009

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2. https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-019-1599-6
3. http://www.orgnet.com/sna.html
4. https://social-network-analysis.in/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

SPEECH AND VIDEO PROCESSING (PROFESSIONAL ELECTIVE –V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM724PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To understand speech as a means of communication;
2. To represent speech for transmission and reproduction and Production online at your own pace. Start today and improve your skills.
3. Join millions of learners from around the world already learning on Udemy.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Describe speech production and related parameters of speech.
2. Show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.
3. Understand different speech modeling procedures such as Markov and their implementation issues.
4. Explain the fundamentals of video processing.
5. Apply the 2-D motion estimation for speech processing

UNIT-I	BASIC CONCEPTS	CLASSES: 12

Speech Fundamentals: Articulatory Phonetics– Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods

UNIT-II	SPEECH ANALYSIS	CLASSES: 12

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths

UNIT-III	SPEECH MODELING AND SPEECH RECOGNITION	CLASSES: 14

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues. Speech Recognition: Large Vocabulary Continuous

Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models– n- grams, context dependent sub-word units; Applications and present status.		
UNIT-IV	**BASIC STEPS OF VIDEO PROCESSING**	**CLASSES: 10**
Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations		
UNIT-V	**2-D MOTION ESTIMATION**	**CLASSES: 12**
Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.		

TEXT BOOKS

1. Lawrence RabinerandBiing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education,2003.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.
3. Yao wang, JoemOstarmann and Ya – quin Zhang, "Video processing and communication ",1st edition , PHI

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1. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing.
2. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.
3. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
4. M. Tekalp ,"Digital video Processing", Prentice Hall International Publisher.

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2. https://processing.org/tutorials/video
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)

BLOCKCHAIN TECHNOLOGY (PROFESSIONAL ELECTIVE – V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM725PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of Blockchain.
2. To obtain knowledge about technologies of Blockchain
3. To incorporate the models of Blockchain

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Define and Explain the fundamentals of Blockchain.
2. Illustrate the technologies of Blockchain
3. Describe the models of Blockchain
4. Analyze and demonstrate the Ethereum
5. Analyze and demonstrate Hyperledger fabric

UNIT-I	INTRODUCTION	Classes: 9

Basic Cryptographic primitives used in Blockchain –Secure- Collision Resistant hash functions - Digital signature - Public key cryptosystems – Zero knowledge proof systems - Need for Distributed Record Keeping - Modelling faults and adversaries- Byzantine Generals problem - Consensus algorithms and their scalability problems - Why Nakamoto Came up with Blockchain based cryptocurrency.

UNIT-II	TECHNOLOGIES BORROWED IN BLOCKCHAIN	Classes: 9

Technologies Borrowed in Blockchain –hash pointers- Consensus- Byzantine Models of fault tolerance- Digital cash etc.- Bitcoin blockchain - Wallet - Blocks - Merkley Tree - hardness of mining - Transaction verifiability - Anonymity - forks - Double spending - Mathematical analysis of properties of Bitcoin - Bitcoin- the challenges and solutions.

UNIT-III	MODELS FOR BLOCKCHAIN	Classes: 9

Models f-GARAY model -RLA Model -Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains -Hybrid models (PoW + PoS) - Bitcoin scripting language and their use

UNIT-IV	ETHEREUM	Classes: 11

Ethereum -Ethereum Virtual Machine (EVM) -Wallets for Ethereum -Solidity - Smart Contracts - The Turing Completeness of Smart Contract Languages and verification challenges-

Using smart contracts to enforce legal contracts Comparing Bitcoin scripting vs. Ethereum Smart Contracts-Some attacks on smart contracts		
UNIT-V	**HYPERLEDGER FABRIC**	**Classes: 12**
Hyperledger fabric- the plug and play platform and mechanisms inpermissioned block chain - Beyond Cryptocurrency – applications of block chain in cyber security- integrity of information- E-Governance and other contract enforcement mechanisms - Limitations of block chain as a technology and myths vs reality of blockchain technology		

TEXT BOOKS

1. S.Shukla, M.Dhawan, S.Sharma,S. Venkatesan "Blockchain Technology: Cryptocurrency and Applications" ,Oxford University Press 2019 .
2. Arvind Narayanan, Joseph Bonneau,EdwardFelten,Andrew Miller and Steven Goldfeder, "Bitcoin and cryptocurrency technologies: a comprehensive introduction",Princeton University Press,2016.

REFERENCE BOOKS

1. Joseph Bonneau et al, SoK: "Research perspectives and challenges for Bitcoin and cryptocurrency", IEEE Symposium on security and Privacy, 2015
2. J.A.Garay et al, "The bitcoin backbone protocol - analysis and applications", EUROCRYPT 2015,Volume 2.

WEB REFERENCES

1. https://www.nptel.ac.in/courses/106105184/
2. https://www.tutorialspoint.com/blockchain/index.htm

E -TEXT BOOKS

1. https://medium.com/moatcoin/part-1-blockchain-simplified-notesnptel-71b876f5d300
2. https://www.javatpoint.com/blockchain-tutorial
3. https://intellipaat.com/blog/tutorial/blockchain-tutorial/

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2. https://www.edx.org/learn/blockchain

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

AD-HOC & SENSOR NETWORKS (Professional Elective-VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM811PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN.
3. Ability to conduct further research in the domain of ASN

UNIT-I	INTRODUCTION TO AD HOC NETWORKS	Classes: 15

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-**Proactive**: DSDV; **Reactive:** DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies**: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT-II	DATA TRANSMISSION	Classes: 11

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT-III	GEOCASTING	Classes: 13

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc.		
UNIT-IV	**BASICS OF WIRELESS, SENSORS AND LOWER LAYER ISSUES**	**Classes: 10**
Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.		
UNIT-V	**UPPER LAYER ISSUES OF WSN**	**Classes: 12**
Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.		

TEXT BOOKS

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN –981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

WEB REFERENCES

1. https://www.smartzworld.com/notes/adhoc-sensor-networks-notes-pdf-asn/
2. https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470050118.ecse004
5. https://btechgeeks.com/ad-hoc-and-sensor-networks-notes/

E -TEXT BOOKS

1. https://books.askvenkat.org/ad-hoc-and-sensor-networks-textbook-download/
2. https://books.google.co.in/books/about/Ad_Hoc_Sensor_Networks.html?id=D24L4ygKFngC
3. https://ebookswhiz.com/pdf/wireless-ad-hoc-and-sensor-networks

MOOCS COURSES

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
2. https://nptel.ac.in/content/storage2/courses/106105160/Week1.pdf
3. https://www.classcentral.com/course/swayam-wireless-ad-hoc-and-sensor-networks-7888
4. https://ece.nitk.ac.in/course/ec357-adhoc-and-sensor-networks
5. https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

SEMANTIC WEB (PROFESSIONAL ELECTIVE - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM812PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To Introduce Semantic Web Vision
2. Understanding about XML,RDF,RDFS,OWL
3. Querying Ontology
4. Ontology Reasoning
5. Migration from Document to Data Web
6. LOD Cloud

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
2. Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
3. Describe logic semantics and inference with OWL.
4. Use ontology engineering approaches in semantic applications.
5. Learn Web graph processing for various applications such as search engine, community detection.

UNIT-I	FOUNDATION OF SEMANTIC WEB TECHNOLOGIES	Classes: 15

The semantic web vision – introduction to semantic web technologies – a layered approach, Describing web resources – RDF data model, RDF syntax, RDF Schema,

UNIT-II	WEB ONTOLOGY LANGUAGE: OWL	Classes: 11

Web ontology Language – introduction, requirement of ontology languages, the OWL language, Logics and Inferences – Monotonic rules and semantics, OWL2 RL, rules inference format, SWRL, SPIN, Rule ML.

UNIT-III	ONTOLOGY ENGINEERING	Classes: 10

Ontology Engineering – Constructing ontologies manually, Reusing existing ontologies, Semiautomatic ontology acquisition, ontology mapping, semantic web

applications architecture, Applications – BBC artists, BBC world Cup 2010 website, government data, schema.org.		
UNIT-IV	**QUERYING THE SEMANTIC WEB**	**Classes: 11**
Querying the semantic web – SPARQL infrastructure, matching patterns, Filters, organizing the results, querying the schema, adding information with SPARQL update.		
UNIT-V	**UNDECIDABILITY**	**Classes: 11**
SPARQL simple Graph Patterns, Complex Graph Patterns, Group Patterns, Queries with Data Values, Filters OWL Formal Semantics,		

TEXT BOOKS

1. Paul Groth, Frank van Harmelen, Rinke Hoekstra, "A Semantic Web Primer", Third edition, MIT Press, 2012
2. Foundations of Semantic Web Technologies, Pascal Hitzler, MarkusKrötzsch, Sebastian Rudolph.

REFERENCE BOOKS

1. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", CRC Press, 2009.
2. Karin Breitman, Marco Antonio Casanova, Walt Truszkowski, "Semantic Web: Concepts, Technologies and Applications", Springer Science &Business Media, 2007.

WEB REFERENCES

1. https://cse.iitkgp.ac.in/~tkmishra/files/SEMANTIC%20WEB%20report.pdf
2. https://www.w3.org/standards/semanticweb/
3. https://www3.cs.stonybrook.edu/~pfodor/courses/cse595.html

E -TEXT BOOKS

1. https://bookboon.com/en/semantic-web-and-ontology-ebook?mediaType=ebook
2. https://www.w3.org/2001/sw/wiki/Books
3. https://www.cambridge.org/core/books/abs/semantic-web-explained/semantic-web/05719697721AEF2680B796A206E5A9F7
4. https://www.semantic-web-book.org/

MOOCS COURSES

1. https://www.udemy.com/course/semantic-web/
2. https://www.udemy.com/course/introduction-the-semantic-web-with-python/
3. https://www.udemy.com/course/semantic-ui-responsive-web-design-and-development/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

AUGMENTED REALITY & VIRTUAL REALITY (PROFESSIONAL ELECTIVE – VI)

IV B. TECH -II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM813PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To understand virtual reality, augmented reality and using them to build engineering applications

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Explain the fundamentals of Virtual Reality and augmented reality
2. Interact with a VR world
3. Create a virtual environment
4. Implement VR game
5. Apply the VR in real time applications

UNIT-I	INTRODUCTION	Classes: 9

The three I's of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces-Output Devices: Graphics displays-sound displays & haptic feedback.

UNIT-II	VR DEVELOPMENT PROCESS	Classes: 9

Geometric modeling - kinematics modeling- physical modeling - behaviour modeling - model Management.

UNIT-III	CONTENT CREATION CONSIDERATIONS FOR VR	Classes: 9

Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment

UNIT-IV	VR ON THE WEB & VR ON THE MOBILE	Classes: 9

JS-pros and cons-building blocks (WebVR, WebGL, Three.js, device orientation events)- frameworks (A-frame, React VR)-Google VR for Android-Scripts, mobile device configuration, building to android-cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics

UNIT-V	APPLICATIONS	Classes: 9
Medical applications-military applications- Educational applications - Robotics applications- Advanced Real time Tracking - other applications- games, movies, simulations, therapy		

TEXT BOOKS

1. C. Burdea& Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc.,2008 2. Jason Jerald. 2015.
2. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.

REFERENCE BOOKS

1. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg& Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016.
2. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR

WEB REFERENCES

1. https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html
2. https://www.pcmag.com/news/augmented-reality-ar-vs-virtual-reality-vr-whats-the-difference

E -TEXT BOOKS

1. http://vr.cs.uiuc.edu/vrbook.pdf

MOOCS COURSES

1. https://www.udemy.com/topic/virtual-reality
2. https://www.coursera.org/courses?query=virtual%20reality

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

QUANTUM COMPUTING (PROFESSIONAL ELECTIVE- VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM814PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. This course teaches the fundamentals of quantum information processing including quantum computation, quantum cryptography, and quantum information theory.
2. List modern relevant quantum algorithms and their purposes.
3. This includes a structural understanding of some basic quantum mechanics,
4. The student will understand diagrammatic reasoning as an alternative form of mathematics
5. This Course Introduces including Shor's factoring algorithm and Grover's search algorithm, quantum error correction, quantum communication, and cryptography.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Analyze the behaviour of basic quantum algorithms.
2. Iimplement simple quantum algorithms and information channels in the quantum circu model.
3. Simulate a simple quantum error-correcting code.
4. Prove basic facts about quantum information channels
5. Able to compute models Like NMR, QED Models

UNIT-I	INTRODUCTION	Classes: 15

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

UNIT-II	QUANTUM BASICS AND PRINCIPLES	Classes: 11

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits

UNIT-III	ALGORITHMS	Classes: 10

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

UNIT-IV	PERFORMANCE, SECURITY AND SCALABILITY	Classes: 11
Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.		
UNIT-V	**QUANTUM COMPUTING MODELS**	**Classes: 11**
Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.		

TEXT BOOKS

1. Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia "Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O'Reilly.
2. Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore theworld of quantum computing using the Quantum Composer and Qiskit, Kindle Edition.
3. V.K Sahni, Quantum Computing (with CD), TATA McGrawHill

REFERENCE BOOKS

1. Chris Bernhardt, Quantum Computing for Everyone (The MIT Press).
2. Michael A. Nielsen and Issac L. Chuang, "Quantum Computation and Information", Cambridge (2002).
3. Riley Tipton Perry, "Quantum Computing from the Ground Up", World Scientific Publishing Ltd (2012).
4. Scott Aaronson, "Quantum Computing since Democritus", Cambridge (2013).
   P. Kok, B. Lovett, "Introduction to Optical Quantum Information Processing",
5. Cambridge.

WEB REFERENCES

1. https://www.quantumcomputinginc.com/
2. https://uwaterloo.ca/institute-for-quantum-computing/quantum-101
3. https://www.horizonquantum.com/

E -TEXT BOOKS

1. http://mmrc.amss.cas.cn/tlb/201702/W020170224608150244118.pdf
2. https://quantumcomputinguk.org/shop/introduction-to-quantum-computing-with-qiskit-ebook-1

MOOCS COURSES

1) https://nptel.ac.in/courses/104104082/
2) https://swayam.gov.in/nd1_noc19_cy31/preview

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

SCRIPTING LANGUAGES (PROFESSIONAL ELECTIVE - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CSM815PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. This course introduces the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Comprehend the fundamentals of Ruby.
2. Apply Ruby language for solving a given problem
3. Gain knowledge of the strengths and weakness of Perland scripting;
4. Understand the advanced features of Perl.
5. Acquire programming skills in TCL and TK

UNIT-I	INTRODUCTION TO RUBY AND WEB	Classes: 10

Introduction: Ruby, Rails, Ruby Fundamentals : Ruby Data Types & Variables , Functions & Control Flow , Ruby Data Structures, Classes, Controllers and Views, Models & Forms, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services Ruby Tk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT-II	EXTENDING RUBY	Classes: 9

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interperter

UNIT-III	INTRODUCTION TO PERL AND SCRIPTING	Classes: 10

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines

UNIT-IV	ADVANCED PERL	Classes: 9

Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT-V	INTRODUCTION TO TCL AND TK	Classes: 11

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The PramaticProgammers guide by Dabve Thomas Second edition

REFERENCE BOOKS

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

WEB REFERENCES

1.https://nptel.ac.in/courses/117/106/117106113/
2.https://www.freetechbooks.com/perl-f5.html
3.https://www.freetechbooks.com/ruby-f49.html
4.https://www.freetechbooks.com/tcltk-f47.html

E -TEXT BOOKS

1. http://www.freebookcentre.net/Language/Free-Tcl-Books-Download.html
2. http://www.freebookcentre.net/Language/Free-Perl-Books-Download.html
3. http://www.freebookcentre.net/Language/Free-Ruby-Books-Download.html

MOOCS COURSES

1.https://onlinecourses-archive.nptel.ac.in
2.https://swayam.gov.in/
3.https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

List of Open Electives

Open Elective-I

CS600OE	Entrepreneurship
CS601OE	Fundamentals of Management for Engineers
CS602OE	Cyber Law & Ethics

Open Elective-II

CS700OE	Data Structures
CS701OE	Artificial Intelligence
CS702OE	Python Programming
CS703OE	Java Programming

Open Elective-III

CS800OE	Machine Learning
CS801OE	Mobile Application Development
CS802OE	Scripting Languages
CS803OE	Database Management Systems

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

ENTREPRENEURSHIP (OPEN ELECTIVE - I)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS600OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.

COURSE OUTCOMES

It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

UNIT-I	**ENTREPRENEURIAL PERSPECTIVES**	**Classes: 12**

Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs -Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT-II	**NEW VENTURE CREATION**	**Classes: 12**

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT-III	**MANAGEMENT OF MSMES AND SICK ENTERPRISES**	**Classes: 12**

Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

UNIT-IV	**MANAGING MARKETING AND GROWTH OF ENTERPRISES**	**Classes: 12**

Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT-V	**STRATEGIC PERSPECTIVES IN ENTREPRENEURSHIP**	**Classes: 12**

Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXT BOOKS

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T. V. Rao, 3e, Cengage, 2012.
3. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.

REFERENCE BOOKS

1. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.

WEB REFERENCES

1. https://guides.loc.gov/entrepreneurs-reference-guide
2. https://journals.sagepub.com/home/etp
3. https://en.wikipedia.org/wiki/Entrepreneurship

E -TEXT BOOKS

1. https://www.inc.com/rhett-power/15-free-ebooks-that-will-help-you-grow-as-an-entrepreneur.html
2. https://www.freebookcentre.net/business-books-download/Entrepreneurship-and-Creativity.html
3. https://www.freebookcentre.net/business-books-download/Entrepreneurship-and-Small-Scale-Businesses.html
4. https://www.freebookcentre.net/business-books-download/A-Course-Material-On-Enterpreneurship-Development.html

MOOCS COURSES

1. https://www.my-mooc.com/en/mooc/entrepreneurship-capstone/
2. https://www.mooc-list.com/tags/entrepreneurship
3. https://mooc-book.eu/index/learn-more/key-areas/13-entrepreneurship-moocs/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS (OPEN ELECTIVE - I)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS601OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

COURSE OUTCOMES

1. The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT-I	INTRODUCTION TO MANAGEMENT	Classes: 12

Evolution of Management, Nature & Scope-Functions of Management- Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process- Types of Plans-MBO

UNIT-II	ORGANIZATION STRUCTURE & HRM	Classes: 12

Organization Design-Organizational Structure- Departmentation– Delegation-Centralization - Decentralization-Recentralization-Organizational Culture-Organizational climate- Organizational change Human Resource Management-HR Planning - Recruitment & Selection - Training & Development- Performance appraisal - Job Satisfaction-Stress Management Practices

UNIT-III	OPERATION MANAGEMENT	Classes: 12

Introduction to Operations Management-Principles and Types of Plant Layout-Methods of production (Job Batch and Mass production) - Method study and Work Measurement-Quality Management - TQM-Six sigma - Deming's Contribution to Quality – Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re-engineering (BPR)

UNIT-IV	MARKETING MANAGEMENT	Classes: 12

Introduction to Marketing-Functions of Marketing-Marketing vs. Selling- Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation -Types of Marketing - Direct Marketing-Network Marketing - Digital Marketing-Channels of Distribution - Supply Chain Management (SCM)

UNIT-V	PROJECT MANAGEMENT	Classes: 12

Introduction to Project Management-steps in Project Management – Project Planning -

Project Life Cycle-Network Analysis-Program Evaluation & Review Technique (PERT)-Critical Path Method (CPM) - Project Cost Analysis - Project Crashing - Project Information Systems
TEXT BOOKS
1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012. 2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009. 3. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill. 4. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
REFERENCE BOOKS
1. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.
WEB REFERENCES
1. https://lecturenotes.in/subject/836/fundamentals-of-management 2. https://pdfcoffee.com/fundamentals-of-management-notes-jntuh-pdf-free.html
E -TEXT BOOKS
1. https://easyengineering.net/principles-of-management-by-sundar-nw/ 2. https://www.ululu.in/b-tech-fundamentals-management-handwritten-class-notes/
MOOCS COURSES
1. https://www.coursera.org/courses?query=engineering%20management 2. https://www.mooc-list.com/tags/engineering-management 3. https://www.classcentral.com/course/funmanage-2720

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

INTRODUCTION TO CYBER LAWS AND ETHICS (OPEN ELECTIVE - I)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS602OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
2. To develop some ideas of the legal and practical aspects of their profession.

COURSE OUTCOMES

1. The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
2. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT-I	INTRODUCTION TO COMPUTER SECURITY	Classes: 12

Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT-II	SECURE SYSTEM PLANNING AND ADMINISTRATION	Classes: 12

Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT-III	INFORMATION SECURITY POLICIES AND PROCEDURES	Classes: 12

Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy developing standards.

UNIT-IV	INFORMATION SECURITY	Classes: 12

Fundamentals-Employee responsibilities- information classification- Information handling-Tools of information security- Information processing-secure program administration.

UNIT-V	ORGANIZATIONAL AND HUMAN SECURITY	Classes: 12

Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

TEXT BOOKS

1. Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O'Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's

Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996
5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997

REFERENCE BOOKS

1. James Graham, "Cyber Security Essentials" Averbach Publication T & F Group.

WEB REFERENCES

1. http://kanoon.nearlaw.com/2017/10/26/cyber-law-and-ethics/#:~:text=Cyber%20law%20is%20also%20known,and%20information%20systems%20(IS).
2. https://blog.ipleaders.in/cyber-law-ethics-india/
3. https://www.routledge.com/Cyber-Law-and-Ethics-Regulation-of-the-Connected-World/Grabowski-Robinson/p/book/9780367462604

E -TEXT BOOKS

1. https://www.scu.edu/media/ethics-center/technology-ethics/IntroToCybersecurityEthics.pdf
2. https://www.researchgate.net/publication/215705616_Investigating_Cyber_Law_and_Cyber_Ethics_Issues_Impacts_and_Practices
3. https://www.perlego.com/book/2554909/cyber-law-and-ethics-regulation-of-the-connected-world-pdf

MOOCS COURSES

1. http://www.wbnsou.ac.in/NSOU-MOOC/mooc_cyber_security.shtml

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DATA STRUCTURES (OPEN ELECTIVE-II)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS700OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms

COURSE OUTCOMES

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT-I	INTRODUCTION TO DATA STRUCTURES	Classes: 12

Abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

UNIT-II	DICTIONARIES & HASH TABLE REPRESENTATION	Classes: 12

Linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III	SEARCH TREES	Classes: 12

Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT-IV	GRAPHS & SORTINGS	Classes: 12

Graph Implementation Methods. Graph Traversal Methods.

Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT-V	PATTERN MATCHING AND TRIES	Classes: 12

Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS

1. Fundamentals of data structures in C, 2nd edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data structures using c – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCE BOOKS

1. Data structures: A Pseudocode Approach with C, 2nd edition, R.F.Gilberg And B.A. Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

WEB REFERENCES

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.programiz.com/dsa

E -TEXT BOOKS

1. http://freebooks.pupilgarage.com/FreeBookDownload?category=algorithm_datastructures
2. https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf
3. https://www.ncertbooks.guru/data-structures/
4. https://www.freebookcentre.net/ComputerScience-Books-Download/Data-Structures-and-Algorithms.html
5. https://www.cet.edu.in/noticefiles/280_DS%20Complete.pdf

MOOCS COURSES

1. https://www.mooc-list.com/tags/data-structures
2. https://www.coursera.org/specializations/data-structures-algorithms
3. https://www.my-mooc.com/en/categorie/algorithms-and-data-structures

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING

ARTIFICIAL INTELLIGENCE (OPEN ELECTIVE-II)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS701OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT-I	PROBLEM SOLVING BY SEARCH	Classes: 12

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A*search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

UNIT-II	PROBLEM SOLVING BY SEARCH-II AND PROPOSITIONAL LOGIC	Classes: 12

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic,

Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT-III	LOGIC AND KNOWLEDGE REPRESENTATION	Classes: 12

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT-IV	PLANNING	Classes: 12

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-V	UNCERTAIN KNOWLEDGE AND LEARNING	Classes: 12

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOKS

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS

1. Artificial Intelligence, 3rd Edn, E.Rich and K.Knight (TMH).
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

WEB REFERENCES

1. https://www.britannica.com/technology/artificial-intelligence
2. https://builtin.com/artificial-intelligence
3. https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence
4. https://www.ibm.com/in-en/cloud/learn/what-is-artificial-intelligence

E -TEXT BOOKS
1. https://www.amazon.in/Artificial-Intelligence-Books/b?ie=UTF8&node=4149453031 2. https://www.mygreatlearning.com/blog/artificial-intelligence-books/ 3. https://www.analyticsinsight.net/top-12-books-on-artificial-intelligence/ 4. https://towardsdatascience.com/5-books-you-can-read-to-learn-about-artificial-intelligence-477b5a26277d
MOOCS COURSES
1. https://www.mooc-list.com/tags/artificial-intelligence 2. https://www.coursera.org/courses?query=artificial%20intelligence

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

PYTHON PROGRAMMING (OPEN ELECTIVE-II)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS702OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

This course will enable students to

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

COURSE OUTCOMES

The students should be able to:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT-I	PYTHON BASICS	Classes: 12

Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT-II	FILES	Classes: 12

File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management,

*Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules. Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT-III	REGULAR EXPRESSIONS	Classes: 12
Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules		
UNIT-IV	**GUI PROGRAMMING**	**Classes: 12**
Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers		
UNIT-V	**DATABASE PROGRAMMING**	**Classes: 12**
Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules		

TEXT BOOKS

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS

1.https://www.python.org/

WEB REFERENCES

1. https://swayam.gov.in/nd1_noc19_cs41/preview
2. https://swayam.gov.in/nd1_noc19_mg47/preview
3. https://swayam.gov.in/nd1_noc19_cs40/preview

E -TEXT BOOKS

1. https://www.youtube.com/watch?v=DI_dz1FOvcY&list=PLHT9VxUGxZRshJ-edzjLZ72HfSta8s5f
2. https://www.udemy.com/machine-learning-using-r-and-python/
3. https://www.udemy.com/r-programming-language/
4. https://www.simpliv.com/itcertification/data-analytics-using-r-programming
5. https://books.goalkicker.com/PythonBook/

MOOCS COURSES

1. https://www.coursera.org/learn/python-programming
2. https://www.edx.org/professional-certificate/python-data-science
3. https://www.edx.org/course/cs50s-web-programming-with-python-and-javascript
4. https://realpython.com/python-beginner-tips/

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING(AI&ML)

JAVA PROGRAMMING (OPEN ELECTIVE-II)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS703OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Introduces object-oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate
3. to the design of abstract classes
4. Introduces the implementation of packages and interfaces
5. Introduces exception handling, event handling and multithreading
6. Introduces the design of Graphical User Interface using applets and AWT

COURSE OUTCOMES

1. Develop Programs with reusability
2. Develop programs to handle multitasking
3. Develop programs to handle exceptions
4. Develop applications for a range of problems using object-oriented programming techniques
5. Design simple Graphical User Interface applications

UNIT-I	OBJECT ORIENTED THINKING AND JAVA BASICS	Classes: 12

Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT-II	INHERITANCE, PACKAGES AND INTERFACES	Classes: 12

Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes: 12

Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util.

UNIT-IV	EVENT HANDLING	Classes: 12

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box group, choices, lists, dialog box, handling menus, layout manager: layout manager types – border, grid, flow, card and grid bag.

UNIT-V	MULTI-THREADING&APPLETS	Classes: 12

Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

TEXT BOOKS

1. Java the complete reference, 7th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley& sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.

WEB REFERENCES

1.http://www.developer.com/icom_includes/feeds/developer/dev-25.xml
2.http://www.ibm.com/developerworks/views/java/rss/libraryview.jsp
3.http://www.javaworld.com/rss/index.html
4. http://feeds.feedburner.com/DevxLatestJavaArticles

E -TEXT BOOKS

1.HTTP Programming Recipes for Java Bots by Jeff Heaton - Heaton Research, Inc.
2.Java Distributed Computing by Jim Farley - O'Reilly Media
3.Java Precisely by Peter Sestoft - IT University of Copenhagen
4.Java for Absolute Beginners: Learn to Program the Fundamentals the Java 9+ Way
5.Fundamentals of the Java Programming Language, Java SE 6
6.JAVA: Easy Java Programming for Beginners, Your Step-By-Step Guide to
7.Learning Java Programming
8.Android App Development in Android Studio: Java+Android Edition for Beginners

MOOCS COURSES

1.https://www.mooc-list.com › tags › java-programming
2.https://www.mooc-list.com › tags › java
3.https://www.edx.org › learn › java
4.https://www.quora.com › What-are-the-best-MOOCs-for-learning-Java
5.https://www.udacity.com › course › java-programming-basics--ud282
6.https://www.futurelearn.com › courses › begin-programming.

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

MACHINE LEARNING (OPEN ELECTIVE-III)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS800OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

COURSE OUTCOMES

1. Understand the concepts of computational intelligence like machine learning
2. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
3. Understand the Neural Networks and its usage in machine learning application.

UNIT-I	INTRODUCTION	Classes: 12

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT-II	ARTIFICIAL NEURAL NETWORKS	Classes: 12

Artificial Neural Networks-1–Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT-III	LEARNING	Classes: 12

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes

optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.
Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT-IV	GENETIC ALGORITHMS	Classes: 12

Genetic Algorithms– Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.
Learning Sets of Rules– Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.
Reinforcement Learning– Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V	ANALYTICAL LEARNING	Classes: 12

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge. Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.
Combining Inductive and Analytical Learning– Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

WEB REFERENCES

1. http://web.eecs.umich.edu/~cscott/past_courses/eecs545f09/bib.html
2. https://christophm.github.io/interpretable-ml-book/references.html
3. https://towardsdatascience.com/embedding-machine-learning-models-to-web-apps-part-1-6ab7b55ee428
4. https://link.springer.com/article/10.1007/s42979-021-00592-x

E -TEXT BOOKS

1. https://machinelearningmastery.com/products/
2. https://www.ibm.com/downloads/cas/GB8ZMQZ3
3. https://www.analyticsinsight.net/10-popular-must-read-free-ebooks-on-machine-learning/
4. https://alex.smola.org/drafts/thebook.pdf
5. https://www.analyticsvidhya.com/blog/2018/02/10-free-must-read-machine-learning-e-books/

MOOCS COURSES

1. https://www.geeksforgeeks.org/Machine Learning
2. https://nptel.ac.in/courses/106105087/pdf/m01L01.pdf
3. https://onlinecourses.nptel.ac.in/noc21_cs13/preview.
4. https://www.tutorialspoint.com/machine_engineering/index.htm

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

MOBILE APPLICATION DEVELOPMENT (OPEN ELECTIVE-III)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS801OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

COURSE OUTCOMES

1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Student will be able to develop, deploy and maintain the Android Applications.

UNIT-I	INTRODUCTION TO ANDROID OPERATING SYSTEM	Classes: 12

Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT-II	ANDROID USER INTERFACE	Classes: 12

Measurements – Device and pixel density independent measuring UNIT – s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III	INTENTS AND BROADCASTS	Classes: 12

Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT-IV	PERSISTENT STORAGE	Classes: 12
Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference		
UNIT-V	**DATABASE**	**Classes: 12**
Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)		

TEXT BOOKS

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOKS

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

WEB REFERENCES

1.https://www.tutorialspoint.com/mobile_development_tutorials.htm

2.https://www.javatpoint.com/android-tutorial

E -TEXT BOOKS

1. http://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fprojanco.com%2FLibrary%2FAndroid%2520App%2520Development%2520in%2520Android%2520Studio%2520%2520Java%2520plus%2520Android%2520edition%2520for%2520beginners.pdf&clen=10563468&chunk=true
2. http://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.mediapiac.com%2Fuploads%2Fconference%2Fpresenters%2Fdocuments%2F17%2F8.pdf&chunk=true

MOOCS COURSES

1.https://onlinecourses-archive.nptel.ac.in

2.https://swayam.gov.in/

3.https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING

SCRIPTING LANGUAGES (OPEN ELECTIVE-III)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS802OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This course introduces the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

COURSE OUTCOMES

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting language

UNIT-I	INTRODUCTION	Classes: 12

Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services.

Ruby Tk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT-II	EXTENDING RUBY	Classes: 12

Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT-III	INTRODUCTION TO PERL AND SCRIPTING SCRIPTS AND PROGRAMS	Classes: 12

Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL-Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-IV	ADVANCED PERL FINER POINTS OF LOOPING	Classes: 12

Pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT-V	TCL & Tk	Classes: 12

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and up

level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk -Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

REFERENCE BOOKS

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J.P. Flynt, Cengage Learning.

WEB REFERENCES

1. http://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fpages.di.unipi.it%2Fcorradini%2FDidattica%2FAP-19%2FDOCS%2FScott-ch13.pdf&clen=4675371

E -TEXT BOOKS

1. https://www.nocostlibrary.com/2021/07/the-world-of-scripting-languages-no.html
2. http://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fwww.cs.stir.ac.uk%2Fcourses%2FCSC9Y4%2Flectures%2Fscripting1a.pdf&clen=2960972&chunk=true

MOOCS COURSES

1.https://onlinecourses-archive.nptel.ac.in
2.https://swayam.gov.in/
3.https://swayam.gov.in/NPTEL

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DEPARTMENT OF COMPUTR SCIENCE AND ENGINEERING (AI&ML)

DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE-III)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS803OE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

COURSE OUTCOMES

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques

UNIT-I	DATABASE SYSTEM APPLICATIONS & INTRODUCTION TO DATABASE DESIGN	Classes: 12

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.
Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT-II	INTRODUCTION TO THE RELATIONAL MODEL	Classes: 12

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III	SQL	Classes: 12

Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT-IV	TRANSACTION CONCEPT	Classes: 12

Transaction State, Implementation of Atomicity and Durability, Concurrent Executions,

Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT-V	DATA ON EXTERNAL STORAGE	Classes: 12

File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, ElmasriNavrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

WEB REFERENCES

1. https://www.ddegjust.ac.in/studymaterial/mca-3/ms-11.pdf
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/
4. https://www.tutorialspoint.com/dbms/index.htm

E -TEXT BOOKS

1. Database Management System byMonelliAyyavaraiah, Arepalli Gopi
2. Database Management System byPanneerselvam, R.

MOOCS COURSES

1. https://www.mooc-list.com/tags/database-management
2. https://nptel.ac.in/courses/106/105/106105175/
3. https://www.edx.org/learn/databases