



# NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)  
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)  
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

## STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

### (CSE/IT/CSE(AI&ML)/CSE(DS))

#### I YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks )			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1100101	Professional Communication	2	0	2	4	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	3
3	20A1100204	Applied Chemistry	3	0	0	3	30	70	100	3
4	20A1105392	Computer Engineering Workshop	2	0	4	6	15	35	50	3
5	20A1105301	Programming and Problem Solving Using C	3	0	0	3	30	70	100	3
6	20A1100293	Applied Chemistry LAB	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving Using C Lab	0	0	4	4	15	35	50	2
8	20A1100801	Environmental Sciences	2	0	0	2	30	70*	100	0
<b>Total</b>			<b>15</b>	<b>1</b>	<b>13</b>	<b>29</b>	<b>195</b>	<b>455</b>	<b>650</b>	<b>18.5</b>

#### I YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks )			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200203	Applied Physics	3	0	0	3	30	70	100	3
3	20A1204301	Digital Logic Design	2	0	2	4	30	70	100	3
4	20A1205401	Oops Through Java	3	0	0	3	30	70	100	3
5	20A1205303	Data Structures	3	0	0	3	30	70	100	3
6	20A1200292	Applied Physics Lab	0	0	3	3	15	35	100	1.5
7	20A1205491	Oops Through Java Lab	0	0	4	4	15	35	100	2
8	20A1205393	Data Structures Lab	0	0	3	3	15	35	100	1.5
9	20A1200191	Communicative English	0	0	3	3	15	35	100	1.5
<b>Total</b>			<b>14</b>	<b>0</b>	<b>15</b>	<b>29</b>	<b>210</b>	<b>490</b>	<b>700</b>	<b>21.5</b>

\* Internal Evaluation

L - LECTURE T - TUTORIAL P - PRACTICAL

CIA - Continuous Internal Assessment SEA - Semester End Assessment



**20A1100101: PROFESSIONAL COMMUNICATION**  
(Common to CE,EEE,ME,ECE,CSE,IT,AIIML and DS)

<b>Lecture – Practical:</b>	2-2 Hours	<b>Internal Marks:</b>	30
<b>Credits</b>	3	<b>External Marks:</b>	70

**Prerequisites: None**

**Course Objectives**

1. To strengthen the lexical ability of the students in different contexts.
2. To expose the students to various sub-skills and strategies of reading and writing – summarizing and paraphrasing.
3. To help the students develop effective writing skills through paragraph writing.
4. To train the students in fundamentals of grammar required to equip them with fluent English.
5. To enable the students to think critically by exposing them to different socio-cultural contexts through various literary texts.

**Course Outcomes**

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

CO1	Build the grammatical structures accurately in their real-time situations in either spoken or written form.
CO2	Extend their ability to use vocabulary from various texts along with GRE and technical vocabulary in written and spoken communication
CO3	Comprehend, analyze and evaluate texts critically. Demonstrate effective writing skills in specific forms of written communication (paragraphs, summaries, email and letters.)
CO4	Apply the strategies of reading various texts and graphs, and describe in prose.
CO5	Relate human values and professional ethics in their academic, professional and social lives.
CO6	Summarize the main events of the literary texts, from different socio-cultural contexts, and interpret them critically.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										1		2
CO2										1		2
CO3										2		2
CO4										1		2
CO5							1	1				2
CO6												2

**UNIT I**

1. **Text: A Drawer full of happiness** from “**Infotech English**”, Maruthi Publications
2. **Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.
3. **Reading for Writing:** Paragraph Writing (specific topics) using suitable Cohesive Devices; Linkers, Sign Posts and Transition Signals; Mechanics of Writing - Punctuation, Capital Letters.
4. **Vocabulary:** Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal Reasoning and Sequencing of Words.
5. **Grammar:** Content Words and Function Words; Word Forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: Countables and Uncountables; Singular and Plural, Basic Sentence Structures; Simple Question Form - WH- Questions; Word Order in Sentences. Collocations (30 Phrases)

**UNIT II**

1. **Text: Nehru’s letter to his daughter Indira on her birthday** from “**Infotech English**”, Maruthi Publications
2. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
3. **Reading for Writing:** Summarizing - identifying main idea/s and rephrasing what is read;

avoiding redundancies and repetitions.

4. **Vocabulary:** Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
5. **Grammar:** Use of Articles and Zero Article; Prepositions; Connectives (25 words)

### UNIT III

1. **Text: Stephen Hawking-Positivity**  
'Benchmark' from "Infotech English", Maruthi Publications
2. **Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical Reading.
3. **Reading for Writing:** Summarizing - Identifying main ideas and Rephrasing what is read; avoiding Redundancies and Repetitions. Letter Writing-types, Format and Principles of Letter Writing. E-mail Etiquette, Writing CVs.
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, Sequencing of Words
5. **Grammar:** Verbs, Phrasal Verbs - Tenses; Subject-Verb Agreement;

### UNIT IV

1. **Text: Liking a Tree, Unbowed: Wangari Maathai-biography** from "Infotech English", Maruthi Publications
2. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicative process or display complicated data.
3. **Reading for Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
5. **Grammar:** Quantifying Expressions - Adjectives and Adverbs; Comparing and Contrasting; Use of Antonyms; Direct and Indirect Speech, Reporting Verbs for Academic Purposes. Idiomatic Expressions (25 Idioms)

### UNIT V

1. **TEXT: Stay Hungry-Stay foolish** from "Infotech English", Maruthi Publications
2. **Reading:** Reading for Comprehension. RAP Strategy Intensive Reading and Extensive Reading Techniques.
3. **Reading for Writing:** Report writing (Significance, Format and Style of Writing Technical Reports)
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, Matching Emotions.
5. **Grammar:** Change of Voice; Editing Short Texts – Identifying and Correcting Common Errors in grammar and usage (Articles, Prepositions, Tenses, Subject-Verb Agreement)

**Text Book:** "Infotech English", Maruthi Publications.

### REFERENCE BOOKS:

1. **English Grammar in Use**, Raymond Murphy, Cambridge University Press.
2. **Oxford Practice Grammar**, John Eastwood, Oxford University Press.
3. **The Most Common Mistakes in English Usage** – Thomas Elliott Berry
4. **Essential Communication Skills** – Shalini Agarwal, Ane Books Pvt Ltd.
5. **Dictionary of Synonyms and Antonyms**, Oxford & IBH, III Ed
6. **A Practical English Grammar**, Agnes V. Martinet and Audrey Jean Thomson, Oxford University Press.
7. **English Vocabulary in Use**, Michael McCarthy and Felicity O'Dell, Cambridge University Press

### E-RESOURCES

1. <https://www.grammarbank.com/>
2. <http://guidetogrammar.org/grammar/index.htm>
3. <https://writeandimprove.com/>
4. <https://englishforeveryone.org/>
5. <http://www.englishvocabularyexercises.com/>
6. <https://englishplusmagazine.com/>

**20A1100201:ENGINEERING MATHEMATICS-I**  
**(Common to CE,EEE,ME,ECE,CSE,IT,AIIML and DS)**

<b>Lecture – Tutorial:</b>	3-1	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.**

**Course Objectives:**

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

**Course Outcomes:**

CO1	Student will be able to develop the <b>use</b> of matrix algebra techniques that is needed by engineers for practical applications (L6) solve system of linear algebraic equations using Gauss elimination, Gauss Seidel and <b>write</b> Eigen values and eigenvectors of a matrix (L3)
CO2	Student will be able to <b>write</b> diagonal form and different factorizations of a matrix (L3), to find inverse of a matrix and integral powers of a matrix by Cayley-Hamilton Theorem <b>identify</b> the nature of a Quadratic form such as positive definite, positive semi definite etc., and use this information to facilitate the calculation of matrix characteristics (L2)
CO3	Student will be able to <b>evaluate</b> the approximate roots of polynomial and transcendental equations by different algorithms (L5)
CO4	Student will be able to <b>apply</b> Newton's forward & backward interpolation and Lagrange's formulae for unequal intervals (L3)
CO5	Student will be able to <b>apply</b> numerical integral techniques to different Engineering problems (L3)
CO6	Student will be able to <b>apply</b> different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

**UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)**

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss

Elimination method – Eigen values and Eigen vectors and properties.	
<b>Unit – II: Cayley-Hamilton theorem and Quadratic forms: (10hrs)</b>	Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.
<b>UNIT – III: Iterative methods: (8 hrs)</b>	Introduction– Bisection method – Method of false position– Iteration method Newton-Raphson method (One variable). Gauss-Jacobi and Gauss-Seidel methods for solving system of equations numerically.
<b>UNIT – IV: Interpolation: (10 hrs)</b>	Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton’s forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange’s interpolation formula.
<b>UNIT –V: Numerical integration and Solution of ordinary differential equations with initialconditions (10 hrs)</b>	Trapezoidal rule– Simpson’s 1/3 <sup>rd</sup> and 3/8 <sup>th</sup> rule– Solution of initial value problems by Taylor’s series– Picard’s method of successive approximations– Euler’s method –Modified Euler’s method – Runge-Kutta method (second and fourth order).
<b>TEXT BOOKS:</b>	
<ol style="list-style-type: none"> <li>1. <b>B. S. Grewal</b>, Higher Engineering Mathematics, 44<sup>th</sup> Edition, Khanna Publishers.</li> <li>2. <b>B. V. Ramana</b>, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.</li> <li>3. <b>David Poole</b>, Linear Algebra- A modern introduction, 4<sup>th</sup> Edition, Cengage.</li> </ol>	
<b>REFERENCE BOOKS:</b>	
<ol style="list-style-type: none"> <li>1. <b>Steven C. Chapra</b>, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.</li> <li>2. <b>M. K. Jain, S.R.K. Iyengar and R.K. Jain</b>, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.</li> <li>3. <b>Lawrence Turyn</b>, Advanced Engineering Mathematics, CRC Press.</li> </ol>	
<b>E-RESOURCES:1. <a href="http://www.nptel.videos.com/mathematics/">www.nptel.videos.com/mathematics/</a>(Math Lectures from MIT,Stanford,IIT’S</b>	
2. <a href="http://nptl.ac.in/courses/1221104017">nptl.ac.in/courses/1221104017</a>	

**20A1100204: APPLIED CHEMISTRY**  
(Common to CSE,IT,AIIML and DS)

<b>Lecture:</b>	3	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:****Course Objectives:**

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

**Course Outcomes:**

CO1	<b>Analyze</b> the different types of composite plastic materials and <b>interpret</b> the mechanism of conduction in conducting polymers.
CO2	Predict potential complications from combining various Chemicals, metals in engineering setting and categorize materials science relevant to corrosion phenomena.
CO3	Apply new materials with excellent engineering properties to take care of society needs and environment.
CO4	Analyze the principles of different analytical instrumentation and applications
CO5	Design models for energy by different natural sources
CO6	Understand the knowledge of computational chemistry and molecular machines

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	3	2	-	-	2	-	-	-	-	-
CO2	3	3	2	1	-	-	2	-	-	-	-	-
CO3	3	2	2	-	-	-	2	-	-	-	-	-
CO4	3	3	2	2	-	-	2	-	-	-	-	-
CO5	3	2	2	2	-	-	2	-	-	-	-	-
CO6	3	3	3	3	-	-	3	-	-	-	-	-

**UNIT – I: POLYMER TECHNOLOGY**

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics:Thermoplastic-Thermosetting, Compounding, fabrication (compression, injection, Transfer and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

**Composite materials: Fibre reinforced plastics, conducting polymers, biodegradable polymers..**

**Unit – II: ELECTROCHEMICAL CELLS AND CORROSION**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, liquid Li ion battery), fuel cells (H<sub>2</sub>-O<sub>2</sub>).

**Corrosion:** Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, factors influencing rate of corrosion, corrosion control method- Protective coatings (Galvanizing, tinning, electroplating and electroless plating [nickel])

### UNIT – III: MATERIAL CHEMISTRY

**Semiconductors:** Preparation of semi conductors by zone refining, Czochralski crystal pulling – applications

Super conductors:-Type –I, Type II and applications

**Nano materials:-** Introduction, sol-gel method & Chemical reduction method of preparation, transmission electron microscopy [TEM], applications of fullerenes, carbon nanotubes (types, preparation and applications)

**Liquid crystals:-** Introduction-types-applications.

### UNIT – IV :SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES

#### SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, applications, FT-IR Basic principle, instrumentation and IR stretching of functional groups (alcohols, carbonyls, amines) applications,

#### NON-CONVENTIONAL ENERGY SOURCES

**Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.**

### UNIT –V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies.

**Molecular switches:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

#### TEXT BOOKS:

1. P.C. Jain and M. Jain “**Engineering Chemistry**”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, “**Engineering Chemistry**”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “**A Textbook of Engineering Chemistry**”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publishing Co. (Latest edition).

#### REFERENCE BOOKS:

1. K. Sessa Maheshwaramma and Mridula Chugh, “**Engineering Chemistry**”, Pearson India Edn.
2. (a) O.G. Palana, “**Engineering Chemistry**”, Tata McGraw Hill Education Private Limited, (2009).  
(b) CNR Rao and JM Honig (Eds) “**Preparation and characterization of materials**” Academic press, New York (latest edition)
3. B. S. Murthy, P. Shankar and others, “**Textbook of Nanoscience and Nanotechnology**”, University press (latest edition)

#### E-RESOURCES:

1. [https://en.wikipedia.org >wiki> Conductive polymers](https://en.wikipedia.org/wiki/Conductive_polymers)
2. [www.sae.org/fuel\\_cells/fuelcells-types.htm](http://www.sae.org/fuel_cells/fuelcells-types.htm)
3. [https://en.wikipedia.org >wiki> Nanomaterials](https://en.wikipedia.org/wiki/Nanomaterials)
4. [https://en.wikipedia.org >wiki> Electrochemical cell](https://en.wikipedia.org/wiki/Electrochemical_cell)
5. [https://en.wikipedia.org >wiki> Spectroscopy](https://en.wikipedia.org/wiki/Spectroscopy)



**20A1100801: ENVIRONMENTAL SCIENCES**  
(Common to CSE,IT,AIIML and Ds)

<b>Lecture – Tutorial:</b>	2-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	0	<b>External Marks:</b>	70*

**Prerequisites:****Course Objectives:**

The objectives of the course are to impart:

- ❖ Overall understanding of the natural resources.
- ❖ Basic understanding of the ecosystem and its diversity.
- ❖ Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- ❖ An understanding of the environmental impact of developmental activities.
- ❖ Awareness on the social issues, environmental legislation and global treaties.

**Course Outcomes:**

CO1	➤ Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	➤ Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	➤ Recall the importance of biodiversity and its conservation. (L1)
CO4	➤ Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	➤ Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	➤ Interpret environmental related acts and social issues. (L2)

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	2	2	-	-	2	3	2	-	-	2	2
CO2	3	2	2	-	-	2	3	2	-	-	2	2
CO3	3	2	2	-	-	2	3	2	-	-	2	2
CO4	3	2	2	-	-	2	3	2	-	-	2	2
CO5	3	2	2	-	-	2	3	2	-	-	2	2
CO6	3	2	2	-	-	2	3	2	-	-	2	2

**UNIT I****(6hrs)**

**Sustainability:** Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

**Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids- Ecological succession.

**UNIT II****(4hrs)**

**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity.

**UNIT III****(7hrs)****Natural Resources:** Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

**UNIT IV****(5hrs)****Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.**UNIT V****(6hrs)****Social Issues and the Environment:** Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics.**TEXT BOOKS:**

- 1) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
- 2) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 3) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 4) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

**REFERENCE BOOKS:**

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

**E-RESOURCES:** 1. <http://nptel.ac.in/courses.php>.2. <http://jntuk-coeerd.in/>

**20A1105301:-Programming and Problem solving with C**  
**(Common to EEE,ME,ECE,CSE,IT,AIIML and DS)**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Basic knowledge on computers, Mathematics**

**Course Objectives:** The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

**Course Outcomes:**

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

CO1	Understand the programming terminology and implement various c-tokens & input-output statements to solve simple problems
CO2	Able to compare and differentiate various looping & branching constructs and apply the best looping structure for a given problem
CO3	Identify the necessity of modularity in programming and design various function types
CO4	Understand pointers and implement the programs to directly access memory locations
CO5	Interpret and implement the need of arrays and structure/union to store homogeneous and heterogeneous groups of data
CO6	Contrast the need of using files in programming and implement file operations

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3		1									
CO2		1	3									
CO3		1	3									
CO4	3		1									
CO5			3									
CO6			3									

**UNIT I :** Objective: Notion of Computer Languages, algorithm, computational procedure, editing and executing programs and C Declarations

**BASICS AND INTRODUCTION TO C:** Basics of Computer, Introduction to C, Machine Assembly and High level Language, Assembler, Compiler and Interpreter, Structure of a C program, Programming Rules, Executing the C Program, Advantages of C, Header Files Flow Chart, Algorithm.

**THE C DECLARATIONS:** The C-Character set, Delimiters, Types of Tokens, The C keywords, Identifiers, Constants, Variables, C Data types, initialization, type modifiers, type conversions, constant and volatile variables. Properties of Operators, Operator Priority, comma and conditional operators, arithmetic, relational, assignment operators and expressions, logical, bitwise operators. Input and output in c: Formatted and Unformatted functions

**UNIT II:** Objective: Understanding branching, iteration, data representation using arrays and strings

**DECISION STATEMENTS:** The if statement, if-else, nested if else, if-else-if ladder, break, continue, goto, Switch statement, nested switch case, Switch case and nested ifs.

**LOOP CONTROL:** for loop, nested for loop, while, do-while, do-while statement with while loop.

**ARRAYS:** Array initialization, array terminology, characteristics of an array, 1-D array and its operations, 2-D arrays and operations, Multi -dimensional arrays.

**STRINGS:** Declaration and initialization of string, string standard functions, string conversion functions, memory functions, application of strings.

**UNIT III:** Objective: Modular programming and recursive solution formulation and storage classes

**FUNCTIONS:** Basics, function definition, return statement, types of functions, call by value, call by reference, function as an argument, Functions with operators, Function and Decision Statements, Functions and loop Statements, Functions with arrays and Pointers, Recursion-Types of Recursion, Rules for Recursive Function, Recursion versus Iterations, Advantages and Disadvantages of Recursion, Efficiency of Recursion, Library Functions.

**STORAGE CLASS:** Variable Lifetime, Automatic Variables, External Variables, Static Variables, Register Variables.

**UNIT IV:** Objective: Understanding pointers, dynamic memory allocation and Preprocessor Directives.

**POINTERS:** Features of pointers, pointers and address, pointer declaration, void pointers, arithmetic operations with pointers, pointers and arrays, array of pointers, pointers to pointers, pointers and strings. Dynamic memory allocation

**PREPROCESSOR DIRECTIVES:** The #define Directive, Defining and Undefining a Macros, The #include Directive

**UNIT V:** Objective: Understanding derived data types of C and basic of file operations.

**STRUCTURE AND UNION:** Features of Structures, Declaration and initialization of Structures, Structure within Structure, Arrays of Structure, Pointer to Structure, Structure and functions, typedef, Bit fields, Enumerated Data Type, Unions and Unions Vs Structures.

**FILES:** Streams and File Types, Steps for File Operations, FILE I/O, Structures Read and Write, Other file function, Command line Arguments.

**TEXT BOOKS:**

[1] Behrouz A. Forouzan & Richard F. Gilberg , –"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

**REFERENCE BOOKS:**

[1]Kernighan and Ritchie , –"The C programming language" , The (Ansi C Version), PHI, second edition.

[2]Yashwant Kanetkar , –"Let us C" , BPB Publications, 2nd Edition 2001.

[3]Paul J. Dietel and Dr. Harvey M. Deitel, –"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).

[4]Herbert Schildt, –"C:The Complete reference", McGraw Hill, 4th Edition, 2002.

[5]K.R.Venugopal, Sundeep R Prasad, –"Mastering C", McGraw Hill, 2nd Edition, 2015

**E-RESOURCES:**

1.<http://cslibrary.stanford.edu/101/EssentialC.pdf>

2. <http://nptel.ac.in/courses/106104128/>

3.[http://www.vssut.ac.in/lecture\\_notes](http://www.vssut.ac.in/lecture_notes)

**20A1105391-Programming and Problem Solving with C Lab**  
**(Common to EEE,ME,ECE,CSE,IT,AI ML and DS)**

<b>Lecture – Tutorial- Practical::</b>	0-0-4	<b>Internal Marks:</b>	15
<b>Credits:</b>	2	<b>External Marks:</b>	35

**Prerequisites:****Course Objectives:**

1. To make the student learn a programming language.
2. To learn problem solving techniques.
3. To teach the student to write programs in C and to solve the problems

**Course Outcomes:**

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

CO1	Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables
CO2	Exercise conditional and iterative statements to inscribe C programs
CO3	Exercise user defined functions to solve real time problems
CO4	Inscribe C programs using Pointers to access arrays, strings and functions
CO5	Inscribe C programs using pointers and allocate memory using dynamic memory management functions
CO6	Exercise user defined data types including structures and unions to solve problems
CO7	Exercise files concept to show input and output of files in C

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1		3									
CO2			2									
CO3			3									
CO4			2									
CO5			3									
CO6		2	3									
CO7		1	3									

**Exercise 1:**

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

**Exercise 2:**

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

**Exercise 3:**

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number

**Exercise 4:**

1. Write a program in C to display the n terms of even natural number and their

sum.

2. Write a program in C to display the n terms of harmonic series and their sum.  $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$  terms.

3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.

2. Write a program in C to separate odd and even integers in separate arrays.

3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.

2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.

2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and \*(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.

2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs

2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.

2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.

2. Write a program in C to copy a file in another name.

3. Write a program in C to remove a file from the disk.

### **TEXT BOOKS:**

[1] Behrouz A. Forouzan & Richard F. Gilberg , –"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

**REFERENCE BOOKS:**

- [1]Kernighan and Ritchie , –"The C programming language" , The (Ansi C Version), PHI, second edition.
- [2]Yashwant Kanetkar , –"Let us C" , BPB Publications, 2nd Edition 2001.
- [3]Paul J. Dietel and Dr. Harvey M. Deitel, –"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
- [4]Herbert Schildt, –"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
- [5]K.R.Venugopal, Sundeep R Prasad, –"Mastering C", McGraw Hill, 2nd Edition, 2015

**E-RESOURCES:**

- 1.<http://cslibrary.stanford.edu/101/EssentialC.pdf>
2. <http://nptel.ac.in/courses/106104128/>
- 3.[http://www.vssut.ac.in/lecture\\_notes](http://www.vssut.ac.in/lecture_notes)

**20A1105392:Computer Engineering Workshop  
(Common to CSE,IT,AIIML and DS)**

<b>Lecture – Tutorial- Practical:</b>	2-0-4	<b>Internal Marks:</b>	15
<b>Credits:</b>	3	<b>External Marks:</b>	35

**Prerequisites:**

**Course Objectives:**

**The objective of this course is to**

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

**Course Outcomes:**

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

CO1	Identify the basic computer peripherals
CO2	Acquire sufficient knowledge on assembling and disassembling a PC
CO3	Learn the installation procedure of Windows and Linux OS
CO4	Acquire knowledge on basic networking infrastructure, internet and World Wide Web
CO5	Learn productivity tools like Word, Excel and Power point

**Contribution of Course Outcomes towards achievement of Program Outcomes**

**(1**

**- Low, 2- Medium, 3 - High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>
CO1	1									
CO2	2	3								
CO3			2					3		
CO4			2					2		
CO5			2							

**List of Experiments**



**Computer Hardware:**

**Experiment 1:** Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

**Operating Systems:****Experiment 2: Virtual Machine setup:**

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

**Experiment 3: Operating System installation:**

- Installing an Operating System such as Linux on Computer hardware.

**Experiment 4: Linux Operating System commands:**

- General command syntax
- Basic help commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

**Networking and Internet:****Experiment 5: Networking Commands:**

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

**Experiment 6: Internet Services:**

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

**Productivity Tools:**

**Experiment 7:** Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

**Experiment 8:**

Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

**Experiment 9:** Automation of an activity using AI tools

Text Books:

- 1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
- 2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

- 1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

- 1) [https://explorersposts.grc.nasa.gov/post631/2006-2007/computer\\_basics/ComputerPorts.do](https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.do)

**TEXT BOOKS:**

1. The Complete Reference Java, 8<sup>th</sup> edition, Herbert Schildt, TMH.

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, Universities 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.

**E-RESOURCES:**

<http://www.javatpoint.com/>  
[java.sun.com/docs/books/tutorial/java/TOC.html](http://java.sun.com/docs/books/tutorial/java/TOC.html)  
<http://www.learnjavaonline.org/>  
<http://www.tutorialspoint.com/java/>  
[www.java.com/en/download/faq/develop.xml](http://www.java.com/en/download/faq/develop.xml)  
[www.oracle.com](http://www.oracle.com) › Java › Java SE  
[www.w3schools.com](http://www.w3schools.com)

**20A1100293: Applied Chemistry Lab**

<b>Labs / Instructions Hours/Week</b>	3	<b>Internal Marks:</b>	15
<b>Credits:</b>	1.5	<b>External Marks:</b>	35

**Prerequisites: Knowledge on Volumetric analysis.****Course Objectives:**

- ❖ To provide knowledge of chemistry practicals.
- ❖ It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
- ❖ It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

**Course Outcomes:**

CO1	❖ Students of Engineering should understand and apply polymers and plastic technologies along with their utilization to solve the problems of the society.
CO2	❖ Knowledge of cells and sensors utilized in many instruments is necessary to engineering students in solving and applying to batteries and fuel cells.
CO3	❖ Knowledge of electrochemical cells is essential in understanding corrosion along with the methods of controlling to budding engineers.
CO4	❖ Students should have the knowledge of water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	❖ Knowledge of fuels and energy, their advantages & disadvantages should be known by the students to solve and understand engineering problems.
CO6	❖ Knowledge, design and analysis of materials should be understood by the Engineering students in solving the complex problems of the society.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	1								
CO2	3	3	1	-								
CO3	3	2	2	-								
CO4	3	1	-	1								
CO5	3	2	2	1								
CO6	3	1	1	1								

**List of Experiments**

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Determination of HCl using standard  $\text{Na}_2\text{CO}_3$  solution.
3. Determination of alkalinity of a sample containing  $\text{Na}_2\text{CO}_3$  and NaOH.
4. Determination of  $\text{KMnO}_4$  using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard  $\text{K}_2\text{Cr}_2\text{O}_7$  solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Preparation of Bakelite.
12. Determination of pH of water sample

**EQUIPMENT REQUIRED:**

PH meters, Potentiometers, Conductometers, colorimeters.

**APPARATUS**

Burettes, Pipettes, Conical flask, Beakers, Volumetric flask.

**REFERENCE BOOKS:**

- 1 . A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr.JyotsnaCherukuri (2012) *Laboratory Manual of engineering chemistry-II*, VGSTechno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

**20A120001 : ENGINEERING MATHEMATICS-II**  
(Common to All Branches)

<b>Lecture – Tutorial:</b>	3-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.**

**Course Objectives:**

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

**Course Outcomes:**

CO1	Student will be able to <b>find</b> the General/Particular solutions of first order and first degree ordinary differential equations by <b>apply</b> different methods <b>(L3)</b> , know the applications of Newton's law of cooling, natural growth and decay problems and <b>find</b> orthogonal trajectories of the given family of curves. <b>(L3)</b>
CO2	Student will be able to <b>identify</b> the essential characteristics of linear differential equations with constant coefficients. <b>(L2)</b> <b>solve</b> the linear differential equations with constant coefficients by appropriate method <b>(L3)</b>
CO3	Student will be able to find convergence (or) divergence of a series <b>(L3)</b>
CO4	Student will be able to utilize mean value theorems to real life problems <b>(L3)</b>
CO5	Student will be able to find partial derivatives numerically and symbolically and use them to <b>analyze</b> and interpret the way a function varies. <b>(L4)</b> <b>acquire</b> the Knowledge maxima and minima of functions of several variable <b>(L1)</b> <b>Utilize</b> Jacobian of a coordinate transformation to deal with the problems in change of variables <b>(L3)</b>
CO6	Student will be able to <b>find</b> length of the arc, volume of solid of revolution and surface area of solid of revolution <b>(L3)</b>

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

**UNIT – I: Differential equations of first order and first degree: (10hrs)**

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories.

**UNIT-II: Linear Differential equations of higher order: (10hrs)**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type  $e^{ax}$ ,  $\sin ax$ ,

$\cos ax$ , polynomials in  $x^n$ ,  $e^{ax}V(x)$  and  $x^nV(x)$  – Method of Variation of parameters, Cauchy and Legendre's linear equations.

**UNIT – III: Sequences, Series and Mean value theorems: (10hrs)**

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule. Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

**UNIT – IV: Partial differentiation: (10hrs)**

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's multiplied method.

**UNIT – V: Multiple integrals: (8hrs)**

(8 hrs)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volumes

**TEXT BOOKS:**

1. **B. S. Grewal**, Higher Engineering Mathematics, 44<sup>th</sup> Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**REFERENCE BOOKS:**

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir**, Thomas calculus, 14<sup>th</sup> Edition, Pearson.
3. **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia**, Engineering Mathematics, Oxford University Press.

**E-RESOURCES:**

1. [www.nptel.videos.com/mathematics/\(Math Lectures from MIT,Stanford,IIT'S](http://www.nptel.videos.com/mathematics/(Math%20Lectures%20from%20MIT,Stanford,IIT'S)
2. [nptl.ac.in/courses/1221104017](http://nptl.ac.in/courses/1221104017)

**20A1200203: APPLIED PHYSICS**  
(Common to CSE,IT,AIIML and DS)

<b>Lecture – Tutorial:</b>	3-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Knowledge on fundamental concepts of waves, optics, sound and magnetism**

**Course Objectives:**

- ❖ The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
- ❖ To develop analytical capability and solve various engineering problems.

**Course Outcomes:**

CO1	Apply the interaction of light with matter through interference, diffraction, polarization and identify these phenomena in different natural optical processes and optical instruments.
CO2	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications.
CO3	Interpret the knowledge of dielectric and magnetic materials with characteristic utility in appliances.
CO4	Apply the knowledge of basic quantum mechanics, to set up one dimensional Schrodinger's wave equation and its application to a infinite potential well.
CO5	Summarize the importance of free electrons in determining the properties of metals and understand the origin & role of energy bands in classifying the solids
CO6	Understand the physics of Semiconductors and their working mechanism for their utility in sensors.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3				3					3		
CO2	3	3		2	2					3		
CO3	3	3			2							
CO4	3											
CO5	3		2		2							
CO6	3				2							

**Unit-I: Wave (12hrs )**

**Interference:** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

**Diffraction:** Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

**Polarization:** Introduction-Types of polarization - Double refraction - Nicol's Prism - Half wave and Quarter wave plates.

**Unit-II: Lasers and Fiber optics (8hrs)**

**Lasers:** Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

**Fiber optics:** Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes –

Propagation of electromagnetic wave through optical fibers - Applications.

**Unit-III: Magnetic and Dielectric Materials (10hrs)**

**Magnetic Materials:** Introduction - Origin of permanent magnetic moment - Classification of

magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

**Dielectric Materials:** Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation.

**Unit IV: Quantum Mechanics, Free Electron Theory ( 8hrs)**

**Quantum Mechanics:** Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function – Schrodinger’s time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

**Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Fermi energy-Density of states.

**Unit – V: Band theory of Solids & Semiconductors (10hrs)**

**Band theory of Solids:** Bloch’s Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids-Concept of hole.

**Semiconductors:** Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein’s equation- Hall effect – Hall coefficient – Applications of Hall effect.

**TEXT BOOKS:**

1. **M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy**” A Text book of Engineering Physics”- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics by **P.K.Palanisamy** SciTech publications

**REFERENCE BOOKS:**

1. Engineering Physics by **M.R.Srinivasan**, New Age international publishers (2009).
2. Engineering Physics - **Sanjay D. Jain, D. Sahasrabudhe and Girish**, University Press
3. **B.K. Pandey and S. Chaturvedi**, Engineering Physics, Cengage Learning

**E-RESOURCES:** [www.doitpoms.ac.uk](http://www.doitpoms.ac.uk),

<http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html>,

<http://www.coherent.com/products/?834/Lasers>,

<http://plato.stanford.edu/entries/qm/>



**20A1205303: Data Structures**  
**(Common to CSE,IT,AIIML,DS)**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: C- Programming**

- 1 To impart basic knowledge of data structures.
- 2 Be familiar with basic techniques of algorithm analysis
- 3 Be familiar with writing recursive methods
- 4 To understand concepts about searching and sorting techniques
- 5 To design and implementation of various basic and advanced data structures like stacks, queues, lists, trees and graphs.
- 6 To introduce various techniques for representation of the data in the real world.

**Course Outcomes:**

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

CO1	Ability to illustrate the concepts of algorithm apply the learning concepts to design data structure for the given problem definition.
CO2	Analyze and implement operations on linked list and demonstrate their applications
CO3	Ability to design applications using stacks and queues and implements various types of Queues
CO4	Ability to analyze and implement operations on trees
CO5	Ability to demonstrate various operations on binary search trees and its applications
	Ability to evaluate the properties and operations on graphs and implement the graph applications

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	--	--	--	2	--	--	--	--	--	--	2
CO2	--	2	2	2	--	--	--	--	--	--	2	2
CO3	2	2	3	--	2	--	--	--	--	--	--	--
CO4	--	2	3	2	--	--	--	--	--	--	2	2
CO5	3	2	3	3	2	--	--	--	--	--	2	2

**UNIT I :**

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity. Searching - Linear search, Binary search, Fibonacci search. Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

**UNIT II:**

Linked List: Introduction, Single linked list, Representation of Linked list in memory. Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion Deletion, Circular Linked list-Insertion, Deletion.

**UNIT III:**

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues Circular Queues, Deques, Priority Queues, Multiple Queues. Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation Infix to Postfix Conversion, Evaluating Postfix Expressions..

**UNIT IV:**

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

**UNIT V:**

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prim's & Kruskal's Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm

**TEXT BOOKS:**

- 1) Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
- 2) Data Structures and algorithm analysis in C, 2nd ed, Mark Allen Weiss

**REFERENCE BOOKS:**

- 1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
- 2) Data Structures: A PseudoCode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzan, Cengage.
- 3) Data Structures with C, Seymour Lipschutz TMH

**E-RESOURCES:**

- 1) <http://algs4.cs.princeton.edu/home/>
- 2) [https://faculty.washington.edu/jstraub/dsa/Master\\_2\\_7a.pdf](https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf)

**20A1205401: OOPS THROUGH JAVA**  
**(Common to CSE,IT,AIIML,DS)**

<b>Lecture – Tutorial-Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:****C Programming****Course Objectives:**

To **introduce** the object oriented programming concepts.

To **understand** object oriented programming concepts, and apply them in solving Problems.

To **introduce** the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes

To **introduce** the implementation of packages and interfaces

To **introduce** the concepts of exception handling and multithreading.

To **introduce** the design of Graphical User Interface using applets.

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

CO1 Understand the concepts of object oriented programming

CO2 Able to **understand** the use of abstract classes and Packages in java.

CO3 Implement Exception Handling techniques and multiple inheritance through interfaces

CO4 Able to understand multithreaded applications with synchronization

Develop Graphical user interface applications using Swing and Applet

CO5 Components

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	3	3	2	-	-	-	-	2	-	-	3

**UNIT I**

GENESIS OF JAVA: History of Java, Importance of java to Internet, Byte code, Java Features, Data types, variables, scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program.

CLASSES AND OBJECTS: classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, Exploring the String class, String Buffer Class, String Tokenizer.

**UNIT II**

INHERITANCE: Inheritance basics, Using super keyword, method overriding, Dynamic method dispatch using final with inheritance, abstract classes.

PACKAGES AND INTERFACES: Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces..

**UNIT III**

EXCEPTION HANDLING AND MULTITHREADING: Exception handling Fundamentals, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exceptions. Differences between multi threading and multitasking, thread life cycle, creating threads, Concurrency utilities. APPLET: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets.

**UNIT IV**

EVENT HANDLING: Delegation event model, Events, Event sources, Event classes, Event Listeners, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy: labels, button, scrollbars, text components, check box, check box groups, choices, list boxes. Layout manager types: border, grid, flow, card and grid bag.

**UNIT V**

SWINGS: Introduction, limitations of AWT, components, containers EXPLORING SWINGS JApplet, JFrame and JComponent, text components, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes. JTabbedPane.

**TEXT BOOKS:**

1. The Complete Reference Java, 8<sup>th</sup> edition, Herbert Schildt, TMH.
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, Universities 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.

**E-RESOURCES:**

<http://www.javatpoint.com/>  
[java.sun.com/docs/books/tutorial/java/TOC.html](http://java.sun.com/docs/books/tutorial/java/TOC.html)  
<http://www.learnjavaonline.org/>  
<http://www.tutorialspoint.com/java/>  
[www.java.com/en/download/faq/develop.xml](http://www.java.com/en/download/faq/develop.xml)  
[www.oracle.com](http://www.oracle.com) › Java › Java SE  
[www.w3schools.com](http://www.w3schools.com)

**20A1204302: DIGITAL LOGIC DESIGN**  
**(Common to CSE,IT,AIIML,DS)**

<b>Lecture – Tutorial- Practical:</b>	2-0-2	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:**

Computer fundamentals and Basic electronics

**Course Objectives:**

1. To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic
2. To study the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques
3. To introduce the basic tools for design of combinational logic
4. To study various programmable logic devices and their use in realization of switching functions
5. To introduce the basic tools for design of sequential logic
6. To learn simple digital circuits like registers and counters in preparation for computer engineering

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

CO1	To define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
CO2	To understand the different switching algebra theorems and apply them for logic functions
CO3	To define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
CO4	To design various combinational logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
CO5	To design various sequential circuits like latches and flip flops
CO6	To design and implement sequential circuits like registers and counters.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3										
CO2	3	2										
CO3	3	2										
CO4	3	2	2							2		
CO5	3	3	2							2		
CO6	3	3	2							2		

**UNIT I****DIGITAL SYSTEMS AND BINARY NUMBERS:**

Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

**UNIT II****CONCEPT OF BOOLEAN ALGEBRA:**

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

**GATE LEVEL MINIMIZATION:**

Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive OR Function.

**UNIT III****COMBINATIONAL LOGIC:**

Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits. Realization of Switching Functions Using PROM, PAL and PLA.

**UNIT IV****SYNCHRONOUS SEQUENTIAL LOGIC:**

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

**UNIT V****REGISTERS AND COUNTERS:**

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

**TEXT BOOKS:**

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage

**REFERENCE BOOKS:**

1. Digital Logic and Computer Design, M.Morris Mano, PEA
2. Digital Logic Design, Leach, Malvino, Saha, TMH
3. Modern Digital Electronics, R.P. Jain, TMH.

**E-RESOURCES:**

1. <https://nptel.ac.in/courses/106108099/>
2. <https://swayam.gov.in/course/1392-digital-circuits-and-systems>
3. <http://www.nesoacademy.org/electronics-engineering/digital-electronics/digital>
4. <https://www.youtube.com/playlist?list=PLWPirh4EWFpHk70zwYoHu87uVsCC8E2S>

**20A1200191: Communicative English Lab**  
**(Common to All Branches (CE, EEE, MECH, ECE, CSE, IT, AIML, DS))**

<b>Labs / Instructions Hours/Week</b>	3 Hours	<b>Internal Marks:</b>	15
<b>Credits</b>	1.5	<b>External Marks:</b>	35

**PREREQUISITES: None**

**COURSE OBJECTIVES**

1. To learn the sound systems of English and understand word stress of English.
2. To train the students in the art of conversation and discussion
3. To equip the students with good communication skills.
4. To emphasize the need of English in the technical world.
5. To improve their presentation and participation skills
6. To prepare them for interviews and future job environments.

**COURSE OUTCOMES**

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

CO 1	Demonstrate better understanding of the nuances of spoken English to put into use in various situation and events.
CO 2	Apply the rules of phonetics–pronunciation, accent and intonation– in their everyday communication
CO 3	Relate their understanding of the importance of spoken skills and the need for life-long learning in day-to-day communication.
CO 4	Construct strategies like critical and analytical skills to participate effectively in group discussions and debates.
CO 5	Demonstrate their ideas accurately and effectively in presentations.
CO 6	Build responses to the questions by listening to short audio texts and identify the context and specific pieces of information.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>P O 1</b>	<b>P O 2</b>	<b>P O 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>P O 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO 1										1		2
CO 2										1		2
CO 3												2
CO 4									1	1		2
CO 5										2		2
CO 6										1		2

<b>UNIT I</b>
<ul style="list-style-type: none"> <li>• Making Inquiries on the phone, Thanking and Responding to Thanks, Responding to Requests and Asking for Directions</li> <li>• Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation</li> </ul>
<b>UNIT II</b>
<ul style="list-style-type: none"> <li>• Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating, Apologising, Advising, Suggesting, Agreeing and Disagreeing</li> <li>• Word stress – Di-Syllabic Words, Poly-Syllabic Words, Weak and Strong Forms, Contrastive Stress (Homographs)</li> </ul>
<b>UNIT III</b>
<ul style="list-style-type: none"> <li>• Debating</li> <li>• Stress in Compound Words, Rhythm, Intonation, Accent Neutralization.</li> </ul>
<b>UNIT IV</b>
<ul style="list-style-type: none"> <li>• Group Discussions</li> <li>• Listening to Short Audio Texts, and Identifying the context and specific pieces of information to answer a series of questions in speaking.</li> </ul>
<b>UNIT V</b>
<ul style="list-style-type: none"> <li>• Presentation Skills and Interview Skills</li> <li>• Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.</li> </ul>
<b>Lab Manual:</b> “Infotech English”, Maruthi Publications.
<b>Software:</b> k-van solutions Multimedia language lab
<b>REFERENCE BOOKS:</b>
<ol style="list-style-type: none"> <li>1. <b>Exercises in Spoken English Part 1,2,3,4</b>, OUP and CIEFL.</li> <li>2. <b>English Pronunciation in use</b> - Mark Hancock, Cambridge University Press.</li> <li>3. <b>English Phonetics and Phonology</b>-Peter Roach, Cambridge University Press.</li> <li>4. <b>English Pronunciation in use</b>- Mark Hewings, Cambridge University Press.</li> <li>5. <b>English Pronunciation Dictionary</b>- Daniel Jones, Cambridge University Press.</li> <li>6. <b>English Phonetics for Indian Students</b>- P. Bala Subramanian, Mac Millan Publications</li> </ol>
<b>E-RESOURCES</b>
<ol style="list-style-type: none"> <li>1. <a href="https://learnenglish.britishcouncil.org/">https://learnenglish.britishcouncil.org/</a></li> <li>2. <a href="https://rachelsenglish.com/">https://rachelsenglish.com/</a></li> <li>3. <a href="https://www.bbc.co.uk/learningenglish/">https://www.bbc.co.uk/learningenglish/</a></li> <li>4. <a href="https://www.engvid.com/">https://www.engvid.com/</a></li> <li>5. <a href="https://bbclearningenglish.com">https://bbclearningenglish.com</a></li> </ol>



**20A1200292: APPLIED PHYSICS LAB**

<b>Labs / Instructions Hours/Week</b>	3	<b>Internal Marks:</b>	15
<b>Credits:</b>	1.5	<b>External Marks:</b>	35

**Prerequisites: Knowledge on vernier callipers, Screw guage, common balance**

**Course Objectives:**

- ❖ The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
- ❖ To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
- ❖ Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.

**Course Outcomes:**

CO1	Understand principle, concept, working of an instrument and can compare results with theoretical calculations.
CO2	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO3	Understand design of an instrument with targeted accuracy for physical measurements.
CO4	Develop skills to impart practical knowledge in real time solution.
CO5	The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering..
CO6	Think innovatively and also improve the creative skills that are essential for engineering.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3	3		3					3			
CO3	3	3	1	3					3			
CO4	3	3		3								
CO5	3											
CO6	3	3	2	3								

**List of Experiments**

1. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
2. Determination of numerical aperture and acceptance angle of an optical fiber.
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of given plano convex lens by Newton's rings.
5. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
6. Determination of dispersive power of the prism.
7. Sonometer: Verification of laws of string.
8. Study of I/V Characteristics of Semiconductor diode.
9. I/V characteristics of Zener diode.
10. Melde's experiment-Longitudinal and Transverse mode.
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
12. Estimation of Planck's constant using photoelectric effect.

13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
  14. Determination of wavelength of Laser light using diffraction grating.
  15. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
- Note: Any 8 experiments out of 15 should be done in the laboratory and 2 experiments in virtual lab.**

**TEXT BOOKS:**

**S. Balasubramanian, M.N. Srinivasan** "A Text book of Practical Physics"- S Chand Publishers, 2017.

**REFERENCE BOOKS:**

Engineering Physics / Applied Physics Lab Manual – **Spectrum Publications**

**E-RESOURCES:** [www.vlab.co.in](http://www.vlab.co.in)

## Data Structures Lab (20A1205393)

Lecture – Tutorial- Practical:	0-0-3	Internal Marks:	15
Credits:	1.5	External Marks:	35

Prerequisites:

C Programming

Course Objectives:

- To understand and implement basic data structures
- To Apply linear and non linear data structures in problem solving.
- Have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting and searching.
- Have a good understanding of the fundamental data structures used in computer science
- It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

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

CO1	Implement different searching and sorting techniques. Compare different searching and sorting techniques.
CO2	Design linear data structures stacks, queues and linked lists.
CO3	Design nonlinear data structures trees and Graphs, and implement their operations
CO4	Be capable to identify the appropriate data structure for given problem
CO5	Have practical knowledge on the applications of data structures

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	2
CO2	3	2	3	2	-	-	-	-	-	-	2
CO3	3	2	3	2	-	-	-	-	-	-	2
CO4	3	2	3	2	-	-	-	-	-	-	2
CO5	3	2	3	2	-	-	-	-	-	-	2

List of Experiments

Exercise 1:

- a. Write a recursive C program to find the Factorial of an integer.
- b. Write a recursive C program to calculate the GCD of two numbers.
- c. Write a recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.
- d. Write a recursive C program to display the Fibonacci Series: 0, 1, 1, 2, 3, 5, 8, ...N.

Exercise 2:

- a. Write a recursive and non-recursive C program to implement Linear Search technique.
- b. Write a recursive and non-recursive C program to implement Binary Search

technique.

Exercise 3:

- a. Write C program that implement Insertion sort, to sort elements in an ascending order.
- b. Write C program that implement Merge sort, to sort elements in an ascending order.
- c. Write C program that implement Quick sort, to sort elements in an ascending order.

Exercise 4:

- a. Write a C program to insert a node in a Single Linked List.
- b. Write a C program to delete a node in a Single Linked List.
- c. Write a C program to reverse elements in a Single Linked List.
- d. Write a C program to insert a node in a Doubly Linked List.

Exercise 5:

- a. Write C program that implement Stack (its operations) using arrays.
- b. Write C program that implement Queue (its operations) using arrays.
- c. Write C program that implement Queue using Two Stacks.

Exercise 6:

- a. Write C program that implement Stack using Linked List.
- b. Write C program that implement Queue using Linked List.
- c. Write a C program to implement the Circular Queue.

Exercise 7:

- a. Write a C program to insert elements in a Binary Search Tree (BST).
- b. Write a C program to delete element in a Binary Search Tree (BST).
- c. Write a C program to implement BST traversals: Inorder, Preorder, and Postorder.

Exercise 8:

- a. Write a C program to implement the Max Heap.
- b. Write C program that implement Heap sort, to sort elements in an ascending order.

Exercise 9:

- a. Write a C program to implement the Breadth First Search technique on a Graph.
- b. Write a C program to implement the Depth First Search technique on a Graph.

Exercise 10:

- a. Write a C program to implement the Prim's algorithm to construct Minimum Spanning Tree.
- b. Write a C program to implement the Kruskal's algorithm to construct Minimum Spanning Tree.

TEXT BOOKS:

1 Data Structures using C, Reema Thareja, Oxford

2. DATA STRUCTURE USING C, Udit Agarwal, KATSON Books

3 Data Structures using C, 2nd Edition, by A. K. Sharma, Pearson India

REFERENCE BOOKS:

1. Kenneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.

2. Richard Johnsonburg, Discrete mathematics, 7/e, Pearson Education, 2008

## OOPS Through JAVA Lab (20A1205491)

Lecture – Tutorial- Practical:	0-0-4	Internal Marks:	15
Credits:	2	External Marks:	35

Prerequisites:

C Programming

Course Objectives:

To develop programs using object oriented concepts.

To develop GUI applications and Client/Server communication using Java.

Course Outcomes:

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

CO1	Understand the concepts of object oriented programming.
CO2	Implement Exception Handling techniques and multiple inheritance through interfaces.
CO3	Apply thread capabilities and Collections framework.
CO4	Develop Graphical user interface applications using Swing and Applet Components.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	--	--	--	2	--	--	--	--	--	--	--
CO2	2	3	--	2	--	--	--	--	--	--	--	--
CO3	--	--	2	--	2	--	--	--	3	--	--	2
CO4	--	--	2	2	--	--	--	--	2	--	--	3

List of Experiments

Exercise 1

- Write a Java program that prints all real solutions to the quadratic equation  $ax^2 + bx + c = 0$ . Read in a, b, c and use the quadratic formula. If the discriminant  $b^2 - 4ac$  is negative, display a message stating that there are no real solutions.
- The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

Exercise 2

- Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
- Write a Java program to multiply two given matrices and find its transpose (Exercise Find identity Matrix of a given size)

Exercise 3

- Write a Java program that checks whether a given string is a palindrome or not. Ex MALAYALAM is a palindrome.
- Write a Java program for sorting a given list of names in ascending order.
- Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

Exercise 4

- Write a Java program that reads a file name from the user, and then displays information

about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c) Write a Java program that displays the number of characters, lines and words in a text file.

#### Exercise 5

Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods

#### Exercise 6

(a) Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides ( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides ( ) that shows the number of sides in the given geometrical figures.

(b) Write a Java program that demonstrates Packages

#### Exercise 7

a) Write a Java program demonstrating the life cycle of a thread.

b) Develop an applet that displays a simple message

#### Exercise 8

a) Develop an applet 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.

b) Write a Java program that allows user to draw lines, rectangles and ovals.

#### Exercise 9

a) 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.

b) Write a Java program for handling mouse events.

#### Exercise 10

a) Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 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 NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

b) Write a Java program that lets users create Pie charts. Design your own user interface (with Swings & AWT)

#### TEXT BOOKS:

1. The Complete Reference Java, 8th edition, Herbert Schildt, TMH.
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, Universities 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.

#### E-RESOURCES:

<http://www.javatpoint.com/>  
[java.sun.com/docs/books/tutorial/java/TOC.html](http://java.sun.com/docs/books/tutorial/java/TOC.html)  
<http://www.learnjavaonline.org/>  
<http://www.tutorialspoint.com/java/>  
[www.java.com/en/download/faq/develop.xml](http://www.java.com/en/download/faq/develop.xml)  
[www.oracle.com](http://www.oracle.com) › Java › Java SE  
[www.w3schools.com](http://www.w3schools.com)



## NRI INSTITUTE OF TECHNOLOGY

An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)  
(credited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)  
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

### DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

#### STRUCTURE FOR SECOND YEAR B.TECH CSE (AI&ML) PROGRAMME

#### II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks )			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Transform Techniques and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2105401	Python Programming	3	0	0	3	30	70	100	3
3	20A2105402	Data Base Management Systems	3	0	0	3	30	70	100	3
4	20A2105403	Computer Organization and Architecture	3	0	0	3	30	70	100	3
5	20A2142401	Concepts in Artificial Intelligence	3	0	0	3	30	70	100	3
6	20A2105491	Python programming Lab	0	0	3	3	15	35	50	1.5
7	20A2105492	Data Base Management System Lab	0	0	3	3	15	35	50	1.5
8	20A2142491	Artificial Intelligence Programming Lab	0	0	3	3	15	35	50	1.5
9	SOC	Mobile Application Development	0	0	4	4	15	35	50	2
10	20A2105901	Aptitude and Reasoning	0	2	0	2	15	35*	50	0
<b>Total</b>			<b>15</b>	<b>2</b>	<b>13</b>	<b>30</b>	<b>225</b>	<b>525</b>	<b>750</b>	<b>21.5</b>

## II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2242401	Introduction to Machine Learning	3	0	0	3	30	70	100	3
5		Formal Languages and Automata Theory	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2242491	Machine Learning Lab	0	0	3	3	15	35	50	1.5
9	SOC	Natural Language Processing with Python	0	0	4	4	15	35	50	2
10	20A2200802	Professional ethics and Human Values	0	2	0	2	30	70*	100	0
Total			15	2	13	30	240	560	800	21.5

**\* Internal Evaluation**

L - LECTURE T - TUTORIAL P - PRACTICAL  
CIA - Continuous Internal Assessment SEA - Semester End Assessment

Internship 2 Months (Mandatory) during summer vacation							
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4



**20A2100201: Vector Calculus, Transform Techniques and Partial Differential Equations**

<b>Lecture</b>	3	<b>Internal Marks:</b>	30
<b>Tutorial</b>	0		
<b>Credits</b>	3	<b>External Marks:</b>	70

**Course Objectives:**

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

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

CO1	Interpret the physical meaning of different operators such as gradient, cur land divergence (L5)
CO2	Estimate the work done against a field, circulation and flux using vector calculus (L5)
CO3	Apply the Laplace transform for solving differential equations (L3)
CO4	Find or compute the Fourier series of periodic signals (L3)
CO5	Knowandbe able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3)
CO6	Identify solution methods for partial differential equations that model physical processes (L3)

**Contribution of Course Outcomes towards achievement of Program****Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

**UNIT I****Unit-I: Vector calculus:**

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

Integration: Line integral–Work done–Area–Surface and volume integrals.

Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)

**UNIT II**

**Unit-II: Laplace Transforms:**

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Inverse Laplace transforms– Convolution theorem (without proof).

**Applications:**

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

**UNIT III****Unit-III: Fourier series and Fourier Transforms:****Fourier Series:**

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

**Fourier Transforms:**

Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosine transforms – inverse trans forms –Finite Fourier transforms

**UNIT IV****Unit-IV: PDE of first order:**

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

**UNIT: V****UNIT-V:Second order PDE:**

Second order PDE: Solutions of linearpartial differential equations with constant coefficient – term of the type  $ax+by$ ,  $\sin(ax + by)$ ,  $\cos(ax + by)$ ,  $xmyn$ .

Method of separation of variables – introduction.

**TEXT BOOKS:**

1.B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

**REFERENCE BOOKS:**

1. ErwinKreyszig, Advanced Engineering Mathematics, 10thEdition, Wiley-India.

2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.

3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.

4. Srimantha Pal, SCBhunia, Engineering Mathematics, Oxford University Press

**E-RESOURCES:**

1. [www.nptelvideos.com/mathematics/](http://www.nptelvideos.com/mathematics/) (Math Lectures from MIT, Stanford,IIT'S)

2. [nptel.ac.in/courses/122104017](http://nptel.ac.in/courses/122104017)

3. [nptel.ac.in/courses/111105035](http://nptel.ac.in/courses/111105035)

## 20A2105401-Python Programming

<b>Lecture - Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70

**Prerequisites:**

Adequate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

**Course Objectives:**

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries.

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

**Course Outcomes:**

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

CO 1 Experience with an interpreted Language and to build software for real needs

CO 2 Use basic Decision structures, Boolean logic, variable types, assignments and operators.

CO 3 Describe and use of Python lists, dictionaries, tuples and sets.

CO 4 Implement methods and functions to improve readability of programs

CO 5 Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	--	--	--	3	--	--	--	3	--	3	--	3	3	-
CO 2	--	3	2	--	--	--	--	--	--	--	--	--	2	3	2
CO 3	--	--	--	2	3	--	--	--	3	--	--	--	3	3	-

CO 4	--	--	--	3	3	--	--	--	3	--	--	--	2	3	-
CO 5	--	--	--	3	--	--	--	--	--	--	3	--	3	3	3

**UNIT I : DATA, EXPRESSIONS, STATEMENTS**

Python Interpreter and Interactive mode; Values and Types: int, float, boolean, string, and list; Variables, Expressions, Statements, Tuple assignment, Precedence of operators, Comments; Modules and Functions, Function Definition and use, Flow of Execution, Parameters and Arguments; Illustrative programs: Exchange the values of two variables, Distance between two points.

**UNIT II: CONTROL FLOW, FUNCTIONS.**

Conditionals: Boolean values and operators, Conditional (if), Alternative (if-else), Chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, sum an array of numbers, Linear search, Binary search

**UNIT III: LISTS, TUPLES, DICTIONARIES**

Lists: List operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning lists, List parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: selection sort, insertion sort, mergesort.

**UNIT IV: FILES, MODULES, PACKAGES AND EXCEPTION HANDLING**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

**UNIT V: CLASSES AND OBJECTS**

Implementation of classes and objects in Python: Classes and Objects, Methods and Self Argument, The `__init__` Method, Class Variables and Object Variables, The `__del__` Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects)

**TEXT BOOKS:**

1. Python Programming: A Modern Approach , Vamsi Kurama, Pearson
2. Learning Python , Mark Lutz , Orielly

**REFERENCE BOOKS:**

Think Python , Allen Downey , Green Tea Press

**E-RESOURCES:**

<https://www.tutorialspoint.com/python/index.htm>

<https://www.programiz.com/python-programming>

<https://www.w3schools.com/python/>

<https://www.javatpoint.com/python-tutorial>

**20A2105402-DATA BASE MANAGEMENT SYSTEMS**

<b>Lecture - Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70

**Prerequisites:**

Basic Database, Data Structures, Mathematics

**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- Learn and practice data modelling using the entity-relationship and developing database designs
- To master the basics of SQL and construct queries using SQL.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access
- Learn the concepts of transaction management and how they provide security and consistency
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

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

CO1	Ability to define, understand the database management system structure
CO2	Ability to apply as relational algebra to find solutions to a broad range of queries.
CO3	Ability to create applications using various normal forms, functional dependencies, validating and identifying anomalies
CO4	Will be able to explain the principle of transaction management design.
CO5	Understands and applies indexing mechanisms in databases

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	--	2	--	--	--	--	--	--	2	2	2	2
CO2	3	3	3	--	--	--	--	--	--	--	2	2	2	2	2
CO3	3	3	--	--	3	2	--	--	--	--	2	2	3	2	2
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2	2

**UNIT I :****DATABASE SYSTEM APPLICATIONS:**

Database System Applications, Purpose of Database Systems, File Systems versus a DBMS, View of Data – Data Abstraction, Instances and Schemas, Data Models, Data Independence, Database Users and Administrators,

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:**

**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 AND CALCULUS:**

Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus.

**UNIT III:**

**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:**

**OVERVIEW OF TRANSACTION MANAGEMENT:**

The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

**CONCURRENCY CONTROL:**

Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

**CRASH RECOVERY:**

Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery.

**UNIT V:**

**OVERVIEW OF STORAGE AND INDEXING:**

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. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3<sup>rd</sup> Edition,2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant .Navathe,Pearson Education,2008.

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

**E-RESOURCES:**

- 1.<https://www.javatpoint.com/dbms-tutorial>
- 2.<https://www.tutorialspoint.com/dbms/index.htm>
- 3.<https://www.geeksforgeeks.org/dbms/>

## 20A2105403- Computer Organization and Architecture

<b>Lecture - Tutorial- Practical::</b>	3-0-0					<b>Internal Marks:</b>	30
<b>Credits:</b>	3					<b>External Marks:</b>	70

**Prerequisites:**

NIL

**Course Objectives:**

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binary code.
- To study the combinational logic design of various logic and switching devices and their realization
- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- The memory organization of the computer and input output organization understanding

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

CO1	Understand the numeric information in different forms and interpret different logic gates.
CO2	Analyze and Design various combinational circuits like Encoders, Decoders, Multiplexers, Demultiplexers, and Arithmetic Circuits.
CO3	Able to understand the basic components and the design of CPU, ALU and Control unit
CO4	Students can calculate the effective address of an operand by addressing modes
CO5	Ability to understand memory hierarchy and its impact on computer cost/performance..
CO6	Ability to understand the advantage of instruction level parallelism.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	-	2	2	--	--	--	--	--	--	--	--	2	--	2
CO2	3	--	3	--	3	--	--	--	--	--	--	--	--	3	--
CO3	--	--	2	2	2	--	--	--	--	--	--	--	--	--	3
CO4	--	--	2	3	3	--	--	--	--	--	--	--	--	2	--
CO5	--	--	3	2	--	--	--	--	--	--	--	2	2	3	--
CO6	--	--	--	2	2	--	--	--	--	--	--	--	3	2	--

**UNIT I :**

NUMBER SYSTEMS & BOOLEAN FUNCTIONS: Representation of numbers in different radix, conversion from one radix to another radix, r-1's complements and r's complements of signed numbers, Boolean theorems, principle of complementation & duality, De-Morgans theorems, Basic logic gates and Universal gates, NAND-NAND and NOR-NOR realizations, Standard SOP and POS.



**UNIT II:**

Design of Half adder, full adder half subtractor, full subtractor, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, 4 bit parallel adder, Carry look-a- head adder circuit. Decoders, Encoders, priority encoder, Multiplexer, Demultiplexer. Basic Structure Of Computers : Computer Types, Functional unit, Basic Operational concepts, Bus structures, Software, Performance.

**UNIT III:**

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Microoperations, 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 Interrupts

**UNIT IV:**

Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC). Computer Arithmetic : Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations.

**UNIT V:**

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware. Input Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

**TEXT BOOKS:**

- 1 Morris M. Mano, Computer Systems Architecture. 3 Ed, Pearson/PHI, 2013
- 2 Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

**REFERENCE BOOKS:**

John P. Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.

**E-RESOURCES:**

[https://www.tutorialspoint.com/computer\\_organization/index.asp](https://www.tutorialspoint.com/computer_organization/index.asp)

<https://www.geeksforgeeks.org/computer-organization-basic-computer-instructions/>

**20A2142401- Concepts in Artificial Intelligence**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	3 0
<b>Credits:</b>	3	<b>External Marks:</b>	7 0

**Prerequisites:**

Course Objectives:

- 1 To learn the difference between optimal reasoning vs human like reasoning
- 2 To understand the notions of state space representation, exhaustive search, heuristic search along 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, Expert Systems, Machine Learning and Natural Language Processing

**Course Outcomes:**

Upon Completion of the course, the students will be able to

CO1 Possess the ability to formulate an efficient problem space for a problem expressed in English.

CO 2 Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.

CO3 Possess the skill for representing knowledge using the appropriate technique

CO4 Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing

CO5 Apply the knowledge to develop the solutions for real life problems

CO6 Develop new algorithms to contribute to the research arena

**Upon successful completion of the course, the student will be able to:****Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	2	-	2	-	-	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-
CO6	3	-	-	2	2	-	-	-	-	2	2	2

## Unit - I

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. Problem Solving – State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A\*, Constraint Satisfaction

## Unit – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. Representing Knowledge Using Rules: Logic programming, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning, Matching, Control Knowledge

## Unit – III

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames, Conceptual dependencies, Scripts

## Unit IV

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems;

Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world

## Unit-V

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools, Expert System Shells.

AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog

**Text Books**

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

**References:**

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
3. Artificial Intelligence, Robert Schalkoff, Mcgraw-Hill Publications
4. Artificial Intelligence and Machine Learning, Vinod Chandra S.S., AnandHareendran S.

**20A2105491-Python Programming Lab**

<b>Lecture - Tutorial- Practical::</b>	0-0-3				<b>Internal Marks:</b>
<b>Credits:</b>	1.5				<b>External Marks</b>

**Prerequisites:**

Adequate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

**Course Objectives:**

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

Students able to build software for real needs and prior introduction to testing software

**Course Outcomes:**

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

CO1	Experience with an interpreted Language and to build software for real needs
CO2	Use basic Decision structures, Boolean logic, variable types, assignments and operators.
CO3	Describe and use of Python lists, dictionaries, tuples and sets.
CO4	Implement methods and functions to improve readability of programs
CO5	Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.
CO6	Design, code ,test and debug python language programs

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	--	--	--	3	--	--	--	3	--	3	--	3	3
CO2	--	3	2	--	--	--	--	--	--	--	--	--	2	3
CO3	--	--	--	2	3	--	--	--	3	--	--	--	3	3
CO4	--	--	--	3	3	--	--	--	3	--	--	--	2	3
CO5	--	--	--	3	--	--	--	--	--	--	3	--	3	3
CO6	--	--	--	--	2	--	--	--	3	--	3	--	2	3

**Exercise 1 - Basics**

- a) Running instructions in Interactive interpreter and a Python Script
- b) Write a program to purposefully raise Indentation Error and Correct it

**Exercise 2 - Operations**

- a) Write a program to compute distance between two points taking input from the user  
(Pythagorean Theorem)
- b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

**Exercise - 3 Control Flow**

- a) Write a Program for checking whether the given number is a even number or not.

- b) Using a for loop, write a program that prints out the decimal equivalents of  $1/2$ ,  $1/3$ ,  $1/4$ , . . . ,  $1/10$
- c) Write a program using a for loop that loops over a sequence.
- d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero

**Exercise 4 - Control Flow - Continued**

- a) Find the sum of all the primes below two million
- b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2,  
the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
- c) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms

**Exercise - 5 - DS**

- a) Write a program `combine_lists` that combines these lists into a dictionary.
- b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

**Exercise - 7 Files**

- a) Write a program to print each line of a file in reverse order.
- b) Write a program to compute the number of characters, words and lines in a file.

**Exercise - 8 Functions**

- a) Write a function `ball_collide` that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.  
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius  
If (distance between two balls centers)  $\leq$  (sum of their radii) then (they are colliding)
- b) Find mean, median, mode for the given set of numbers in a list.

**Exercise - 9 Functions- Continued**

- a) Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
- b) Write a function `dups` to find all duplicates in the list.
- c) Write a function `unique` to find all the unique elements of a list.

**Exercise - 10 - Functions - Problem Solving**

- a) Write a function `cumulative_product` to compute cumulative product of a list of numbers.
- b) Write a function `reverse` to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

### **Exercise 11 - Multi-D Lists**

- a) Write a program that defines a matrix and prints
- b) Write a program to perform addition of two square matrices
- c) Write a program to perform multiplication of two square matrices

### **Exercise - 12 - Modules**

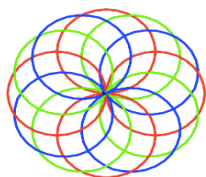
- a) Write a program that defines a module "person" and import it
- b) write a program that renames a module

### **Exercise - 13 OOP**

- a) Class variables and instance variable and illustration of the self variable
  - i) Robot
  - ii) ATM Machine

### **Exercise - 14 GUI, Graphics**

1. Write a GUI for an Expression Calculator using tk
2. Write a program to implement the following figures using turtle:



### **Exercise - 15 - Testing**

- a) Write a test-case to check the function even\_numbers which return True on passing a list of all even numbers
- b) Write a test-case to check the function reverse\_string which returns the reversed string

### **Exercise - 16 - Advanced**

Build any one classical data structure

### **TEXT BOOKS:**

1. Python Programming: A Modern Approach , Vamsi Kurama, Pearson
2. Learning Python , Mark Lutz , Orielly

### **REFERENCE BOOKS:**

Think Python , Allen Downey , Green Tea Press

### **E-RESOURCES:**

<https://www.tutorialspoint.com/python/>  
<https://docs.python.org/3/tutorial/>  
<https://www.w3schools.com/python/>  
<https://www.javatpoint.com/python-tutorial>

**20A2105492-DATABASEMANAGEMENTSYSTEMS LAB**

<b>Lecture - Tutorial- Practical::</b>	0-0-3				<b>Internal Marks:</b>
<b>Credits:</b>	1.5				<b>External Marks:</b>

**Prerequisites:****C Programming, Mathematics****Course Objectives:**

- Design and implement a database schema for a given problem-domain
- Populate and query a database using SQLDML/DDL commands.
- Declare and enforce integrity constraints on a database
- ProgrammingPL/SQLincludingstoredprocedures,stored functions,cursors,packages.
- Understand realtime database design models and cancodethemodel
- understandandretrieveinformationfromcomplexdesigneddatabasesusingcorrelatednestedqueries

**Course Outcomes:**

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

CO1	Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
CO2	Queries to Retrieve and Change Data:Select, Insert,Delete,andUpdate
CO3	QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFunctionsandConversion Functions.
CO4	Queries using GroupBy,OrderBy,andHavingClauses
CO5	Queries on Joins and CorrelatedSub-Queries
CO6	Queries on Controlling Data:Commit,Rollback,andSavepoint

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2	2
CO5	2	2	2	--	2	--	--	--	--	--	--	--	2	2
CO6	2	2	3	--	2	--	--	--	--	--	--	--	2	2

**ListofExperiments :**

**SQL**

1. QueriesforCreating,Dropping,andAlteringTables,Views,andConstraints
2. QueriestoRetrieveandChangeData:Select,Insert,Delete,andUpdate
3. QueriesusingoperatorsinSQL
4. QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFunctionsandConversion Functions
5. QueriesusingGroupBy,OrderBy,andHavingClauses
6. Queries on Controlling Data: Commit, Rollback, and Save point
7. Queries on Joins and Correlated Sub-Queries
8. Queries on Working with Index, Sequence, Synonym

**PL/SQL**

1. WriteaPL/SQLCodeusingBasicVariable,AnchoredDeclarations,andUsageofAssignmentOperation
2. WriteaPL/SQLCodeBindandSubstitutionVariables.PrintinginPL/SQL
3. WriteaPL/SQLblockusingSQLandControlStructuresinPL/SQL
4. WriteaPL/SQLCodeusingCursors,ExceptionsandCompositeDataTypes
5. WriteaPL/SQLCodeusingProcedures,Functions,TriggersandPackage



**TEXT BOOKS:**

Fundamentals of Database Systems, Elmasri Navrate, 6<sup>th</sup> edition, Pearson Education

**REFERENCE BOOKS:**

1. "Database System Concepts", Korth, Silberchatz, Sudarshan, 6th Edition, McGraw-Hill
2. Peter Rob and Carlos Coronel, "Database Systems Design, Implementation and Management", Thomson Learning, 5th Edition.
3. Introduction to Database Systems, C J Date, Pearson  
Database Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

**20A2142491:ARTIFICIAL INTELLIGENCE-PROGRAMMING LAB**

<b>Lecture – Tutorial- Practical::</b>	0-0-2	<b>Internal Marks:</b>	15
<b>Credits:</b>	1	<b>External Marks:</b>	35
<b>Prerequisites:</b>			
<b>C- Programming, Data Structures</b>			
<b>Course Objectives:</b>			
1 Able to develop algorithms for mathematical and scientific problems.			
2 Able to understand the components of computing systems.			
3 Able to choose data types and structures to solve mathematical and scientific problem			
4 Able to develop modular programs using control structures.			
<b>Course Outcomes:</b>			
<b>Upon successful completion of the course, the student will be able to:</b>			
CO1	Possess the ability to understand need of artificial intelligence.		
CO2	understand the principles of problem solving and be able to apply them successfully		
CO3	Possess the skill for representing knowledge using the appropriate technique		
CO4	Familiar with techniques for computer-based representation and manipulation of complex information, knowledge,		
CO5	Apply the knowledge to develop the solutions for real life problems		
CO6	Develop new ideas on resolving uncertainty		
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-</b>			

<b>Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	3	3	2	-	-	-	2	-	-	2
CO2	3	3	3	3	3	-	-	2	2	-	-	2
CO3	3	3	3	3	3	-	-	2	2	-	-	2
CO4	3	3	3	3	2	-	-	-	2	-	-	2
CO5	3	3	3	3	3	-	-	-	2	-	-	2
CO6	3	3	3	3	2	-	-	-	2	-	-	2
<ol style="list-style-type: none"> <li>1 Write a program to solve the Monkey Banana problem</li> <li>2 Write a program to solve 8 queens problem</li> <li>3 Solve any problem using depth first search.</li> <li>4 Solve any problem using best first search.</li> <li>5 Solve 8-puzzle problem using best first search</li> <li>6 Solve Robot (traversal) problem using means End Analysis</li> <li>7 Solve traveling salesman problem.</li> <li>8 Solve the water-jug problem with test cases.</li> </ol>												
<b>TEXT BOOKS:</b>												
Artificial Intelligence: A Modern Approach,. Russell & Norvig. 1995, Prentice Hall. Artificial Intelligence, Elain Rich and Kevin Knight, 1991, TMH.												
<b>REFERENCE BOOKS:</b>												
Artificial Intelligence-A modern approach, Stuart Russel and peter norvig, 1998, PHI.  Artificial intelligence, Patrick Henry Winston., 1992, Addition Wesley 3 Ed.,												
<b>E-RESOURCES:</b>												
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in">https://nptel.ac.in</a></li> <li>2. <a href="https://www.coursera.org/learn/ai-programming">https://www.coursera.org/learn/ai-programming</a></li> <li>3. <a href="https://www.AI-project.org/">https://www.AI-project.org/</a></li> </ol>												

## Course Code- Mobile Application Development

<b>Lecture - Tutorial- Practical::</b>	0-0-4					<b>Internal Marks:</b>
<b>Credits:</b>	2					<b>External Marks</b>

**Prerequisites:****Course Objectives:**

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

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

CO1	Identify various concepts of mobile programming that make it unique from programming for other platforms
CO2	Critique mobile applications on their design pros and cons
CO3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
CO4	Program mobile applications for the Android operating system that use basic and advanced phone features
CO5	Deploy applications to the Android marketplace for distribution.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2	2
CO5	2	2	2	--	2	--	--	--	--	--	--	--	2	--

**List of Experiments :**

1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours

5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

**REFERENCE BOOKS:**

1. Android Programming unleashed , B.M. Harwani, Pearson, 2013.
2. Android Programming (Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013

**20A2105901: APTITUDE AND REASONING**

**COURSE DESCRIPTION AND OBJECTIVE:**

1. Students will be introduced to various Arithmetic and Reasoning Problems.
2. The students will have acquaintance with various topics like Time, Speed and Distance, Percentages, Data Interpretation etc...
3. Aptitude is designed to assess the logical thinking and how well they are able to think out of the box. These ability tests (All the companies do prefer this test) are strictly timed to assess the speed and accuracy of the students in solving the problems.

**COURSE OUTCOMES:**

Upon successful completion of this course, students will be able to

1. Solve the Arithmetic and Reasoning Problems as fast as possible and as simple as possible.
2. Exhibits good analytical skills and aptitude skills.
3. Perform well in all competitive exams like RRB, SSC, GROUPS, and BANKING etc...
4. Clear the aptitude section of exams for higher education like CAT, GMAT, and GRE etc...

UNIT – I

1. PERCENTAGES
2. SIMPLE INTEREST & COMPOUND INTEREST

UNIT – II

1. TIME AND WORK
2. PIPES AND CISTERN

UNIT- III

1. DIVISION OF WAGES
2. MAN DAYS & CHAIN RULE

UNIT- IV

1. CODING AND DECODING
2. ALPHABET & NUMBER SERIES

UNIT – V

1. ANALOGY
2. ODD ONE OUT

**TEXT BOOKS:**

- 1) **APTIPEDIA, WILEY**
- 2) **Quantative Aptitude, RS AGARWAL, S.Chand Publishers**

**REFERENCE BOOKS:**

- 1). **HOW TO PREPARE FOR Quantative Aptitude, ARUN SHARMA, Mc GRAW HILL**

## 20A2200201-PROBABILITY AND STATISTICS

<b>Lecture – Tutorial:</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:--- NIL**

**Course Objectives:**

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

**Course Outcomes:**

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

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

**Contribution of Course Outcomes towards achievement of Program**

**Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

**UNIT I**

Descriptive Statistics and Methods for Data Science : Data Science- Introduction to Statistics- Population Vs sample – Collection of Data – Primary and Secondary Data - Types of Variables : Dependent and Independent , Categorical and Continuous Variables – Data Visualization - Measures of Central Tendency - Measures of Variability (spread and variance) – Skewness and Kurtosis

**UNIT II**

Correlation and Curve Fitting : Correlation –Correlation Coefficient – Rank Correlation – Regression Coefficients and properties – Regression lines – Method of Least Squares – Straight line – parabola – Exponential –power curves

### UNIT III

Probability and distributions: Probability and conditional probability-Bayes's theorem-Random variables- Discrete and continuous Random variables –Distribution Function- Mathematical Expectation and Variance – Binomial ,Poisson and Uniform and Normal Distributions

### UNIT IV

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central Limit theorem (without proof) – Representation of the normal theory distributions — Point and Interval estimation – Maximum error of estimate. Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance

### UNIT V

One tail and two-tail tests-Tests Concerning One Mean and Two Means (Large Samples) – Tests on Proportions. Introduction to t,  $\chi^2$  and F – Tests.

#### TEXT BOOKS:

- 1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
- 2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

#### REFERENCE BOOKS:

- 1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8<sup>th</sup> Edition, Pearson 2007.
- 2) Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8<sup>th</sup> Edition, Cengage.
- 3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4<sup>th</sup> Edition, Academic Foundation, 2011.
- 4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3<sup>rd</sup> Edition, Pearson, 2010.

#### E-RESOURCES:

1.nptel

## 20A2205401- Web Technologies

<b>Lecture - Tutorial- Practical::</b>	3-0-0					<b>Internal Marks:</b>	30
<b>Credits:</b>	3					<b>External Marks:</b>	70

**Prerequisites:**1. **Java Programming**2. **DataBase Management Systems****Course Objectives:**

To understand the concepts of Hyper Text Markup Language and Cascading Style Sheets

To learn JavaScript for creating dynamic websites

To learn the operations perform on data among web applications using XML

To learn Server-Side Programming using Servlets and JavaServerPages.

To learn the creation of pure Dynamic Web Application using JDBC

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

CO1	Student able to Implement and design webbased applications using features of HTML
CO2	Implement webbased applications using features of XML
CO3	Student will Apply the concepts of server side technologies for dynamic web applications
CO4	Ability to design the webbased applications using effective database access with rich client interaction
CO5	Ability to Develop reusable component for Graphical User Interface applications

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
<b>CO 1</b>	-	-	3	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO 2</b>	-	-	3	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO 3</b>	3	-	2	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO</b>	-	3	3	2	-	-	-	-	-	-	-	2	3	-	-



4																	
C O S	-	3	-	3	2	-	-	-	-	-	-	-	3	3			-

**UNIT I :**

Introduction to Javascript, objects in JavaScript, Dynamic HTML with JavaScript

**UNIT II:**

Working with XML: Document Type Definition, XMLschemas, Documentobjectmodel, XSLT,DOM and SAX.

**UNIT III:**

Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, and Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

**UNIT IV:**

Database Access: Database Programming using JDBC, studying javax.sql.\*package, accessing a database from a JSP page, Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSPProcessing.JSP application design with MVC.

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing-Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests.

**UNIT V:**

**PHP Programming: Introducing PHP:** Creating PHP script, Running PHP script. **Working with variables and constants:** Using variables, Using constants, Data types,Operators.**Controlling program flow:** Conditional statements,Controlstatements,Arrays,functions.Working with forms and Databases such as MySQL.

**TEXT BOOKS:**

- TheComplete Reference,Java2, 3ed, PatrikNaughton, HerbertSchildt, TMH
- ProgrammingtheWorldWideWeb,RobetWSebesta,7ed,Pearson.
- WebTechnologies,UttamKRoy,OxfordJavaServerPages,HansBergstan,Oreilly

**REFERENCE BOOKS:**

- Web Technologies, HTML<JavaScript,PHP,Java,JSP,XMLandAJAX,Blackbook,DreamTech.
- An Introduction to Web Design, Programming, PaulSWang, SandaSKatila,Cengage
- An introduction toWeb Design and Programming,WangThomson
- Web application technologies concepts,Knuckles,JohnWiley.
- Programming worldwideweb,Sebesta,Pearson
- BeginningWebProgramming,JonDuckett,Wrox,WileyJavaserverpages,Pekowsky,Pearson

**E-RESOURCES:**

1. <https://www.w3schools.com/>
2. <https://www.tutorialspoint.com/perl/>
3. <https://www.railstutorial.org/book>
4. <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

**20A2205402- SOFTWARE ENGINEERING**

<b>Lecture – Tutorial- Practical::</b>	3	0	0	<b>Internal Marks:</b>	3 0
<b>Credits:</b>	3			<b>External Marks:</b>	7 0

**Prerequisites:**

Programming and problem solving, General Aptitude

**Course Objectives:**

1. To study pioneer of Software Development Life Cycle, Development models and Agile Software development.
2. To study the concepts related to analysis, design concepts of software development
3. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
4. To discuss various software testing strategies viz., unit test; integration, regression, and system testing and validation testing
5. To learn the process of improve the quality of software work products.
6. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

**Course Outcomes:**

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

CO1	Understand the basic concepts of Software engineering and applications
CO2	Compare different software engineering process models
CO3	Analyze the principles of requirement Engineering
CO4	Create design models for software Engineering projects
CO5	Apply different testing techniques

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	P S O 3
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--	- -
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3	- -
CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--	- -
CO4	--	2	--	--	--	--	--	--	--	3	--	--	2	--	3
CO5	--	--	2	--	--	--	--	--	--	2	--	--	--	3	- -

**UNIT I :**

**Software and Software Engineering:** The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software

Engineering Practice, The Essence of Practice, General Principles, Software Myths.

**The Software Process:** Software Engineering, Software Process, Generic process model, Prescriptive process model, specialized, unified process, Agile development, Agile Process, Extreme Programming, Other agile Process models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

#### UNIT II:

**Agile Development:** Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.

**Principles that guide practice,** Software Engineering Knowledge, Principles That Guide Process, Principles That Guide Practice, Principles That Guide Each Framework Activity, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles

**Understanding Requirements:** Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

#### UNIT III:

**Requirements Modeling:** Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

**Requirements Modeling:** Flow, Behavior, Patterns, And Web apps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirement modeling for WebApps.

#### UNIT IV:

**Design Concepts:** Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

**Architectural Design:** Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs.

**Modeling Component-Level Design:** What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps.

**Performing User Interface Design:** The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

#### UNIT V:

**Software Testing Strategies:** A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.

**Testing Conventional Applications:** Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.

#### TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Ian Sommerville, "Software Engineering". 9th ed, Pearson Education. 2011.

#### REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering". 2 ed, PHI. 2009
2. Rajib Mall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

#### E-RESOURCES:

1. <http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf>
2. <http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf>
3. <http://sites.computer.org/ccse/SE2004Volume.pdf>
4. <http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF>
5. [http://www.dau.mil/pubs/pdf/SEFGuide\\_01-01.pdf](http://www.dau.mil/pubs/pdf/SEFGuide_01-01.pdf)
6. <https://nptel.ac.in/courses/106101061/2>
7. <https://nptel.ac.in/courses/106101061/5>

## 20A2242401- Introduction to Machine Learning

<b>Lecture - Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	3 0
<b>Credits:</b>	3				<b>External Marks:</b>	7 0

**Prerequisites: Differentiation, Calculus, Descriptive Statistics.**

**Course Objectives: To learn the fundamentals of Machine Learning with R, Basics of Convex and Non-Convex functions and Optimization methods, Understanding the use and evaluation of Machine Learning Models.**

**Course Outcomes:**

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

CO1 Able to learn fundamentals of Machine Learning.

CO2 Understanding R Data Structures and Exploring Data.

CO3 Learn the use of Convex and Non-Convex functions.

CO4 Analyze various Optimization methods.

CO5 Use of Machine Learning Models.

CO6 Evaluation of Machine Learning Models.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	P O 2	P O 3
CO1	3	-	2	2	2	2	-	-	-	-	2	-	2	2	3
CO2	2	2	3	2	2	-	-	-	-	-	2	-	2	2	2
CO3	-	-	3	2	2	-	-	-	-	-	2	-	3	3	2
CO4	3	3	2	3	3	3	-	-	-	-	2	-	2	3	2
CO5	3	3	2	3	3	3	-	-	-	-	2	-	2	3	2
CO6	-	2	2	3	3	3	-	-	-	-	2	-	2	3	3

**UNIT I: Introducing to Machine Learning**

Introduction to Machine Learning- Origins, Uses, and abuses, How do machines learn, Steps to apply machine learning to your data, Choosing a machine learning algorithm, Using R for machine learning.

**UNIT II: Managing and Understanding Data**

R data structures, Vectors, Lists, Dataframes, Matrices and arrays, Managing data with R, Exploring and understanding data- Exploring the structure data, Exploring numeric variables, Exploring Categorical variables, Exploring the relationship between variables, Understanding Imbalanced Data Sets, Outliers, Noisy Data.

**UNIT III:** Convex and Non-Convex functions

Convex functions-Examples, Finding maximum and minimum- Differentiation, Gradient descent

Non-Convex functions-Examples, Difference between the minimum and global minimum

**UNIT IV:** Optimization Methods

Applications of Operations Research,

Linear Programming- Formulation-Graphical Method, Simplex Method, Artificial Technique-Two phase method-Big-M method, Duality principle.

**UNIT V:** MACHINE LEARNING MODELS

Machine Learning Models-Types, Calculating accuracy of Regression and Classification Models, Training Validation and Testing Data, Overfitting and Underfitting, Regularization, Hyperparameter.

Supervised Models: Linear, KNN, Naïve-Bayes.

**TEXTBOOKS:**

1. Machine Learning with R, Learn how to use R to apply powerful machine learning methods and gain an insight into real-world applications, Brett Lantz, PACKET PUBLISHING.
2. Operations Research, S. D. Sharma –Kedarnath Ramnath & Co 2002.

**REFERENCE BOOKS**

1. Introduction to Machine Learning Alex Smola and S.V.N. Vishwanathan, CAMBRIDGE UNIVERSITY PRESS.

**E-RESOURCES:**

1. [https://onlinecourses.swayam2.ac.in/aic20\\_sp35/preview](https://onlinecourses.swayam2.ac.in/aic20_sp35/preview)
2. [https://onlinecourses.nptel.ac.in/noc20\\_cs29/preview](https://onlinecourses.nptel.ac.in/noc20_cs29/preview)
3. <https://www.coursera.org/learn/r-programming>.
4. <https://www.coursera.org/browse/data-science/machine-learning>

**Formal Languages and Automata Theory**

<b>Lecture - Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:****Course Objectives:-**

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing

3. To explain the hierarchy of problems arising in the computer sciences.

4. To familiarize Regular grammars, context free grammar.

**Course Outcomes:**

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

CO1	Able to use basic concepts of formal languages of finite automata techniques
CO2	Student able to design Finite Automata's for different Regular Expressions and Languages
CO3	Construct context free grammar for various languages
CO4	Solve various problems of applying normal form techniques, push down automata and Turing Machines
CO5	Participate in GATE, PGECET and other competitive examinations

**Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-

**UNIT I : FINITE AUTOMATA (FA)**

Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Equivalence of NFA and DFA. Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion. Text search using automata.

**UNIT II: REGULAR EXPRESSIONS (RE) & REGULAR GRAMMARS**

Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions. Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular -Pumping lemma, Closure properties of regular languages. Applications of RE – RE in Unix

**UNIT III: CONTEXTS FREE GRAMMER (CFG) & Push Down Automata(PDA)**

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL. Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

**UNIT IV: Turing Machines(TM)**

Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required). , linear bounded automata and context sensitive language.

**UNIT V: Computability Theory:**

Chomsky hierarchy of languages, decidability of, problems, Universal Turing Machine, undecidability of posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

**TEXTBOOKS:**



1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson

Education.

2. Introduction to Theory of Computation – Sipser 2nd edition Thomson.

REFERENCEBOOKS:

- Introduction to Formal Languages , Automata Theory and Computation – Kamala Krithivasan, Rama R
- Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
- Theory of Computation : A Problem – Solving Approach- Kavi Mahesh, Wiley India Pvt. Ltd.
- "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
- Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekar, 2nd edition, PHI.
- Introduction to languages and the Theory of Computation, John C Martin, TMH..

E-RESOURCES:

1. Foundations of Computation-CAROL CRITCHLOW, DAVID ECK
2. Introduction to Theory of Computation- Anil Maheshwari, Michielsmid-carleton University-2012

## 20A2205491- WEB TECHNOLOGIES LAB

<b>Lecture - Tutorial- Practical::</b>	0-0-3					<b>Internal Marks:</b>
<b>Credits:</b>	1.5					<b>External Marks</b>

**Prerequisites:**

1. **Java Programming**
2. **Data Base Management Systems**

**Course Objectives:**

1	HyperText Markup Language (HTML) and Cascading Style Sheets (CSS) for laying out (formatting) pages that contain text, images and graphics
2	Extensible Markup Languages (XML) used to store and transport data among web pages, a mechanism for defining new tag sets and interchanging data among web applications
3	Client-side Programming using JavaScript for validating the data
4	Server-Side Programming using servlets to generate static content and Java Server Pages are used to generate dynamic content
5	Creating a pure Dynamic Web Application which retrieves the data from Database according to the client request using JDBC
6	Creating a pure Dynamic Web Application which retrieves the data from Database according to the client request using PHP

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

CO1	Create a website statically or dynamically
CO2	Get knowledge on displaying and decorating the contents in a webpage.
CO3	Learn the concepts of store and transport the data among web pages
CO4	Create objects with which the client can communicate with server.
CO5	Generate static or dynamic content according to the client's request
CO6	Provide User Authentication by using cookies and back end operations using JDBC and PHP

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
<b>CO1</b>	-	-	3	-	-	-	-	-	-	-	-	2	3	3

<b>CO2</b>	-	-	3	-	-	-	-	-	-	-	-	2	3	3
<b>CO3</b>	3	-	2	-	-	-	-	-	-	-	-	2	3	3
<b>CO4</b>	-	3	3	2	-	-	-	-	-	-	-	2	3	3
<b>CO5</b>	-	3	-	3	2	-	-	-	-	-	-	3	3	3
<b>Total</b>	3	6	11	5	2	-	-	-	-	-	-	11	3	3

**Week-1:**

Design the following static web pages required for an online book store web site.

**Week-1:**

Design the following static web pages required for an online book store web site.

**1) HOMEPAGE:**

The static home page must contain three frames.

- Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
- Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.
- Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the website.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

**2) LOGINPAGE:**


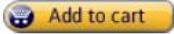

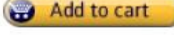

This page looks like below:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	<p style="text-align: center;">Login : <input type="text"/></p> <p style="text-align: center;">Password: <input type="password"/></p> <p style="text-align: center;"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p>			

**3) CATALOGUEPAGE:**

The catalogue pages should contain the details of all the books available in the website in a table. The details should contain the following:

1. Snapshot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book : XML Bible Author : Winston Publication : Wiely	\$ 40.5	
ECE		Book : AI Author : S.Russel Publication : Princeton hall	\$ 63	
EEE		Book : Java 2 Author : Watson Publication : BPB publications	\$ 35.5	
CIVIL		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	\$ 50	

Note:Week2 containstheremainingpages andtheir description.

**Week-2:**

4) **CARTPAGE:**Thecart pagecontainsthedetailsabout thebookswich areaddedto thecart.Thecartpageshould look likethis:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE	<b>Book name</b>	<b>Price</b>	<b>Quantity</b>	<b>Amount</b>
ECE	Java 2	\$35.5	2	\$70
EEE	XML bible	\$40.5	1	\$40.5
CIVIL	<b>Total amount -</b>			<b>\$130.5</b>

**5) REGISTRATIONPAGE:**

Createa“registrationform “withthefollowingfields

- 1) Name(Textfield)
- 2) Password(passwordfield)
- 3) E-mailid (textfield)
- 4) Phonenumber(text field)
- 5) Sex (radiobutton)
- 6) Dateofbirth(3selectboxes)
- 7) Languagesknown(checkboxes –English,Telugu,Hindi,Tamil)
- 8) Address(textarea)

**WEEK3:**

**VALIDATION:**

WriteJavaScript to validate the followingfields oftheaboveregistrationpage.

1. Name(Name shouldcontains alphabetsand thelength shouldnot belessthan 6characters).
2. Password(Passwordshouldnot belessthan6 characterslength).
3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
4. Phone number (Phone number should contain 10 digits only).Note:Youcan alsovalidatetheloginpagewiththeseparameters.UsePHPto connectwiththedatabaseto storetheabovedetails.

**Week-4:**

Designawebpageusing **CSS (CascadingStyleSheets)**whichincludesthe following:

- 1) Usedifferent font, styles:  
Inthestyledefinitionyoudefinehow eachselectorshouldwork(font,coloretc.).Then,inthebodyofyour

pages, you refer to these selectors to activate the styles.

For example:

```
<HTML>
<HEAD>
<style type="text/css">
B.headline {color:red; font-size:22px; font-family:arial; text-decoration:underline}
</style>
</HEAD>
```

```
<BODY>
<b>This is normal bold</b><br>
Selector {cursor:value}

For example:

<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>

<b class="headline">This is headline style bold</b>
</BODY>

</HTML>
```

- 2) Set a background image for both the page and single elements on the page. You can define the background image for the page like this:

```
BODY {background-image:url(myimage.gif);}
```

- 3) Control the repetition of the image with the background-repeat property. As background-repeat: repeat  
Tile the image until the entire page is filled, just like an ordinary background image in plain HTML.

- 4) Define styles for links

```
asA:link
A:visitedA
:activeA:h
over
```

Example:

```
<style type="text/css">
A:link {text-decoration:
none}A:visited {text-decoration:
none}A:active{text-decoration:none}
A:hover{text-decoration:underline;color:red;}
</style>
```

- 5) Work with layers:

For example:

LAYER1 ON TOP:

```
<div style="position:relative;font-size:50px;z-index:2;">LAYER1</div>
```

```
<div style="position:relative; top:-50; left:5; color:red; font-size:80px;
zindex:1">LAYER2</div>
LAYER2ONTOP:
<divstyle="position:relative;font-size:50px;z-index:3;">LAYER1</div>
<div style="position:relative; top:-50; left:5; color:red; font-size:80px;
zindex:4">LAYER2</div>
```

6) Add a customized cursor:Selector{cursor:va  
lue}

Forexample:

```
<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>
```

#### Week-5:

WriteanXMLfile which willdisplaytheBookinformation whichincludesthefollowing:

- 1) Title ofthebook
- 2) AuthorName
- 3) ISBNnumber
- 4) Publishername
- 5) Edition
- 6) Price

WriteaDocumentTypeDefinition(DTD)tovalidate theaboveXMLfile.DisplaytheXMLfileasfollows.

Thecontentsshouldbedisplayedinatable.TheheaderofthetableshouldbeincolorGREY.And the Authornamescolumnshouldbedisplayedinonecolorandshouldbecapitalizedandinbold.Useyour own colors forremaining columns.

UseXMLschemas XSLand CSS forthe abovepurpose.

Note:Giveatleastfor4 books. Itshouldbevalidsyntactically.Hint:You can usesome xml editors like XML-spy

#### Week-6:

1) InstallTOMCATwebserverandAPACHE.

Whileinstallationassignportnumber4040toTOMCATand8080toAPACHE.Makesurethattheseports areavailablei.e., no other process is usingthis port.

2) Accesstheabovedevelopedstaticwebpagesforbookswebsite,usingtheseserversbyputtingthe web pages developed in week-1 andweek-2 in thedocument root.

Access the pages by using the urls :<http://localhost:4040/rama/books.html> (for tomcat)<http://localhost:8080/books.html> (forApache)

#### Week-7:

##### UserAuthentication:

Assumefourusersuser1,user2,user3anduser4havingthepasswordspwd1,pwd2,pwd3andpwd4respectively. Writeaservelet fordoingthefollowing.

1. CreateaCookieandadd thesefouruser id'sand passwordsto this Cookie.
2. ReadtheuseridandpasswordsenteredintheLoginform(week1)andauthenticatewiththevalues(useridand passwords ) available in thecookies.

If heisavaliduser(i.e.,user-name andpassword match)youshould welcomehimbyname(user-name)elseyou

should display "You are not an authenticated user".  
Use init-parametersto do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

**Week-8:**

Install a database (Mysql or Oracle).

Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).

Practice 'JDBC' connectivity.

Write a java program / servlet / JSP / PHP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the website, whenever a new user clicks the submit button in the registration page (week 2).

**Week-9:**

Write a JSP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week 9) by using registration form.

Authenticate the user when he submits the login form using the user name and password from the database (similar to week 8 instead of cookies).

**Week-10:**

Create tables in the database which contain the details of items (books in our case like Bookname, Price, Quantity, Amount) of each category. Modify your catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

**TEXT BOOKS:**

- The Complete Reference, Java 2, 3ed, Patrik Naughton, Herbert Schildt, TMH
- Programming the World Wide Web, Robert W. Sebesta, 7ed, Pearson.
- Web Technologies, Uttam K Roy, Oxford Java Server Pages, Hans Bergstan, Oreilly

**REFERENCE BOOKS:**

- Web Technologies, HTML < JavaScript, PHP, Java, JSP, XML and AJAX, Blackbook, DreamTech.
- An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
- An Introduction to Web Design and Programming, Wang Thomson
- Web application technologies concepts, Knuckles, John Wiley.
- Programming world wide web, Sebesta, Pearson
- Beginning Web Programming, Jon Duckett, Wrox, Wiley Java server pages, Pekowsky, Pearson

**E-RESOURCES:**

1. <https://www.w3schools.com/>
2. <https://www.tutorialspoint.com/perl/>
3. <https://www.railstutorial.org/book>
4. <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

**20A2205492- SOFTWARE ENGINEERING LAB**

<b>Lecture – Tutorial- Practical::</b>	0-0-3		<b>Internal Marks:</b>	1 5
<b>Credits:</b>	1.5		<b>External Marks:</b>	3 5

**Prerequisites:**

Programming and problem solving, General Aptitude

**Course Objectives:**

- To understand the software engineering methodologies involved in the phases for project development.
- To gain knowledge about open source tools used for implementing software engineering methods.
- To exercise developing product-startups implementing software engineering methods.
- To use Open source Tools, viz., StarUML / UMLGraph / Topcased

**Course Outcomes:**

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

CO1	Ability to translate end-user requirements into system and software requirements
CO2	Analyze the principles of requirement Engineering
CO3	Ability to generate a high-level design of the system from the software requirements
CO4	Create design models for software Engineering projects
CO5	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--	-



CSE B.TECH. II YEAR CSE(AI&ML) NRA20 REGULATIONS SYLLABUS

																-
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3		-
CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--		-
CO4	--	2	--	--	--	--	--	--	--	3	--	--	3	--	3	-
CO5	--	--	3	--	--	--	--	--	--	2	--	--	--	3		-

### List of Experiments

#### (For at least 4 problems)

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

1. Problem Analysis and Project Planning -Thorough study of the problem – IdentifyProject scope, Objectives and Infrastructure.
2. Software Requirement Analysis – Describe the individual Phases/modules of theproject and Identify deliverables. Identify functional and non-functional requirements.
3. Data Modeling – Use work products – data dictionary.
4. Software Designing - Develop use case diagrams and activity diagrams, build and testclass diagrams, sequence diagrams and add interface to class diagrams.
5. Prototype model – Develop the prototype of the product.

### Sample Projects:

#### 1. Course management system (CMS)

A course management system (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:

- An area for faculty posting of class materials such as course syllabus and handouts
- An area for student posting of papers and other assignments
- A grade book where faculty can record grades and each student can view his or hergrades
- An integrated email tool allowing participants to send announcement email messages to the entire class or to a subset of the entire class
- A chat tool allowing synchronous communication among class participants
- A threaded discussion board allowing asynchronous communication among participants

In addition, a CMS is typically integrated with other databases in the university so that students enrolled in a particular course are automatically registered in the CMS as participants in that course.

The Course Management System (CMS) is a web application for department personnel, Academic Senate, and Registrar staff to view, enter, and manage course information formerly submitted via paper.

Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

#### 2. Easy Leave

This project is aimed at developing a web based Leave Management Tool, which is of importance to either an organization or a college.

The **Easy Leave** is an Intranet based application that can be accessed throughout the organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications, cancellation of leave, automatic approval of leave, report generators etc in this Tool.

### Functional components of the project:

There are registered people in the system. Some are approvers. An approver can also be a requestor. In an organization, the hierarchy could be Engineers/Managers/Business Managers/Managing Director etc. In a college, it could be Lecturer/Professor/Head of the Department/Dean/Principal etc.

Following is a list of functionalities of the system: A person should be able to

- login to the system through the first page of the application
- change the password after logging into the system
- see his/her eligibility details (like how many days of leave he/she is eligible for etc)
- query the leave balance

- see his/her leave history since the time he/she joined the company/college
- apply for leave, specifying the from and to dates, reason for taking leave, address for communication while on leave and his/her superior's email id
- see his/her current leave applications and the leave applications that are submitted to him/her for approval or cancellation
- approve/reject the leave applications that are submitted to him/her
- withdraw his/her leave application (which has not been approved yet)
- Cancel his/her leave (which has been already approved). This will need to be approved by his/her Superior
- get help about the leave system on how to use the different features of the system
- As soon as a leave application /cancellation request /withdrawal /approval /rejection /password-change is made by the person, an automatic email should be sent to the person and his superior giving details about the action
  - The number of days of leave (as per the assumed leave policy) should be automatically credited to everybody and a notification regarding the same be sent to them automatically
  - An automatic leave-approval facility for leave applications which are older than 2 weeks should be there. Notification about the automatic leave approval should be sent to the person as well as his superior

### 3. E-Bidding

Auctions are among the latest economic institutions in place. They have been used since antiquity to sell a wide variety of goods, and their basic form has remained unchanged. In this dissertation, we explore the efficiency of common auctions when values are interdependent- the value to a particular bidder may depend on information available only to others-and asymmetric. In this setting, it is well known that sealed-bid auctions do not achieve efficient allocations in general since they do not allow the information held by different bidders to be shared.

Typically, in an auction, say of the kind used to sell art, the auctioneer sets a relatively low initial price. This price is then increased until only one bidder is willing to buy the object, and the exact manner in which this is done varies. In my model a bidder who drops out at some price can "reenter" at a higher price.

With the invention of E-commerce technologies over the Internet the opportunity to bid from the comfort of one's own home has seen a change like never seen before. Within the span of a few short years, what may have began as an experimental idea has grown to an immensely popular hobby, and in some cases, a means of livelihood, the Auction Patrol gathers tremendous response every day, all day. With the point and click of the mouse, one may bid on an item they may need or just want, and in moments they find that either they are the top bidder or someone else wants it more, and you're outbid! The excitement of an auction all from the comfort of home is a completely different experience.

Society cannot seem to escape the criminal element in the physical world, and so it is the same with Auction Patrols. This is one area where in a question can be raised as to how safe Auction Patrols.

Proposed system

To generate the quick reports

To make accuracy and efficient calculations

To provide proper information briefly

To provide data security

To provide huge maintenance of records Flexibility of transactions can be completed in time

### 4. Electronic Cash counter

This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better outlook to the user interfaces and to implement all the banking transactions like:

- Supply of Account Information

- New Account Creations
- Deposits
- Withdraws
- Cheque book issues
- Stop payments
- Transfer of accounts
- Report Generations.

#### Proposed System:

The development of the new system contains the following activities, which try to automatethe entire process keeping in view of the database integration approach.

- User friendliness is provided in the application with various controls.
- The system makes the overall project management much easier and flexible.
- Readily upload the latest updates, allows user to download the alerts by clicking theURL.
- There is no risk of data mismanagement at any level while the project development isunder process.
- It provides high level of security with different level of authentication

#### Other Sample Projects :

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

#### TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education

#### REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009
2. RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

#### E-RESOURCES:

1. <http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf>
2. <http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf>
3. <http://sites.computer.org/ccse/SE2004Volume.pdf>
4. <http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF>
5. <http://www.dau.mil/pubs/pdf/SEFGuide 01-01.pdf>
6. <https://nptel.ac.in/courses/106101061/2>
7. <https://nptel.ac.in/courses/106101061/5>

## 20A2242491- Machine Learning Lab

<b>Lecture - Tutorial- Practical::</b>	0-0-3				<b>Internal Marks:</b>
<b>Credits:</b>	1.5				<b>External Marks:</b>

**Prerequisites: Differentiation, Calculus, 'R'**

**Course Objectives: Understanding the implementation of various 'R' Data Structures, Graphs, and Machine Learning Models of Classification and Regression.**

**Course Outcomes:**

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

CO1	Able to Implement Lists and Data Frames and Matrices.
CO2	Able to Know the Data Cleaning and Pre-Processing Methods.
CO3	Able to build Various Graphics Applications.
CO4	Able to categorize the predictions against the actual values.
CO5	Able to build multiple Linear regression models across the range of predictor values.
CO6	Able to use K.N.N., Naive Bayes in Machine Learning Models.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	-	2	2	2	2	-	-	-	-	2	-	2	2
CO2	2	2	3	2	2	-	-	-	-	-	2	-	2	2
CO3	-	-	3	2	2	-	-	-	-	-	2	-	3	3
CO4	3	3	2	3	3	3	-	-	-	-	2	-	2	3
CO5	3	3	2	3	3	3	-	-	-	-	2	-	2	3
CO6	-	2	2	3	3	3	-	-	-	-	2	-	2	3

**List of Experiments**

- Implement List
- Implement DataFrames.
- Implement Matrices.
- Implement Data Cleaning Techniques.
- Implement Data Pre-Processing Techniques.

- Implement Bar Charts(Side by Side, Stacked).
- Implement Line Charts.
- Implement ScatterPlot, Histogram.
- Implement Confusion Matrix.
- Implement Linear Regression Model.
- Implement K.N.N. Regression and Classification Model.
- Implement Naïve Bayes Classification Model.

**TEXTBOOKS:**

Machine Learning with R, Learn how to use R to apply powerful machine learning methods and gain an insight into real-world applications, Brett Lantz, PACKET PUBLISHING.

**REFERENCE BOOKS**

1. Introduction to Machine Learning Alex Smola and S.V.N. Vishwanathan, CAMBRIDGE UNIVERSITY PRESS.

**E-RESOURCES**

1. [www.onlinecourses.nptel.ac.in/noc20\\_mg24/preview](http://www.onlinecourses.nptel.ac.in/noc20_mg24/preview).
2. [www.coursera.org/learn/predictive-modeling-analytics](http://www.coursera.org/learn/predictive-modeling-analytics).
3. [https://onlinecourses.swayam2.ac.in/imb21\\_mg20/preview](https://onlinecourses.swayam2.ac.in/imb21_mg20/preview).

**Course Code- NATURAL LANGUAGE PROCESSING WITH PYTHON**

<b>Lecture - Tutorial- Practical::</b>	0-0-4				<b>Internal Marks:</b>	1 5
<b>Credits:</b>	2				<b>External Marks:</b>	3 5
<b>Prerequisites:</b>						
<b>Course Objectives:</b>						
The main objective of the course is Understand the various concepts of natural language processing along with their implementation using Python						
<b>Course Outcomes:</b>						
<b>Upon successful completion of the course, the student will be able to:</b>						
CO1	Explore natural language processing (NLP) libraries in Python					
CO2	Learn various techniques for implementing NLP including parsing & text processing					

CO3 Understand how to use NLP for text feature engineering

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--

**List of Experiments :**

1. Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hash tag from textual data.
2. Perform lemmatization and stemming using python library nltk.
3. Demonstrate object standardization such as replace social media slangs from a text.
4. Perform part of speech tagging on any textual data.
5. Implement topic modeling using Latent Dirichlet Allocation (LDA ) in python.
6. Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python
7. Demonstrate word embeddings using word2vec.
8. Implement Text classification using naïve bayes classifier and text blob library.
9. Apply support vector machine for text classification.
10. Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
11. Case study 1: Identify the sentiment of tweets In this problem, you are provided with tweet data to predict sentiment on electronic products of netizens.
12. Case study 2: Detect hate speech in tweets. The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it. So, the task is to classify racist or sexist tweets from other tweets

**WEB REFERENCES**

1. <https://www.analyticsvidhya.com/blog/2017/01/ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python/>
2. [https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm\\_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm\\_medium=blog](https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm_medium=blog)
3. <https://www.analyticsvidhya.com/blog/2018/07/hands-on-sentiment-analysis-dataset-python/>

**20A2200802: Professional Ethics & Human Values**

<b>Lecture – Tutorial- Practical:</b>	0-2-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	0	<b>External Marks:</b>	70*

**Prerequisites:****Course Objectives:**

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

**Course Outcomes**

Students will be able to:

Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field  
 Identify the multiple ethical interests at stake in a real-world situation or practice  
 Articulate what makes a particular course of action ethically defensible  
 Assess their own ethical values and the social context of problems  
 Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects  
 Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work  
 Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

**Unit I- Human Values:**

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

**Unit II – Engineering Ethics:**

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

**Unit III Engineering as Social Experimentation:**



Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons. Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

#### **Unit IV**

Engineers Responsibility for Safety and Risk: Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing riskSafety and the Engineer-Designing for the safety-Intellectual Property rights (IPR). Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer’s design practices for providing safety.
3. Provide knowledge on intellectual property rights.

#### **Unit IV**

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research. Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

#### **TEXT BOOKS:**

1. “Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
- 2) “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
- 3) “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger –Tata McGrawHill–2003.
- 4) “Professional Ethics and Morals” by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
- 5) “Professional Ethics and Human Values” by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publication.
- 6) “Professional Ethics and Human Values” by Prof.D.R.Kiran-“Indian Culture, Values and Professional Ethics” by P.S.R Murthy-BS Publication



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URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nriit.edu.in



## PROPOSED STRUCTURE FOR THIRD YEAR B.TECH (AI&ML) PROGRAMME

### III YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	Professional Core courses	Big-data Analytics	3	0	0	3	30	70	100	3
2	Professional Core courses	Computer Networks	3	0	0	3	30	70	100	3
3	Professional Core courses	Operating Systems	3	0	0	3	30	70	100	3
4	Open Elective Course/Job oriented elective	OE-1	3	0	0	3	30	70	100	3
5	Professional Elective courses	PE-1	3	0	0	3	30	70	100	3
6	Professional Core courses Lab	Operating System & Computer Networks lab	0	0	3	3	15	35	50	1.5
7	Professional Core courses Lab	Big-data Analytics Lab	0	0	3	3	15	35	50	1.5
8	Skill advanced course*	DEVOPS	0	0	4	4	15	35	50	2
10	Mandatory course (AICTE suggested)	Employability Skills	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
<b>Total</b>			17	0	13	30	255	595	850	21.5
<b>Honors/Minor courses - 2</b>			<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>	30	70	100	<b>4</b>

Code	Professional Elective - 1
	1.1 Compiler Design
	1.2 Internet of Things
	1.3 Data visualization techniques
	1.4 Advanced Data Structures



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## VI SEMESTER – B.Tech – (AI & ML)

### III YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks )			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	Professional Core courses	Deep Learning and its Applications	3	0	0	3	30	70	100	3
2	Professional Core courses	Cryptography and Network Security	3	0	0	3	30	70	100	3
3	Professional Core courses	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	Open Elective Course/Job oriented elective	OE-2	3	0	0	3	30	70	100	3
5	Professional Elective courses	PE-2	3	0	0	3	30	70	100	3
6	Professional Core courses Lab	Deep Learning Lab	0	0	3	3	15	35	50	1.5
7	Professional Core courses Lab	Cryptography and Network Security lab	0	0	3	3	15	35	50	1.5
8	Professional Core courses Lab	Algorithms Lab	0	0	3	3	15	35	50	1.5
9	Skill advanced course/ soft skill course*	MEAN stack Technologies	0	0	4	4	15	35	50	2
10	Mandatory course (AICTE suggested)	Employability Skills - 2	2	0	0	2	30	70*	100	0
<b>Total</b>			17	0	13	30	240	560	800	21.5
<b>Honors/Minor courses - 3</b>			<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>	30	70	100	<b>4</b>
<b>Industrial/Research Internship (Mandatory) 2 Months during summer vacation</b>										

Code	Professional Elective -2
	2.1 Natural Language Processing
	2.2 Intelligent Information Retrieval
	2.3 Reinforcement Learning
	2.4 Object Oriented Analysis and Design



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## Course Title: Big Data Analytics

<b>Lecture – Practical:</b>	<b>3-0-0</b>	<b>Internal Marks:</b>	30
<b>Credits</b>	3	<b>External Marks:</b>	70

**Prerequisites: None**

### Course Objectives

- To understand the need and application of Map Reduce.
- To understand the various search algorithms applicable to Big Data.
- To analyze and interpret streaming data.
- To learn how to handle large data sets in main memory.
- To learn the various clustering techniques applicable to Big Data.

### Course Outcomes

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

CO1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing
CO2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO3	Students Interpret business models and scientific computing paradigms, and apply software tools for big data analytics
CO4	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2			3			2					2	2		
CO2				3					3						2
CO3		3				3				2				3	
CO4				3					2			2	2		

### UNIT I:

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Mode

### UNIT II:

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.

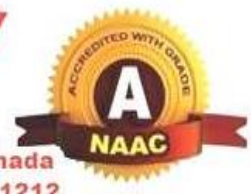


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## UNIT III:

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

## UNIT IV:

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

## UNIT V:

NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding — Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R

## Text Book:

1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.

## REFERENCE BOOKS:

1. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
2. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
3. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT Press,2001

## E-RESOURCES

[Big Data Analytics Tutorial \(tutorialspoint.com\)](http://tutorialspoint.com)

[Big Data Analytics Notes Pdf Download & List of Reference Books for BDA \(ncertbooks.guru\)](http://ncertbooks.guru)



### Course Title: Computer Networks

<b>Lecture – Tutorial:</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70
<b>Prerequisites: Computer Networks</b>			
<b>Course Objectives:</b>			
<ul style="list-style-type: none"> <li>• Understand state-of-the-art in network protocols, architectures, and applications.</li> <li>• Process of networking research</li> <li>• Constraints and thought processes for networking research</li> <li>• Problem Formulation—Approach---Analysis</li> </ul>			
<b>Course Outcomes:</b>			
CO1	Able to understand OSI and TCP/IP models.		
CO2	Understand data link layer protocols and flow control		
CO3	Understand routing and network layer protocols and IPV4		
CO4	Understand transport layer congestion, flow control and protocols		
CO5	Understand application layer protocols		

#### UNIT I : INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

PHYSICAL LAYER Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications

#### UNIT II: DATA LINK LAYER:

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, Bridges.

#### UNIT III:NETWORK LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. OSPF. IPV4

#### UNIT IV TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols congestion control.



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## UNIT V APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

### Text Book:

1. Tanenbaum and David J Wetherall, Computer Networks, 5<sup>th</sup> Edition, Pearson Edu, 2010.

### REFERENCE BOOKS:

1. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education.
2. Computer Networks, 5ed, David Patterson, Elsevier.
3. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A Systems Approach" 5<sup>th</sup> Edition, Morgan Kaufmann/Elsevier, 2011.
4. Computer Networks, Mayank Dave, CENGAGE.
5. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
6. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

### E-RESOURCES

1. [www.tutorialspoint.com](http://www.tutorialspoint.com)
2. [nptl.ac.in/courses/](http://nptl.ac.in/courses/)



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## OPERATING SYSTEMS

<b>Lecture - Tutorial-</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Practical::</b>			
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Basics of Computer Organization.**

**Course Objectives:-**Upon completion of this course, the student will be able to acquire the basic operating system concepts such as processes & threads.Explain the Details of some units such as memory management, I/O, and File systems.

**CourseOutcomes:**

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

CO1	Understand the important computer system resources and the structure and functioning of operating system.
CO2	Understand process management policies and scheduling of processes by CPU.
CO3	Evaluate the requirement for process synchronization and coordination handled by operating system. Describe and analyze the memory management and its allocation policies.
CO4	Understand demand paging, thrashing and principles of deadlocks.
CO5	Understand File system Interface, File System implementation, Mass-storage structure and Disk scheduling algorithms.

**ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1-Low,2-Medium,3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-

**UNITI :**

**Computer System and Operating System Overview:** Overview of computer operating systems ,operating systems functions, operating systems structures and systems calls, operating systems generation.

**UNITII:**

**Process Management** – Process concept- process scheduling, operations, Inter process communication. MultiThread programming models. Process scheduling criteria and algorithms and their evaluation.

**UNITIII:**





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**Concurrency:** Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples.

**Memory Management:** Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

#### UNIT IV:

**Virtual Memory Management:** virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing. **Principles of deadlock** – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

#### UNIT V:

**File System Interface**-The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

**File System implementation**-File system structure, file system implementation, directory implementation, allocation methods, free-space management

**Mass-storage structure:** overview of Mass storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

#### TEXTBOOKS:

1. Operating System Concepts - Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems - Internal and Design Principles, William Stallings, Sixth Edition - 2005, Pearson Education.

#### REFERENCEBOOKS:

1. Operating systems - A Concept based Approach - D.M. Dhamdhere, 2nd Edition, TMH.
2. Operating System A Design Approach - Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

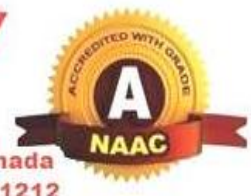
#### E-RESOURCES:

<https://nptel.ac.in/courses/106105214/>

<https://www.udacity.com/course/introduction-to-operating-system-ud923>

<https://www.youtube.com/watch?v=qf668RboXLs>

<https://www.youtube.com/watch?v=VoaNvf9iO4Q&list=PLV8vIYTIIdSnaHTjrBXjSyNTOWEtA33hvn>



### Title of the Course: Compiler Design

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites:** Formal Language and Automata Theory

**Course Objectives:**

1. To describe the design of a compiler including its phases and components and basic understanding of Grammars and language definition.
2. To Identify the similarities and differences among various parsing techniques and grammar transformation Techniques.
3. To Understand the syntax analysis, intermediate code generation, type checking, the role of symbol table and its organization.
4. To Understand, design code generation and optimization schemes.

**Course Outcomes:**

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

CO1	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
CO2	To apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
CO3	To write the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO4	To employ the knowledge of modern compiler & its features.
CO5	To participate in GATE, PGECET and other competitive examinations

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3						-	2
CO2	2	3	3	2	2	2				2	2	3
CO3	3	3	3	3	3	2						2
CO4	3	2	3	2	3					2	2	2



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CO5	3	3	3	1	-	2	1	1	-	2	-	2
<b>UNIT I :</b>												
<b>Overview of Compilation:</b> Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA. Interpretation, bootstrapping, LEX - lexical analyzer generator and Boot Strapping.												
<b>UNIT II:</b>												
<b>SYNTAX ANALYSIS:</b> Context free grammars, Top down parsing – Backtracking, LL (1), Recursive Descent Parsing, Predictive Parsing. Bottom up Parsing: Shift Reduce parsing, LR and LALR parsing, Operator Precedence parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator.												
<b>UNIT III:</b>												
<b>Semantic analysis:</b> Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Type checker.												
<b>Symbol Tables:</b> Symbol table format, organization for block structures languages. Block structures and non block structure storage allocation: static, runtime stack and heap storage allocation.												
<b>UNIT IV:</b>												
<b>RUN-TIME ENVIRONMENT AND CODE GENERATION :</b>												
Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of a simple Code Generator.												
<b>UNIT V:</b>												
<b>CODE OPTIMIZATION:</b>												
Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization. Instruction scheduling, inter procedural optimization.												
Principal Sources of Optimization – Peep-hole optimization – DAG- Optimization of Basic Blocks-Global Data Flow Analysis – Efficient Data Flow Algorithm.												
<b>TEXT BOOKS:</b>												
1. Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, “Compilers Principles, Techniques & Tools”, Pearson Education, third edition, 2007.												
2. Andrew N. Appel, “Modern Compiler Implementation in C”, Cambridge University Press, 2004.												
<b>REFERENCE BOOKS:</b>												
1. John R. Levine, Tony Mason, Doug Brown, “lex & yacc”, O'Reilly Media, Inc., 1992.												
2. Kenneth C. Loudon, Compiler Construction: Principles and Practice, Course Technology Inc; International edition, 1997												
<b>E-RESOURCES:</b>												



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1. <https://www.holub.com/software/compiler.design.in.c.html>

### Course Code-INTERNET OF THINGS

<b>Lecture - Tutorial- Practical::</b>	3-0-0					<b>Internal Marks:</b>
<b>Credits:</b>	3					<b>External Marks:</b>

**Prerequisites:** Python programming

**Course Objectives:**

The objective of this course is to explore the interconnection and integration of the physical world and the cyber space. Understand the design concepts in setting up IOT Devices. Study about the setup, configuration and installation of equipment for IOT.

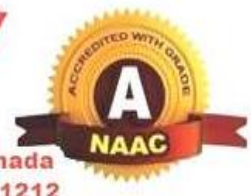
**Course Outcomes:**

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

CO1	Understand Device-processor communication models & protocols.
CO2	Understand the application areas of IOT.
CO3	Visualize the effect of internet on Mobile Devices, Cloud & Sensor Networks.
CO4	Acquire programming experience with Raspberry Pi kit to interface various devices.
CO5	Implement Programming models for IoT Cloud Environment.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	2	--	--	2	--	--	--	2	--	--	--	2	--
CO2	--	--	--	2	--	--	2	--	--	--	--	--	2	--
CO3	--	--	2	--	--	3	--	--	--	3	2	3	--	3
CO4	--	--	--	3	--	--	--	3	--	--	--	--	2	--
CO5	2	--	--	--	--	--	--	--	--	2	--	2	--	3



### UNIT I :Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabled Technologies, IoT Levels and Deployment Templates

### UNIT II: Domain Specific IoTs

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

### UNIT III: IoT AND M2M

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT IoT System Management: Need for IoT Systems Management, SNMP, NETCONF, YANG, YANG-NETCONF, NETOPEER.

### UNIT IV: IoT Physical Devices & Endpoints

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces (Serial, SPI, and I2C), Programming Raspberry Pi with Python, Other IoT Devices

### UNIT V: IoT Physical Servers and Cloud Offerings

Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework – Django, Designing a RESTful Web API.

### TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madiseti, –Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.

2. Matt Richardson & Shawn Wallace, O'Reilly (SPD),|Getting Started with Raspberry Pi, 2014, ISBN: 978935023975.

### REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press).

2. Adrian McEwen, –Designing the Internet of Things, Wiley Publishers, 2013, ISBN: 978-1- 118-43062-0.

3. Daniel Kellmerit, –The Silent Intelligence: The Internet of Things, 2013, ISBN: 0989973700.

4. Ovidiu Vermesan, Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment", River Publishers Series in Communication, June 2014.

### E-RESOURCES:

[https://www.tutorialspoint.com/internet\\_of\\_things/internet\\_of\\_things\\_tutorial.pdf](https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf).



<http://nptel.ac.in/courses/106105166>

### Course Code-Data Visualization Techniques

<b>Lecture – Tutorial- Practical::</b>	3-0-0		<b>Internal Marks:</b>	30								
<b>Credits:</b>	3		<b>External Marks:</b>	70								
<b>Prerequisites:</b> Computer Graphics, and Image Processing												
<b>Course Objectives:</b>												
<ul style="list-style-type: none"> <li>• To develop skills to both design and critique visualizations.</li> <li>• To introduce visual perception and core skills for visual analysis.</li> <li>• To understand visualization for time-series analysis.</li> <li>• To understand visualization for ranking analysis.</li> <li>• To understand visualization for deviation analysis.</li> <li>• To understand visualization for distribution analysis.</li> <li>• To understand visualization for correlation analysis.</li> <li>• To understand visualization for multivariate analysis.</li> </ul>												
<b>Course Outcomes:</b>												
<b>Upon successful completion of the course, the student will be able to:</b>												
CO1	Able to Identify and recognize visual perception and representation of data											
CO2	Able to Illustrate about projections of different views of objects.											
CO3	Apply various Interaction and visualization techniques											
CO4	Analyze various groups for visualization.											
CO5	Able to visualizations											
CO6	Able to understand the importance and applications of data visualization											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	-	2	2	-	2	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-
CO3	-	2	3	2	2	-	-	-	-	-	-	-
CO4	2	3	2	2	2	-	-	-	-	-	-	2
CO5	2	2	-	3	3	-	-	-	-	-	-	-
CO6	-	2	3	3	-	-	-	-	-	-	-	2
<b>UNIT I: INTRODUCTION TO DATA VISUALIZATIONS AND PERCEPTION:</b>												
Introduction of visual perception, visual representation of data, Gestalt principles, Information overload..												
<b>UNIT II : VISUAL REPRESENTATIONS.</b>												



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Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications

## UNIT III : CLASSIFICATION OF VISUALIZATION SYSTEMS

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

## UNIT IV: VISUALIZATION OF GROUPS:

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

## UNIT V : VISUALIZATION OF VOLUMETRIC DATA AND EVALUATION OF VISUALIZATIONS

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

### TEXT BOOKS:

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition, A K Peters, Ltd 2015
2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.

**1. Tamara Munzner, visualization analysis & design ,1st edition, ak peters visualization series 2014**

**2. Scott Murray, interactive data visualization for the web ,2nd edition, 2017**

### E-RESOURCES:

1. <https://online.hbs.edu/blog/post/data-visualization-techniques>
2. <https://www.datapine.com/blog/data-visualization-techniques-concepts-and-methods/>



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## Course Title: Advanced Data Structures

<b>Lecture – Practical:</b>	3-0-0	<b>Internal Marks:</b>	30												
<b>Credits</b>	3	<b>External Marks:</b>	70												
<b>Prerequisites: Data Structures</b>															
<b>Course Objectives</b>															
<ul style="list-style-type: none"> <li>Describe and implement a variety of advanced data structures (hashtables, priority queues, balanced search trees, digital search trees).</li> <li>Analyze the space and time complexity of the algorithms studied in the course.</li> <li>Identify different solutions for a given problem; analyze advantages and disadvantages of different solutions.</li> </ul>															
<b>Course Outcomes</b>															
<b>Upon successful completion of the course, the student will be able to:</b>															
CO1	Able to understand the importance, operations and application of Hashing														
CO2	Able to understand implementation of skip lists														
CO3	Able to get a good understanding about different balanced trees.														
CO4	Able to understand the implementation of heaps and binomial queues.														
CO5	Have an idea on applications of algorithms in a variety of areas, like string matching, indexing etc.														
CO6	Able to understand the importance and applications of tries														
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>															
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3
Dictionaries: Sets, Dictionaries, Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques															





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<b>UNIT II: Dynamic Hashing and Skip Lists</b>
Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directoryless Dynamic Hashing, Hash Table Restructuring, Skip Lists, Analysis of Skip Lists.
<b>UNIT III: Balanced Trees</b>
AVL Trees: Maximum Height of an AVL Tree, Insertions and Deletions. 2-3 Trees: Insertion, Deletion, applications, introduction to Red-black trees
<b>UNIT IV: Priority Queues</b>
Binary Heaps: Implementation of Insert and Delete min, Creating Heap. Binomial Queues: Binomial Queue Operations, Binomial Amortized Analysis, Lazy Binomial Queues
<b>UNIT V: Pattern Matching and Tries</b>
Pattern matching algorithms- the Boyer-Moore algorithm, the Knuth-Morris-Pratt algorithm Tries: Definitions and concepts of digital search tree, Binary trie, Patricia, Multi-way trie
<b>Text Book</b>
1. Fundamentals of DATA STRUCTURES in C: 2nd ed., Horowitz, Sahani, Anderson-freed, Universities Press. 2. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
<b>REFERENCE BOOKS:</b>
1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage. 2. Introduction to Algorithms, 3rd Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
<b>E-RESOURCES</b>
1. Web: <a href="http://lcm.csa.iisc.ernet.in/dsa/dsa.html">http://lcm.csa.iisc.ernet.in/dsa/dsa.html</a> 2. <a href="http://utubersity.com/?page_id=878">http://utubersity.com/?page_id=878</a> 3. <a href="http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures">http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures</a> 4. <a href="http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms">http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms</a>



### Course Title: Computer Networks Lab

<b>Lecture</b>	–	<b>Tutorial-</b>	0-0-3	<b>Internal Marks:</b>	15
<b>Practical::</b>				<b>External Marks:</b>	35
<b>Credits:</b>			1.5		

**Prerequisites:** Knowledge of C Programming, Basic commands of UNIX.

Knowledge of C Programming, Basic commands of UNIX

**Course Objectives:**

The object of this course is to provide hands-on practice on implementing different network related commands (like netstat, ping, arp, telnet, etc..) and programming (like socket programming, routing algorithms, etc..) in C programming and Java.

**Course Outcomes:**

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

CO1     Should be able to Calculate Data link layer framing methods like bit stuffing and byte stuffing.

CO2     Should be able to Analyze Cyclic redundancy check on different polynomials.

CO3     Should be able to understand Socket Programming Implementation by using TCP and UDP Protocols.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	2	-	-	-	-	-	-	-	-
CO2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	3	-	-	2	2	-	-	-	-	-	2	2

**PART-A**

1. Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate MVT and MFT
3. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. ...
7. Simulate Paging Technique of memory management.
8. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked

**PART-B**

9. Implement the data link layer framing methods such as character stuffing and bit stuffing.
10. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
11. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
12. Implementation of Distance Vector Routing Algorithm.
13. Implementation of SMTP.



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14. Implementation of FTP.

**TEXT BOOKS:**

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education
3. Tanenbaum and David J Wetherall, Computer Networks, 5<sup>th</sup> Edition, Pearson Edu, 2010.
4. Computer Networks: A Top Down Approach, Behrouz A. Forouzan , Firouz Mosharraf, McGraw Hill Education.

**E-RESOURCES:**

- [http://www.softpanorama.org/Internals/unix\\_system\\_calls.shtml](http://www.softpanorama.org/Internals/unix_system_calls.shtml)
- <https://www.tutorialspoint.com/system-calls-in-unix-and-windows>

**Course Title: Big Data Analytics Lab**

<b>Lecture – Practical:</b>	<b>0-0-3</b>	<b>Internal Marks:</b>	15
<b>Credits</b>	1.5	<b>External Marks:</b>	35



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**Prerequisites: None**

**Course Objectives**

- I. Optimize business decisions and create competitive advantage with Big data analytics
- II. Practice java concepts required for developing map reduce programs.
- III. Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
- IV. Practice programming tools PIG and HIVE in Hadoop eco system.
- V. Implement best practices for Hadoop development.

**Course Outcomes**

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

CO1	Understand the key practical issues in big data management and its associated applications in intelligent business and scientific computing
CO2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO3	Students Interpret business models and practical scientific computing paradigms, and apply software tools for big data analytics
CO4	Achieve adequate practical perspectives of big data analytics in various applications like recommender systems, social media applications

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	1			3			1					2	1		
CO2				3					1						2
CO3		3				1				2				3	
CO4				3					2			2	1		

**Experiments:**

1. Installation of VMWare to setup the Hadoop environment and its ecosystems.
  - 2.a Perform setting up and Installing Hadoop in its three operating modes.
    - i. Standalone.
    - ii. Pseudo distributed.
    - iii. Fully distributed.
  - b. Use web based tools to monitor your Hadoop setup
3. Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations



4. Implement the following file management tasks in Hadoop:

- i. Adding files and directories
- ii. Retrieving files
- iii. Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

5. Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
6. Implement matrix multiplication with Hadoop Map Reduce.
7. Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a suitable candidate for analysis with Map Reduce since it is semi-structured and record-oriented.
8. PIG LATIN LANGUAGE –
  - a) Installation of PIG.
  - b) PIG COMMANDS a Write Pig Latin scripts sort, group, join, project, and filter your data.
  - c) PIG LATIN MODES, PROGRAMS a Run the Pig Latin Scripts to find Word Count.
  - d) Run the Pig Latin Scripts to find a max temp for each and every year
9.
  - a) Installation of HIVE.
  - b) HIVE OPERATIONS a Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

### REFERENCE BOOKS:

Jay Liebowitz, —Big Data And Business Analytics Laboratory, CRC Press.



### Course Title: DEVOPS

<b>Lecture – Practical:</b>	0-0-4	<b>Internal Marks:</b>	15
<b>Credits</b>	2	<b>External Marks:</b>	35

**Prerequisites:**

Working knowledge of one or more high-level programming languages (C#, Java, PHP, Ruby, Python, etc.) Intermediate knowledge of administering Linux or Windows systems at the command-line level

**Course Objectives :** The Objective of this course is to give a strong foundation of the Development and its Operations.

**Course Outcomes**

**Upon successful completion of the course, the student will be able to:** Understand the traditional software development. Learn the rise of agile methodologies. • Define and design purpose of DevOps. •

CO1	Realize the importance of agile software development practices in determining the requirements for a software system
CO2	Analyze and execute iterative software development processes to manage software development activities.
CO3	Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need.
CO4	Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality.
CO5	Perform software process improvement by applying DevOps capabilities at enterprise level.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	2	-	-		3	2	3	3
CO2	2	3	2	3	-	-	-	-	-	-	2	3	3	3	3
CO3	2	2	3	3	2	-	2	-	2	-	2	-	2	-	3
CO4	2	-	2	2	2	-	2	-	-	-	-	3	2	3	-
CO5	-	-	2	2	2	-	3	-	2	-	2	3	3	3	3

**PROGRAMS LIST**

- 1) **In-depth knowledge of DevOps methodology**
- 2) **Implementing Software Version Control**
- 3) **Containerizing Code on production using Docker**
- 4) **Creating CI/CD Pipelines using Jenkins**
- 5) **Configuration Management using Puppet and Ansible**



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- 6) Automating build and test using Selenium and Maven
- 7) Container Orchestration using Kubernetes
- 8) Performance Tuning and Monitoring using Nagios
- 9) Devops Tools : Jenkins,Docker. Phantom.,NagiosVagrant,Ansible,GitHub.

## E-RESOURCES

<https://www.guru99.com/>



### Course Code-Employability Skills-I

<b>Lecture – Practical:</b>	2-0-0	<b>Internal Marks:</b>	30												
<b>Credits</b>	0	<b>External Marks:</b>	70*												
<b>Prerequisites: None</b>															
Course Objectives: 1.To explore and practice basic communication skills 2.To learn skills for effective discussions & team work 3.To assess and improve personal grooming															
<b>Course Outcomes</b>															
<b>Upon successful completion of the course, the student will be able to:</b>															
CO1	Establish effective communication with employers, supervisors, and co-workers														
CO2	Identify to explore their values and career choices through individual skill assessments														
CO3	Adapts positive attitude and appropriate body language														
CO4	Interpret the core competencies to succeed in professional and personal life														
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>															
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1								2		2					
CO2								2							
CO3										2					2
CO4								2		2		2			
<b>UNIT I:Soft Skills:</b> An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.															
<b>Unit 2: Positivity and Motivation:</b>															





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Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels

**UNIT III: Interpersonal Communication:**

Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles, assertion, persuasion, negotiation.

**UNIT IV: Public Speaking:**

Skills, Methods, Strategies and Essential tips for effective public speaking. Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.

**UNIT V: Non-Verbal Communication**

Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

**REFERENCE BOOKS:**

- 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 3) R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- 5) R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

**E-RESOURCES**





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CO4		1			3										
CO5			3			1									
CO6										2					

## UNIT I: MACHINE LEARNING BASICS

Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient descent, Curse of Dimensionality

## Unit 2: DEEP LEARNING ARCHITECTURES

Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications,

## UNIT III: CONVOLUTIONAL NEURAL NETWORKS & TRANSFER LEARNING TECHNIQUES

Architectural Overview, Motivation, Layers, Filters, Parameters sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications, Transfer learning techniques, variants of CNN: Dense Net, Pixel Net.

## UNIT IV: SEQUENCE MODELLING – RECURRENT AND RECURSIVE NETS

Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures – BPTT for training RNN, Long Short Term Memory Networks.

## UNIT V: AUTO ENCODERS & DEEP GENERATIVE MODELS

Undercomplete Autoencoder, Regularized Autoencoder, stochastic Encoders and Decoders, Contractive Encoders, Deep Belief networks, Boltzmann Machines, Deep Boltzmann Machine, Generative Adversarial Networks.

**Text Book:** 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “ Deep Learning”, MIT Press, 2017

2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017

3. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018.

## REFERENCE BOOKS:

1. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.

2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.

3. Giancarlo Zaccane, Md. Rezaul Karim, Ahmed Menshaway "Deep Learning with TensorFlow:

4. Explore neural networks with Python", Packt Publisher, 2017.

Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.

Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

## E-RESOURCES

<https://www.javatpoint.com/deep-learning>



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## Course Title: Cryptography and Network Security

<b>Lecture–Tutorial-Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70
<b>Prerequisites:</b> Students are expected to have knowledge on the following topics: Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies			
<b>Course Objectives</b>			
<ol style="list-style-type: none"><li>1. The Objectives of first unit is to present an overview of the main concepts of cryptography, understand the threats &amp; attacks, understand ethical hacking</li><li>2. The Objectives of second unit is to understand the difference between stream ciphers &amp; block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA</li><li>3. The objectives of third unit is to present the basic principles of public key cryptography, Distinct uses of public key cryptosystems</li><li>4. The objectives of fourth unit is to Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature</li><li>5. The objectives of fifth unit is to Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL &amp; TLS. Present an overview of electronic mail security.</li><li>6. The objectives of fifth unit is to Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques</li></ol>			



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## Course Outcomes:

### Upon Completion of the course, the students will be able to

- CO1. Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks.
- CO2. Distinguish the block ciphers and stream ciphers and apply them on a various symmetric cryptographic technique.
- CO3. Understand the principle and mathematical models used in public-key cryptosystems by applying them on different (various) types of algorithms.
- CO4. Analyze the message authentication functions with its types and digital certifications for secure communication.
- CO5. Understand the user authentications principles and security approach at both the web and email.
- CO6. Understand the concept of IP Security with its services and dealing with the prevention and detection of intrusions.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	2	-	1	-	-	-	1	3	1	1
<b>CO2</b>	3	3	1	2	1	2	-	1	-	-	-	1	3	1	1
<b>CO3</b>	3	3	-	1	1	1	-	1	-	-	-	1	3	2	-
<b>CO4</b>	3	3	-	2	1	1	-	1	-	-	-	1	3	2	1
<b>CO5</b>	3	2	1	2	1	1	-	1	-	-	-	1	3	1	1
<b>CO6</b>	3	2	-	2	1	1	-	1	-	-	-	1	3	2	1



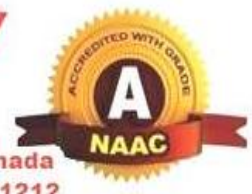
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## Unit-I

**Introduction**, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Mathematics of Cryptography

**Classical Encryption Techniques**, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques

## UNIT II:

**Symmetric Encryption**, Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard, BlowFish, IDEA, CAST-128 algorithms

## UNIT III:

**Asymmetric Encryption**, Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Key Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, Elliptic Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode,

## UNIT IV:

**DATA INTEGRITY, Digital Signature schemes, & Key Management**

Message Integrity and message authentication, Cryptographic hash functions, Digital Signature and Key Management

## UNIT V:

Network Security: Security at Application layer: PGP and MIME, Security at Transport layer: SSL and TLS, Security at Network layer: IPSec, System Security

## Text Book:

1. Cryptography and Network Security Principles and Practice 6th Edition, William Stallings, Pearson Education
2. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, 3E) Mc Gra Hill
3. Atul Kahate, Cryptography and Network Security, TMH. (2003)

## REFERENCE BOOKS:

1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition, 2011, Pearson Education. 95
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

## E-RESOURCES:

1. <http://users.abo.fi/ipetre/crypto/>
2. [https://www.vssut.ac.in/lecture\\_notes/lecture1428550736.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf)
3. <https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/>
4. <https://lecturenotes.in/subject/112/cryptography-and-network-security-cns>



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5. <https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/>
6. <https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/>
7. <https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/>

### Course Title: Design and Analysis of Algorithms

<b>Lecture–Tutorial–Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: None**

**Course Objectives**

- Analyze the asymptotic performance of algorithms and components
- To study divide and conquer paradigm approach used to analyze and design algorithms
- To study greedy method approach used to analyze and design algorithms.
- To study Dynamic programming paradigm Backtracking approach used to analyze and design algorithms
- To study Backtracking approach used to analyze and design algorithms
- To study branch and bound paradigm and Deterministic approach used to analyze and design algorithms

**Course Outcomes:**

**Upon Completion of the course, the students will be able to**

CO1: Analyze worst-case running times of algorithms using asymptotic analysis and components

CO2: Describe the divide and conquer method explains when an algorithmic design situation demands it.

CO3: Describe the greedy method explains when an algorithmic design situation demands it.

CO4: Describe the dynamic-programming paradigm explains when an algorithmic design demands it.

CO5: Describe the back tracking method explains when an algorithmic design demands it.

CO6: Describe the branch and bound paradigm and deterministic methods explain when an algorithmic design demands it.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2



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CO6	3	-	3	3	-	-	-	-	-	-	-	-	-	3	3	3
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<p><b>UNIT I Introduction to Algorithms</b> Fundamentals of algorithmic problem solving – Analysis framework - Performance Analysis: - Space complexity, Time complexity - Growth of Functions: Asymptotic Notation- Big oh notation, Omega notation, Theta notation, little oh.</p>
<p><b>UNIT II Divide and Conquer:</b> Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Finding the Maximum and Minimum</p>
<p>Unit III <b>Greedy method:</b>The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim’s Algorithm, Kruskal’s Algorithms, Optimal Merge Patterns, Single Source Shortest Paths</p>
<p><b>UNIT IV Dynamic Programming:</b> General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.</p>
<p><b>UNIT V Backtracking:</b> General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. <b>Branch and Bound:</b> General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution</p>
<p><b>TEXT BOOKS:</b></p>
<p>Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekaran, University press</p>
<p><b>REFERENCE BOOKS:</b></p>
<ol style="list-style-type: none"> <li>1. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017.</li> <li>2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education</li> <li>3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.</li> <li>4. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education</li> </ol>

## Course Code-NATURAL LANGUAGE PROCESSING

<b>Lecture – Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70
<b>Prerequisites: :</b>						
Data structures, finite automata and probability theory						
<b>Course Objectives:</b>						
Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.						





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## Course Outcomes:

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

CO1	Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
CO2	Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
CO3	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
CO4	Able to design, implement, and analyze NLP algorithms
CO5	Able to design different language modeling Techniques.

### Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	3	-	2	-	-	-	-	-	-	-	3	3	2
CO2	2	3	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	-	2	2	2	3	-	-	-	-	-	-	-	2	-	2
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO5	-	2	2	3	3	-	-	-	-	-	-	-	2	2	2

## UNIT I :

Introduction to Natural Language Processing: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis ,Representations and Understanding, Organization of Natural language Understanding Systems

UNIT II:, Linguistic Background: An outline of English syntax, Words, The Elements of Simple Noun Phrases, Verb Phrases and Simple Sentences, Noun Phrases Revisited, Adjective Phrases, Adverbial Phrases

## UNIT III:

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Finite State Models and Morphological Processing, Grammars and Logic Programming., Augmented Transition Networks.



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## UNIT IV:

Semantics and Logical Form: Word senses and Ambiguity, Encoding Ambiguity in the Logical Form, Verbs and States in Logical Form, Speech Acts and Embedded Sentences, Defining Semantic Structure: Model Theory

## UNIT V:

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems

## TEXT BOOKS:

1. James Allen, "Natural Language Understanding", Pearson Education
2. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
3. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

## REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications
2. Christopher D Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing" MIT Press, 1999.
3. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice

## E-RESOURCES:

1. <https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1>
2. <http://www.nptelvideos.in/2012/11/natural-language-processing.html>

### Course Title: INTELLIGENT INFORMATION RETRIEVAL

<b>Lecture – Practical:</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits</b>	3	<b>External Marks:</b>	70
<b>Prerequisites: None</b>			
<b>Course Objectives</b>			
<ol style="list-style-type: none"> <li>1. To familiarize with Boolean and vector space retrieval models; evaluation and interface issues, text index construction and scoring</li> <li>2. To develop intelligent systems by applying the methods such as Prediction, Forecasting, Classification, Clustering and Optimization</li> <li>3. To build working systems that assist users in finding useful information on the Web.</li> </ol>			



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## Course Outcomes

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

CO1	Describe the genesis and variety of information retrieval situations;
CO2	Construct the variety of information retrieval models and techniques;
CO3	Evaluate methods and principles of information retrieval systems;
CO4	Develop Methods for implementing information retrieval systems
CO5	Implement Characteristics of operational and experimental information retrieval systems;

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	2	-	-	-	-	-	-	2			
CO2	3	-	2	-	2	-	-	-	2	-	-	-			
CO3	2	2	-	-	2	-	-	-	-	-	3	-			
CO4	2	2	-	3	2	-	-	-	-	-	-	2			
CO5	3	-	2	-	2	-	-	-	2	-	-	-			

### UNIT I: Fundamentals of IR Systems, Models and Indexing

Overview of IR Systems, Information retrieval using the Boolean model, The dictionary and postings lists, Tolerant retrieval, Automatic Indexing, Index construction and compression, Scoring, Vector space model and term weighting

### UNIT II: Document Representation and Analysis

Statistical Characteristics of Text, Regular Expressions, Text Normalization, Edit Distance, N- Gram Language Models, Naive Bayes and Sentiment Classification- Logistic Regression for Document Analysis

### UNIT III: Query Processing and Evaluation

Basic Query Processing, Data Structure and File Organization for IR, Evaluation in information retrieval- Relevance feedback, User Profiles, Collaborative Filtering and query expansion.

### UNIT IV: Retrieval Models

Similarity Measures and Ranking, Boolean Matching, Vector Space Models, Probabilistic Models, XML Retrieval, Language models for information retrieval.

### UNIT V: Text Classification and Clustering

Text classification- vector space classification- support vector machines and machine learning on documents- Clustering- flat clustering- hierarchical clustering- Matrix decompositions and Latent semantic indexing.

### Text Book:

1. C. D. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press (2008)
2. Ricardo Baeza Yates, Berthier Ribeiro-Neto, Modern Information Retrieval: The Concepts and Technology behind Search (2nd Ed, 2010)
3. Mikhail Klassen, Matthew A. Russell, Mining the Social Web, O'Reilly Media, Inc., 3rd Edition (2019)



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## REFERENCE BOOKS:

- 1.Ceri, S., Bozzon, A., Brambilla, M., Della Valle, E., Fraternali, P.and Quarteroni, S., 2013. Web information retrieval. Springer Science & Business Media.
- 2.D. Jurafsky, and J. Martin, Speech and language processing : an introduction to natural language processing, computational linguistics, and speech recognition, Pearson Prentice Hall, Second Edition (2013)
- 3.Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis ,Springer, 2010
- 4.Bruce Croft, Donald Metzler and Trevor Strohma, Search Engines: Information Retrieval in Practice (1st Ed 2009).

## E-RESOURCES

[https://www.youtube.com/watch?v=fFxpSmylCwI&ab\\_channel=nptelhrd](https://www.youtube.com/watch?v=fFxpSmylCwI&ab_channel=nptelhrd)  
[https://www.youtube.com/watch?v=m0oiAOgSQFw&ab\\_channel=nptelhrd](https://www.youtube.com/watch?v=m0oiAOgSQFw&ab_channel=nptelhrd)

**Course Title: REINFORCEMENTLEARNING**

<b>Lecture – Practical:</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits</b>	3	<b>External Marks:</b>	70
<b>Prerequisites: Machine Learning</b>			
<b>Course Objectives</b>			



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1. Learn how to define RL tasks and the core principals behind the RL, including policies, value functions.
2. Understand and work with tabular methods to solve classical control problems.
3. Recognize current, advanced techniques and applications in RL.

### Course Outcomes

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

CO1	Implement in-code common algorithms following code standards and libraries used in RL.
CO2	Understand and work with approximate solutions.
CO3	Explore imitation learning tasks and solutions.
CO4	Learn how to define RL tasks and the core principals behind the RL, including policies, value functions.
CO5	Understand and work with tabular methods to solve classical control problems.
CO6	Recognize current advanced techniques and applications using RL.

### Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2			3										3	
CO2	3	2											2		
CO3		3												3	
CO4			3	2									3		
CO5	3	2	1											3	
CO6					3										3

### UNIT I:

**Reinforcement Learning Primitives:** Introduction and Basics of RL, Defining RL Framework, Probability Basics: Probability Axioms, Random Variables, Probability Mass Function, Probability Density Function, Cumulative Distribution Function and Expectation. Introduction to Agents, Intelligent Agents – Problem Solving – Searching, Logical Agents.

### UNIT II:

**Markov Decision Process and Dynamic Programming:** Markov Property, Markov Chains, Markov Reward Process (MRP), Bellman Equations for MRP, Dynamic Programming: Policies (Evaluation, Improvement, Iteration, Value Iteration), Asynchronous Dynamic programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

**UNIT III: Monte Carlo Methods and Temporal Difference Learning:** Monte Carlo: Prediction, Estimation of Action Values, Control and Control without Exploring Starts, Off-Policy Control, Temporal Difference Prediction: TD(0), SARSA: On-Policy TD control, Q-Learning: Off-Policy TD control, Games, Afterstates, and Other Special Cases.

### UNIT IV: Deep Reinforcement Learning:

Deep Q-Networks, Double Deep-Q Networks (DQN, DDQN, Dueling DQN, Prioritized Experience Replay)

**UNIT V: Policy Optimization in RL:** Introduction to Policy-based Methods, Vanilla Policy Gradient, REINFORCE Algorithm and Stochastic Policy Search, Asynchronous Actor-Critic and Asynchronous Advantage Actor-Critic (A2C, A3C), Advanced Policy Gradient (PPO, TRPO, DDPG).



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## Text Book:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An Introduction", Second Edition, MIT Press, 2019.
2. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach.", Pearson Education Limited, 2016.
3. Michael Wooldridge, "An Introduction to Multi Agent Systems", John Wiley, 2002.

## REFERENCE BOOKS:

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2017.
2. Marco Wiering, Martijn van Otterlo (Ed), "Reinforcement Learning, State-of-the-Art, Adaptation, Learning, and Optimization book series, ALO, volume 12, Springer, 2012.
3. Keng Wah Loon, Graesser, Laura, "Foundations of Deep Reinforcement Learning: Theory and Practice in Python", Addison Wesley Data & Analytics Series, 2020.
4. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.

## E-RESOURCES

1. <https://www.geeksforgeeks.org/what-is-reinforcement-learning/>
2. <https://www.javatpoint.com/reinforcement-learning>
3. <https://towardsdatascience.com/reinforcement-learning-101-e24b50e1d292>
4. <https://www.coursera.org/specializations/reinforcement-learning>
5. [https://en.wikipedia.org/wiki/Reinforcement\\_learning](https://en.wikipedia.org/wiki/Reinforcement_learning)



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<b>Lecture – Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70

**Prerequisites:**

No particular skills are required as a prerequisite before learning UML.

**Course Objectives:**

• problems	To understand how to solve complex
• using object oriented approach	Analyze and design solutions to problems
• Language	Study the notations of Unified Modeling
• driven requirements for a particular system.	Specify, analyze and design the use case
• transform them into implementation specific layouts.	Model the event driven state of object and
• components and collaborate them interchangeably.	Identify, Analyze the subsystems, various

**Course Outcomes:**

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

CO1	Analyse, design, document the requirements through use case driven approach
CO2	Identify, analyse, and model structural concepts of the system
CO3	Develop, explore the conceptual model into various scenarios and applications.
CO4	Apply the concepts of architectural design for deploying the code for software.
CO5	Identify, analyse, and model Architectural concepts of the system

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2		2							2			



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CO2	3	3	3								2	2			
CO3	3	3			3	2					2	2			
CO4	2	2	3		2	2					2	3			
CO5	3	3	3		2	3					2	2			

## UNIT I :

### Introduction to UML:

The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, genericity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture

## UNIT II:

**Basic structural Modeling:** Classes, relationships, common mechanisms, diagrams, Advanced structural modeling: advanced relationships, interfaces, types & roles, packages, instances.

**Class & object diagrams:** Terms, concepts, examples, modeling techniques, class & Object diagrams.

## UNIT III:

**Collaboration diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages.

**Sequence diagrams:** Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

## UNIT IV:

**Behavioral Modeling:** Interactions, use cases, use case diagrams, activity diagrams.

**Advanced Behavioral Modeling:** Events and signals, state machines, processes & threads, time and space, state chart diagrams.

## UNIT V:

**Architectural Modeling:** Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

## TEXT BOOKS:





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1. The Unified Modeling Language User Guide, Grady Booch, Rumbaugh, Ivar Jacobson, PEA
2. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Addison Wesley

### REFERENCE BOOKS:

1. Head First Object Oriented Analysis & Design, Mclaughlin, SPD OReilly, 2006
2. Object oriented Analysis & Design Using UML, Mahesh , PHI
3. The Unified Modeling Language Reference Manual, 2/e, Rumbaugh, GradyBooch, etc., PEA
4. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson
5. Object Oriented Analysis Design & implementation, Dathan., Ramnath, University Press
6. Object Oriented Analysis & Design, John Deacon, PEA
7. Fundamentals of Object Oriented Analysis and Design in UML, M Pages-Jones, PEA
8. Object-Oriented Design with UML, Barclay, Savage, Elsevier, 2008

### E-RESOURCES:

1. <https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/>
2. <https://www.javatpoint.com/uml>
3. <https://www.uml-diagrams.org/>



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## Course Title: Deep Learning Lab

<b>Lecture–Tutorial-Practical::</b>	0-0-3	<b>Internal Marks:</b>	15
<b>Credits:</b>	1.5	<b>External Marks:</b>	35
<b>Prerequisites:</b> Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• Implementation of artificial neural network using Keras</li> <li>• Understanding different optimization functions to improve training</li> <li>• Understanding different weight initialization techniques.</li> <li>• Understanding convolution neural network</li> </ul>			
<b>Course Outcomes:</b>			
<b>Up on Completion of the course, the students will be able to</b>			
CO1: Implementation of artificial neural network			
CO2: Implementation of optimizers			
CO3: Implementing Regularization Techniques			
CO4 : Implementing Convolution Neural Network			
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>			

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-

### List of Experiments

- 1) Implementing single perceptron and training using keras
- 2) Implementing Multilayer perceptron and training
- 3) Implementing different weight initializing techniques
- 4) Implementing multiclass classification using softmax layer
- 5) Implement different optimization techniques to improve training
- 6) Students should select a new data set from kaggle and implement above all



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- 7) Implementing simple convolution neural network using keras
- 8) Observe the difference by taking different max pooling layers and changing the CNN architecture
- 9) Implement image multi class classification using CNN
- 10) Image classification using Imagenet dataset

**TEXT BOOKS:**

Hands-On Neural Networks with Keras by Niloy Purkait Released March 2019 Publisher(s): Packt Publishing ISBN: 9781789536089

**Course Title:** Cryptography and Network Security Lab

<b>Lecture–Tutorial-Practical::</b>	0-0-3	<b>Internal Marks:</b>	15
<b>Credits:</b>	1.5	<b>External Marks:</b>	35
<b>Prerequisites:</b> Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• To provide skills for implementing the security algorithms.</li> <li>• To enable students to work on various cipher models</li> <li>• To provide skills to work towards providing security solutions for real life problems.</li> </ul>			
<b>Course Outcomes:</b>			
<b>Up on Completion of the course, the students will be able to</b>			
CO1: Implement the symmetric cipher models.			
CO2: Implement asymmetric cipher models.			
CO3: Implement Digital signatures, MAC			
CO4 : Implement other security aspects viz., firewall implementation, web security			
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>			

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-

**List of Experiments**

Use any language such as C/C++/Java



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1. Write a Java program to perform encryption and decryption using the following algorithms:
  - a. Ceaser Cipher
  - b. Substitution Cipher
  - c. Hill Cipher
2. Write a Java program to implement the DES algorithm logic
3. Implementation of symmetric cipher algorithm (AES) in Java/C
4. Write a C/JAVA program to implement the Blow Fish algorithm logic
5. Write a C/JAVA program to implement the Rijndael algorithm logic.
6. Using Java Cryptography, encrypt the text "Hello world" using Blow Fish. Create your own key using Java key tool.
7. Write a Java program to implement RSA Algorithm
8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
9. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
10. Random number generation using a subset of digits and alphabets.
11. Implementation of RSA based signature system
12. Authenticating the given signature using MD5 hash algorithm.
13. Implementation EIGAMAL cryptosystem.
14. Implement Message Authentication Codes for message integrity.
15. Implement Elliptic Curve cryptosystems
16. Firewall implementation and testing.
17. Implementation of a trusted secure web transaction.

Note: The concerned Course Coordinator will finalize the actual list of experiments/problems at the start of semester based on above generic list.



### Course Title: ALGORITHMS LAB

<b>Lecture</b>	–	<b>Tutorial-</b>	0-0-3	<b>Internal Marks:</b>	15							
<b>Practical::</b>				<b>External Marks:</b>	35							
<b>Credits:</b>			1.5									
<b>Prerequisites:</b>												
<b>C- Programming, Data Structures</b>												
<b>Course Objectives:</b>												
1 Learn how to analyze a problem and design the solution for the problem.												
2 Design and implement efficient algorithms for a specified application.												
3 Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.												
<b>Course Outcomes:</b>												
<b>Upon successful completion of the course, the student will be able to:</b>												
CO1	Possess the ability to understand need of algorithms.											
CO2	understand the principles of problem solving and be able to apply them successfully											
CO3	Possess the skill for sorting techniques											
CO4	Familiar with techniques for computer-based representation and manipulation of complex information, knowledge,											
CO5	Apply the concepts of graphs and trees											
CO6	Develop new ideas on resolving paths.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	3	3	2	-	-	-	2	-	-	2
CO2	3	3	3	3	3	-	-	2	2	-	-	2
CO3	3	3	3	3	3	-	-	2	2	-	-	2
CO4	3	3	3	3	2	-	-	-	2	-	-	2
CO5	3	3	3	3	3	-	-	-	2	-	-	2
CO6	3	3	3	3	2	-	-	-	2	-	-	2
1. QUICK SORT												
2 MERGE SORT												
3 WARSHALL'S ALGORITHM												
4 KNAPSACK PROBLEM												
5 SHORTEST PATHS ALGORITHM												
6 MINIMUM COST SPANNING TREE												
7 TREE TRAVERSALS												
8 GRAPH TRAVERSALS												
9 SUM OF SUB SETS PROBLEM												
10 TRAVELLING SALES PERSON PROBLEM												



# NRI INSTITUTE OF TECHNOLOGY

**AUTONOMOUS**

Accredited : NAAC with "A", NBA (CSE, ECE & EEE)

Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada  
Pothavarappadu, Agiripalli Mandalam, Krishna Dt., Andhra Pradesh - 521212

URL : [www.nrigroupofcolleges.ac.in](http://www.nrigroupofcolleges.ac.in), Ph : 0866 2469666, Email : [principal@nriit.edu.in](mailto:principal@nriit.edu.in)



11 MINIMUM COST SPANNING TREE

12 ALL PAIRS SHORTEST PATHS

### TEXT BOOKS:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T., R Tomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wiley and Sons, 2006.

### REFERENCE BOOKS:

1. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999

### E-RESOURCES:

1. <http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html>
2. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>
3. <http://www.facweb.iitkgp.ernet.in/~sourav/daa.html>

### Course Title: MEAN STACK TECHNOLOGY -LAB

Lecture – Practical:	0-0-4	Internal Marks:	15
Credits	2	External Marks:	35
<ul style="list-style-type: none"><li>• <b>Prerequisites:</b></li><li>• To have basic knowledge on developing web applications</li><li>• Knowing HTML and CSS web languages</li><li>• JavaScript, IDE or Text Editor, Command Line Interface (CLI)</li><li>• Server-side development with any programming language.</li></ul>			



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**Course Objectives** : The Objective of this course is to give a strong foundation of the Development and its Operations.

**Course Outcomes**

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

- 1.Understand the traditional software development.
- 2.Learn the rise of agile methodologies.
- 3.Define and design purpose of DevOps.

CO1	To code a MEAN Stack Application
CO2	Developing Single Page Applications (SPAs) via MEAN Stack
CO3	Setup routing within Angular & Express
CO4	Write Express Back-End Web Services with Express & Node
CO5	Employ Express Web Services
CO6	Understanding Mango DBMS

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-						3	-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-						3	2	2	-
CO4	3	3	2	-	-	-							-	2	3
CO5	2	2	3	2	2	2							1	3	-
CO6		3		3	3	3						3	3	3	3

**List of Experiments**

- Angular :
- Getting Started with Angular
- Introduction to Components
- Templates, Interpolation, and Directives
- Data Binding & Pipes
- More on Components
- Building Nested Components
- Forms
- Services and Dependency Injection
- Retrieving Data Using HTTP
- Navigation and Routing Basics



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- Node Js :
- Introduction
- Exploring language additions to the V8 JavaScript engine
- Understanding NodeJS
- HTTP and File System
- Buffers, Streams, and Events
- Using Express Framework
- Working with Models, Views, and Routes
- Database
- Working with MongoDB
- Working with RESTful web services
- Angular With Node

### Course Title: EMPLOYABILITY SKILLS –II

Lecture – Practical:	2-0-0	Internal Marks:	30
Credits	0	External Marks:	70*
Prerequisites: None			
Course Objectives			





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- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

## Course Outcomes

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

CO1	Recite the corporate etiquette.
CO2	Make presentations effectively with appropriate body language
CO3	Be composed with positive attitude
CO4	Apply their core competencies to succeed in professional and personal life

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2			3			2			2		2	2		
CO2				3					2						2
CO3		3				2				3				3	
CO4				3					2	3		2	2		

### UNIT I:

Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness

### UNIT II:

Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips. Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

### UNIT III:

Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.

### UNIT IV:

Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills.



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**UNIT V:Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence**

**Text Book:**

1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.

**REFERENCE BOOKS:**

- 1) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 2) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 3) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- 4) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 5) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

### IV YEAR I SEMESTER (AI&ML)

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks )			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	PE3	1. Data Science 2.Block Chain Technology 3.Cognitive Science and Analytics 4.Qunatum Computing (MOOCS)	3	0	0	3	30	70	100	3
2	PE4	1. Data Visualization Techniques 2.Design Thinking in Software Development 3. High Performance Computing 4.Smart System and Design 5.Visual Analytics(MOOCS)	3	0	0	3	30	70	100	3
3	PE5	1.Data Mining and Data Warehousing 2. Predictive Analytics 3.Distributed System 4.Social Networking and Semantics 5.Computer Vision(MOOCS)	3	0	0	3	30	70	100	3
4	OE3	Open Elective -3	3	0	0	3	30	70	100	3
5	OE4	Open Elective -4	3	0	0	3	30	70	100	3
6	HSS	Universal Human Values	3	0	0	3	30	70	100	3
6	Audit Course	Functional English for 21 <sup>st</sup> Century Learning	2	0	0	2	30	70	100	2
7	SKILL ADVANCED COURSE	Data Science Lab	0	0	2	2	15	35	50	1
8	Summer Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)		0	0	0	0	0	50	50	3
<b>Total</b>			20	0	2	22	225	575	800	22
<b>Honors/Minor courses - 3</b>			<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>	30	70	100	<b>4</b>

## IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	Project	Major Project Project Work, Seminar and Internship in Industry	-	-	16	16	30	70	100	8
2	CSP	Community Service Project	-	-	8	8	100	0	100	4
<b>Total</b>			-	-	24	24	130	70	200	12

**Course Code- Data Science**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30									
<b>Credits:</b>	3	<b>External Marks:</b>	70									
<b>Prerequisites: Linear algebra, Statistics fundamentals, Python</b>												
<b>Course Objectives:</b>												
<ul style="list-style-type: none"> <li>• To understand the fundamentals of Data Science.</li> <li>• To learn the summary and descriptive statistics.</li> <li>• To understand Statistical and Linear Algebra basics.</li> <li>• To apply classification and regression techniques to predict the outcome.</li> <li>• To understand Unsupervised and Reinforcement learning approaches.</li> </ul>												
<b>Course Outcomes:</b>												
<b>Upon successful completion of the course, the student will be able to:</b>												
CO1	Understand the applications of Data Science.											
CO2	Apply summary and descriptive statistics on various data sets.											
CO3	Apply Statistical and Linear Algebra functions.											
CO4	Apply Classification and Regression to decision-making Scenarios.											
CO5	Develop Unsupervised and Reinforcement applications.											
<b>Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	2	--	3	--	--	--	--	--	--	--
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	--
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	--
<b>UNIT-1:Introduction:</b> Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.												
<b>UNIT-2: Exploratory Data Analytics:</b> Data Acquisition, Pre-Processing, Summary and Descriptive Statistics, Skewness, Kurtosis, Plots- Box Plots, Residual, Scatter, and Distributed.												
<b>UNIT-3:Statistical and Linear algebra:</b> Developing Initial Hypotheses, testing hypotheses, least-squares principle, Matrices to represent relations between data, Linear algebraic operations on matrices – Matrix decomposition: Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).												
<b>UNIT-4:Supervised Learning-Classification</b> – Decision tree, Random Forest, Support Vector, Naive-Bayes, Ada and XG Boost, Logistic Regression, Confusion Matrix, Evaluation metrics.												
<b>Regression-</b> Linear, Multiple, Decision tree, Random Forest, Support Vector, Gradient descent, LASSO, Ridge, Evaluation metrics.												
<b>Unit –V: Unsupervised Learning:</b> Clustering, K-Means Clustering, Density-Based Clustering, Dimensionality Reduction, Collaborative Filtering.												
<b>Reinforcement Learning:</b> Association Rule Learning, Upper Confidence Bound, Thompson Sampling, Q-Learning.												

**TEXTBOOKS:**

1. JojoMoolayil, "Smarter Decisions : The Intersection of IoT and Data Science," PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science," O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
4. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
5. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.
6. Tom Mitchell, "Machine Learning," McGraw-Hill, 1997.

**REFERENCE BOOKS:**

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics," IGI Global

**e-Resources:**

1. <https://nptel.ac.in/courses/106106179>

## Course Code- BLOCKCHAIN TECHNOLOGY

<b>Lecture – Practical::</b>	<b>Tutorial-</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>		3				<b>External Marks:</b>	70

### Prerequisites:

1. Knowledge in security and applied cryptography.
2. Knowledge in distributed databases.

### Course Objectives:

- To Introduce block chain technology and Crypto currency
- Discuss the fundamental ideas of Bit coin MOOCs.
- Identify the different components of the block chain process.
- Recognize the differences between block chain and bit coin and other crypto currencies.

### Course Outcomes:

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

CO1	Contentedly discuss and describe the history, types and applications of Blockchain
CO2	Gains familiarity with cryptography and Consensus algorithms.
CO3	Demonstrate the block-chain services to develop a New Paradigm of Organizational activities
CO4	Learn the limitations of the block-chain mechanism to develop an efficient organizational structure
CO5	Applying Bit-Coin protocols and how to develop the digital currency in the websites

### Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	2	-	1	1	-	-	1	1	-	3	2	3	-
CO2	3	3	3	2	2	2	-	-	1	2	-	3	2	3	-
CO3	2	-	-	-	-	-	-	3	-	3	-	-	2	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	3	3	2	3

### UNIT I :

**Introduction** Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.

### UNIT II:

Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain-Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)

**UNIT III:**

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

**UNIT IV:**

**Blockchain Science:** Gridcoin, Foldingcoin, Blockchain Genomics, Bitcoin MOOCs.Currency, Token, Tokenizing, Campuscoin, Coin drop as a strategy for Public adoption.Regulations

**UNIT V:**

Currency Multiplicity, Demurrage currency.

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

**TEXT BOOKS:**

1. Blockchain Blue print for Economy by Melanie Swan

**REFERENCE BOOKS:**

1. **Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher**

**E-RESOURCES:**

1. [Blockchain | Tools, Publications & Resources \(ala.org\)](#)
2. [Blockchain Learning Hub | UNICEF Office of Innovation](#)



**Course Code-Cognitive Science and Analytics**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Computer Science, Linguistics, Deep Learning.**

**Course Objectives:**

- To understand how cognitive science is methodologically distinctive.
- To understand Psychology, Computer Science, Linguistics, a Neuroscience.
- To develop skills in analyzing, interpreting, and assessing empirical data.
- To develop research techniques that contribute to cognitive science.
- To understand central modeling techniques in cognitive science, including traditional computational, deep learning, and dynamical approaches.

**Course Outcomes:**

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

CO1	Understand the basic principles and processes of cognitive science.
CO2	Demonstrate qualitative and quantitative skills and critical thinking in cognitive science by applying a suitable methodology to real-world applications.
CO3	Apply declarative and logical models.
CO4	Envisage the concept of cognitive learning.
CO5	Demonstration with the acquired inter-disciplinary knowledge in language processing and application of different research approaches with cognitive science

**Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	--	3	--	--	--	--	--	--	
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	--
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	

UNIT-1: Introduction to Cognitive Science: Introduction to the study of cognitive sciences. Neural Network Models- language: definition Affordances Categories and concepts; Concept learning: Linguistic knowledge: Syntax, semantics, (and pragmatics) Direct perception, Logic; Machine learning

UNIT-2: Concept Hierarchies: A brief history of cognitive science. Processing of sensory information in the brain, Linguistic knowledge: Syntax, semantics (and pragmatics), Ecological Psychology, constructing memories, Methodological concerns in philosophy, Discretization and generating concept hierarchies, Data Mining System, Generative linguistics, Affordance learning in robotics, Explicit vs. implicit memory

UNIT-3: Memory Models: Brief history of neuroscience, PET, EEG Lateralization Child, and robotic development Sensory memory; Short term memory Mathematical models, Multisensory integration in the cortex, Lateralization, Attention, and related concepts, long term memory; Rationality.

UNIT-4: Sensory Information Fusion: **Mathematical models Information fusion, the great past tense debate, Human visual attention, Bounded rationality; Prospect theory; Heuristics and biases Looking at brain signals.**

**Modeling:** From sensation to cognition, The great past tense debate, Computational models of attention, Reasoning in computers.

**Unit –5: Information Processing: Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional Context and**

**social judgment, Schemas, and social signals.**

**TEXTBOOKS:**

1. Pradeep Kumar Mallick, Samarjeet Borah, "Emerging Trends and Applications in Cognitive Computing," 2019, IGI Global Publishers.

**REFERENCES:**

1. Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind," 2020 Cambridge University Press, New York.

**E-RESOURCES:**

1. <https://www.javatpoint.com/deep-learning>

2. <https://towardsdatascience.com>

## Course Code-Quantum Computing

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30									
<b>Credits:</b>	3	<b>External Marks:</b>	70									
<b>Prerequisites: Physics, Linear Algebra, Probability and Stochastic processes, Java, Python.</b>												
<b>Course Objectives:</b>												
To Understand the fundamentals of basic quantum algorithms.												
To develop simple quantum algorithms.												
To analyze quantum information processing.												
To develop quantum cryptography.												
To understand quantum information theory.												
<b>Course Outcomes:</b>												
<b>Upon successful completion of the course, the student will be able to:</b>												
CO1	Analyze the behavior of basic quantum algorithms.											
CO2	Implement simple quantum algorithms.											
CO3	Implement information channels in the quantum circuit model.											
CO4	Simulate a simple quantum error-correcting code.											
CO5	Prove basic facts about quantum information channels.											
<b>Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	3	3	2	--	3	--	--	--	--	--	--	--
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	--
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	--
<b>UNIT-1:Introduction: Quantum Measurements:Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.</b>												
<b>UNIT-2:Quantum Basics and Principles: Quantum Basics and Principles: No cloning theorem &amp; Quantum Teleportation, Bell’s inequality and its implications, Quantum Algorithms &amp; Circuits.</b>												
<b>UNIT-3:Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover’s Search Algorithm, Quantum Fourier Transform, Shore’s Factorization Algorithm.</b>												
<b>UNIT-4:Performance Security, and Scalability: Performance, Security, and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.</b>												
<b>Unit –V:Quantum Computing Models: 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.</b>												
<b>TEXTBOOKS:</b>												
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 the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt

3) V.K Sahni, Quantum Computing (with CD), TATA McGraw Hill.

#### **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).

5) P. Kok, B. Lovett, "Introduction to Optical Quantum Information Processing," Cambridge.

#### **E-RESOURCES:**

1. <https://www.javatpoint.com/deep-learning>

2. <https://towardsdatascience.com>

### Course Code-Data Visualization Techniques

<b>Lecture – Tutorial- Practical:: Credits:</b>	3-0-0 3	<b>Internal Marks:</b>	30									
		<b>External Marks:</b>	70									
<b>Prerequisites:</b> Computer Graphics, and Image Processing												
<b>Course Objectives:</b>												
<ul style="list-style-type: none"> <li>• To develop skills to both design and critique visualizations.</li> <li>• To introduce visual perception and core skills for visual analysis.</li> <li>• To understand visualization for time-series analysis.</li> <li>• To understand visualization for ranking analysis.</li> <li>• To understand visualization for deviation analysis.</li> <li>• To understand visualization for distribution analysis.</li> <li>• To understand visualization for correlation analysis.</li> <li>• To understand visualization for multivariate analysis.</li> </ul>												
<b>Course Outcomes:</b>												
<b>Upon successful completion of the course, the student will be able to:</b>												
CO1	Able to Identify and recognize visual perception and representation of data											
CO2	Able to Illustrate about projections of different views of objects.											
CO3	Apply various Interaction and visualization techniques											
CO4	Analyze various groups for visualization.											
CO5	Able to visualizations											
CO6	Able to understand the importance and applications of data visualization											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>												
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO1	-	2	2	-	2	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-
CO3	-	2	3	2	2	-	-	-	-	-	-	-
CO4	2	3	2	2	2	-	-	-	-	-	-	2
CO5	2	2	-	3	3	-	-	-	-	-	-	-
CO6	-	2	3	3	-	-	-	-	-	-	-	2
<b>UNIT I: INTRODUCTION TO DATA VISUALIZATIONS AND PERCEPTION:</b>												
Introduction of visual perception, visual representation of data, Gestalt principles, Information overload..												
<b>UNIT II : VISUAL REPRESENTATIONS.</b>												
Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications												
<b>UNIT III : CLASSIFICATION OF VISUALIZATION SYSTEMS</b>												
Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.												
<b>UNIT IV: VISUALIZATION OF GROUPS:</b>												
Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.												
<b>UNIT V : VISUALIZATION OF VOLUMETRIC DATA AND EVALUATION OF VISUALIZATIONS</b>												
Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information,												

GIS systems, collaborative visualizations, Evaluating visualizations

**TEXT BOOKS:**

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition, A K Peters, Ltd 2015

2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.

**1. Tamara Munzner, visualization analysis & design ,1st edition, ak peters visualization series 2014**

**2. Scott Murray, interactive data visualization for the web ,2nd edition, 2017**

**E-RESOURCES:**

1. <https://online.hbs.edu/blog/post/data-visualization-techniques>

2. <https://www.datapine.com/blog/data-visualization-techniques-concepts-and-methods/>

## DESIGN THINKING IN SOFTWARE DEVELOPMENT

<b>Lecture – Practical:</b>	<b>3-0-0</b>	<b>Internal Marks:</b>	30												
<b>Credits</b>	3	<b>External Marks:</b>	70												
<b>Prerequisites: None</b>															
<b>Course Objectives</b>															
<ol style="list-style-type: none"> <li>1. Study a problem from multiple perspectives</li> <li>2. Learn how to frame the design challenge properly.</li> <li>3. Learn how to ideate, prototype and Iterate solutions.</li> <li>4. Learn from the overall design process how to create value as entrepreneurs</li> <li>5. Learn how to design successful products or enterprises</li> </ol>															
<b>Course Outcomes</b>															
<b>Upon successful completion of the course, the student will be able to:</b>															
<b>CO1</b>	Explain the principles of design thinking and its approaches.														
<b>CO2</b>	Identify the empathy, define phases in human-centered design problems.														
<b>CO3</b>	Develop an idea, build a prototype and test in design thinking context.														
<b>CO4</b>	Apply design thinking techniques for product innovation.														
<b>CO5</b>	Use design thinking in business process models.														
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	3	3	2	3	3						-	2	2	--	--
CO2	2	3	3	2	2	2				2	2	3	2		3
CO3	3	3	3	3	3	2						2	--	3	3
CO4	3	2	3	2	3					2	2	2	2	--	--
CO5	3	3	3	1	-	2	1	1	-	2	-	2	--	3	--
<b>UNIT-1</b>															
<b>INTRODUCTION TO DESIGN THINKING:</b>															
An insight into Design, History of Design thinking, Importance of Design Thinking, Design thinking Vs Engineering thinking, Analysis Vs Synthesis, importance of Design thinking, Design Vs Design thinking, understanding Design thinking, Design Thinking Framework, Benefits of Design Thinking, Design Thinking – Applications															
<b>UNIT-2</b>															
<b>EMPATHIZE AND DEFINE PHASES IN DESIGN THINKING:</b> Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate. Role of Empathy in design thinking, methods and tools of															

empathy, understanding empathy tools. Explore define phase state users' needs and problems using empathy methods, The Define Stage in Design Thinking: Purpose & Importance

problem statement, how to define a meaningful problem statement

### UNIT-3

#### **IDEATION, PROTOTYPING AND TESTING PHASES IN DESIGN THINKING:**

Ideation methods, brain storming, advantages of brain storming, methods and tools of ideations, prototyping and methods of prototyping, user testing methods, Advantages and disadvantages of user Testing/ Validation

### UNIT-4

#### **THE RELEVANCE OF DESIGN THINKING IN SOFTWARE DEVELOPMENT**

**Agile Practices and Design Thinking:** History of Agile – Agile principles – Agile Vs Waterfall – Agile Methodology Overview- Agile frameworks, Design Thinking for software development, Agile vs design thinking: key differences, Mapping Agile and Design Thinking, Software Engineering with Agile Practices, Software Engineering with Design Thinking, Design thinking and Agile process model, Better Together

### UNIT-5

**Lean Fundamentals:** Five Principles of Lean Manufacturing, Lean principles for software development, Kanban and other Lean practices viz., Kanban for Software Development, Value Stream Mapping, Intro to Kaizen, Kaizen, the 5 Whys, Value Stream Mapping and Kaizen, Lean Startup Principles, Lean Startup, Learn Startup with Design Thinking, Design Thinking vs Agile vs Lean Startup, Design Thinking, Combine design thinking, lean startup, and agile

#### **Text Books**

1. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.
2. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School – Idris Mootee.
3. Change by design, Tim Brown, 2009, Harper Collins.
4. Design Thinking - The Guide Book – Facilitated by the Royal Civil Service Commission, Bhutan
5. Engineering design, George E Dieter, 4th Revised edition, 2009 McGraw Hill.

#### **Reference Books**

6. Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, First Edition, 2012, Wiley.
7. Human-Centered Design Toolkit: An Open-Source Toolkit to Inspire New Solutions in the Developing World, IDEO, Second Edition, 2011, IDEO.
8. Mauricio Vianna, Ysmar Vianna, Brenda Lucena and Beatriz Russo, "Design thinking: Business innovation", MJV Technologies and innovation press, 2011.
9. Design Thinking: Integrating Innovation, Customer Experience, and Brand Value by Thomas Lockwood (Editor) Published February 16th 2010 by Allworth Press.
10. Alistair Cockburn, "Agile Software Development", 2nd ed, Pearson Education, 2007.

#### **E-RESOURCES**

1. <https://www.interaction-design.org/literature/topics/design-thinking>
2. <https://www.interaction-design.org/literature/article/how-to-approach-an-empathy-based-design-thinking>



## Course Code: HighPerformanceComputing

<b>Lecture – Tutorial- Practical::</b>	3-0-0			<b>Internal Marks:</b>	30
<b>Credits:</b>	3			<b>External Marks:</b>	70

**Prerequisites:**

Computer Organization and Architecture or equivalent

**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- Learn and practice data modelling using the entity-relationship and developing database designs
- To master the basics of SQL and construct queries using SQL.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access
- Learn the concepts of transaction management and how they provide security and consistency
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Course Outcomes:**

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

CO1	Ability to define, understand the database management system structure
CO2	Ability to apply as relational algebra to find solutions to a broad range of queries.
CO3	Ability to create applications using various normal forms, functional dependencies, validating and identifying anomalies
CO4	Will be able to explain the principle of transaction management design.
CO5	Understands and applies indexing mechanisms in databases

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 1	PO 2	PO 3
CO1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO2	2	--	2	--	--	--	1	--	--	--	--	--	--	2	
CO3	2	--	2	2	--	--	--	--	--	--	---	--	--	2	
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2	2

## UNIT I :Modern Processors

Stored Program Computer Architecture- General purpose cache- based microprocessor-Performance based metrics and benchmarks- Moore's Law- Pipelining- Superscalarity-SIMD- Memory HierarchiesCache-mapping-prefetch- Multicoreprocessors-Mutithreaded processors- Vector Processors- Design Principles- Maximum performance estimates-Programmingforvectorarchitecture

## UNIT II:Basicoptimizationtechniquesforserialcode

scalar profiling- function and line based runtime profiling- hardware performance counters- common sense optimizations- simple measures, large impact- elimination of common subexpressions- avoiding branches- using simd instruction sets- the role of compilers - general optimization options- inlining - aliasing- computational accuracy- register optimizations- using compiler logs- c++ optimizations - temporaries- dynamic memory management- loop kernels and iterators data access optimization: balance analysis and light speed estimates- storage order- case study: jacobi algorithm and dense matrix transpose.

## UNIT III:Parallel Computers

Taxonomy of parallel computing paradigms- Shared memory computers- Cache coherence- UMA - ccNUMA- Distributed-memory computers- Hierarchical systems- Networks- Basic performance characteristics- Buses- Switched and fat- tree networks- Mesh networks- Hybrids - Basics of parallelization - Why parallelize - Data Parallelism - Function Parallelism- Parallel Scalability- Factors that limit parallel execution- Scalability metrics- Simple scalability laws- parallel efficiency - serial performance Vs Strong scalability- Refined performance models- Choosing the right scaling baseline- Case Study: Can slow processors compute faster- Load balance.

## UNIT IV: Distributed memory parallel programming with MPI

Message passing - introduction to MPI – example - messages and point-to-point communication - collective communication – nonblocking point-to-point communication- virtual topologies - MPI parallelization of Jacobi solver- MPI implementation - performance properties

## UNIT V:Efficient MPI programming

MPI performance tools- communication parameters- Synchronization, serialization, contention- Reducingcommunication overhead- optimal domain decomposition- Aggregating messages – Nonblocking Vs Asynchronous communication- Collective communication- Understanding intra-node point-to-point communication

## TEXT BOOKS:

GeorgHager, GerhardWellein, IntroductiontoHighPerformanceComputingforScientists and Engineers, Chapman & Hall / CRC Computational Science series, 2011

## REFERENCE BOOKS:

1. CharlesSeverance, KevinDowd, HighPerformanceComputing, O'ReillyMedia, 2ndEdition, 1998.
2. KaiHwang, FayeAlayeBriggs, ComputerArchitectureandParallelProcessing, McGrawHill, 1984.

## E-RESOURCES:

<https://www.geeksforgeeks.org/high-performance-computing/>

<https://www.ibm.com/topics/hpc>

**Course Code: Smart System and Design**

<b>Lecture – Tutorial- Practical::</b>	3-0-0				<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70

**Prerequisites: Smart System and Design**

None

**Course Objectives:**

- Understand the basic concepts of IoT and device connectivity.
- Acquire knowledge in Real time data logging and data analytics on cloud.
- Explore the potential areas utilizing embedded controllers/processors in real time systems.

**Course Outcomes:**

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

CO1	Understand internet of Things and its hardware and software components
CO2	Interface I/O devices, sensors & communication modules
CO3	Examine remote data and control devices
CO4	Compare the connectivity technologies and protocols in IOT
CO5	Infer Security issues in IOT

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	2	2	3	1	1	1	1	2	2	3	--	--	
CO2	3	2	2	2	2	2	2	1	2	1	2	2	--	2	
CO3	3	1	2	1	--	--	--	--	--	--	---	--	--	2	
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2	2

**UNIT I: Introduction to IoT**

Introduction - User Experience design for IoT - Technology of Connected Devices - Networks : Technology of connectivity - Security and Privacy Issues

**UNIT II: Smart Home**

Automating the Home - Smart Steps to Smart Home - Components for Smart Home - Smart Network - Controlling Smart Homes - Interfacing ESP8266 and Relay board - Blynk App - Arduino and libraries installation - IFTTT Applet - Case Study : Smarter Sensing with smart monitors - Smarter Protection with smart security systems - Smarter heating and cooling with smart thermostat.

### **UNIT III:Wearable Tech**

Wearables: Fundamentals, Advancement and roadmap for future - Smart Watches, Fitness Trackers, Smart Eyewear - wearable bio and chemical sensors - wearable inertial sensors and applications - Architecture & pin diagram for Arduino - Interacting with Analog & Digital sensors - Dealing with personal data - Monitoring sensor data from cloud platform - Controlling actuator from IoT Cloud platform - Case Study : application of optical heart rate monitoring - wearable IoT enabled real time Health monitoring system.

### **UNIT IV: Health Care**

Internet of Medical Things - Smart Medical Devices and Monitoring - Smart Hospitals - Smart Medical records - Insight to Raspberry Pi and Preparing Raspberry Pi board - GPIO Configuration - Programming Raspberry Pi, Internal & External representation of sensor data - parsing sensor data on import - displaying measured information on IoT Cloud platform - Controlling actuator from IoT Cloud platform - Triggering event notification - CoAP Communication - Other Communications - Case Study : Patient Record in Mobile App.

### **UNIT V:Smart Farming**

Agricultural Internet of Things - Environmental and climatic change - Role of Arduino and Node MCU in agricultural field - interfacing with external devices - development of local web server for automation - labview / Matlab based data logger for agricultural field parameters monitoring system - Case study : Smart control for site specific management of fixed irrigation system - scilab based data logger for plant protection from fire in agriculture field - smart greenhouse monitoring system for flower plant growth.

### **TEXT BOOKS:**

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes and Smart Cities are changing the world", 2015, ISBN-13 : 978-0789754004
2. Edward Sazonov, Michael R. Neuman, "Wearable Sensors: Fundamentals, Implementation and Applications", Academic Press/Elsevier, 2014, ISBN 978-0124186620.

### **REFERENCE BOOKS:**

1. Perry Lea, "Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security", Packt Publishing Limited, January 2018, ISBN-13 : 978-1788470599
2. Marco Schwartz, "Internet of Things with ESP8266", Packt Publishing Ltd, 2016, ISBN-13 : 978-1786468024.
3. Cuno Pfister , "Getting Started with the Internet of Things", Shroff; First edition-2015, ISBN-13 : 978-9350234136.

### **E-RESOURCES:**

1. <https://www.coursera.org/specializations/iot>
2. <https://www.edx.org/course/introduction-to-the-internet-of-things-iot>



**Course Code: Visual Analytics**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: Fundamentals of Data Visualization, Knowledge of Tableau/Power BI**

**Course Objectives:**

- To understand the various types of data.
- To apply and evaluate the principles of data visualization.
- To use visualization techniques for a problem and its associated dataset.
- To apply a structured approach to create compelling visualizations
- To build a visualization dashboard to support decision-making.

**Course Outcomes:**

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

CO1	Identify the different data types and visualization types to bring out the insight. Then, relate the visualization to the problem based on the dataset.
CO2	Analyze the different attributes and showcase them in plots. Identify and create various visualizations for geospatial and table data.
CO3	Ability to visualize categorical, quantitative, and text data.
CO4	Develop diverse types of visual analytics.
CO5	Design a visualization dashboard to support the decision-making on large-scale data.

**Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	--	3	--	--	--	--	--	--	--
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	--
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	--

**UNIT-1: Introduction to Data Visualization: Overview of data visualization - Data Abstraction - Analysis: Four Levels for Validation- Task Abstraction - Analysis: Four Levels for Validation**

**UNIT-2: Visualization Techniques: Scalar and point techniques, Color maps, Contouring Height Plots - Vector visualization techniques, Vector properties, Vector Glyphs, Vector Color Coding Stream Objects.**

**UNIT-3: Visual Analytics: Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View, Arrange Tables Geo-Spatial data Reduce Items and Attributes.**

**UNIT-4: Diverse types of visual Analytics: Time- Series data visualization, Text data visualization, Multivariate data visualization, and case studies.**

**Unit –5: Visualization Dashboard Creation: Dashboard creation using visualization tools for the use cases: Finance-marketing-insurance- healthcare etc.,**

**TEXTBOOKS:**

1. Tamara Munzer, Visualization Analysis and Design -, CRC Press 2014 AlexandruTelea, Data Visualization Principles and Practice CRC Press 2014.
2. 2 Paul J. Deitel, Harvey Deitel, Java SE8 for Programmers (Deitel Developer Series) 3rd Edition, 2014.
3. 3 Y. Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition, Pearson Ltd 2015

**REFERENCES:**

1. Paul Deitel Harvey Deitel, Java, How to Program, Prentice Hall; 9th edition, 2011.
2. 2. Cay Horstman BIG JAVA, 4th edition, John Wiley Sons, 2009

3. 3. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.

**E-RESOURCES:**

1. <https://www.javatpoint.com>

2. <https://towardsdatascience.com>

**Course Title: Data Mining and Data Warehousing**

<b>Lecture – Practical:</b>	3-0-0	<b>Internal Marks:</b>	30												
<b>Credits</b>	3	<b>External Marks:</b>	70												
<b>Prerequisites: Data Structures</b>															
<b>Course Objectives</b>															
The objective of this course is to provide knowledge of techniques and strategies to create and use the data warehouses, to understand, learn different data mining techniques and to understand the applicability of these techniques.															
<b>Course Outcomes</b>															
<b>Upon successful completion of the course, the student will be able to:</b>															
CO1	Understand the basic concepts of warehousing and data preprocessing techniques														
CO2	Derive various interesting patterns and associations in datasets.														
CO3	Design and develop classifier models to predict future trends.														
CO4	Apply unsupervised learning techniques for a given application.														
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>															
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	-	-	-	3	-	-	-	-	-	-	-	2	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	-	3	2	-	-	-	-	-	-	2	2	2	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	-	2	3
<b>UNIT I: DATA WAREHOUSING AND BUSINESS ANALYSIS</b>															
Data Warehouse and Online Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling: Data cube and OLAP, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction. Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.															
<b>UNIT II: DATA MINING OVERVIEW AND ADVANCED PATTERN MINING</b>															
Data Mining Introduction: Introduction, Why Data Mining, kinds of Data that can be mined, Patterns that can be Mined, technologies where it can be used, major issues in data Mining. <b>Mining Frequent Patterns, Associations, and Correlations:</b> Basic Concepts, Frequent Item-set Mining Methods. (Apriori and FP growth algorithms)															
<b>UNIT III: CLASSIFICATION AND PREDICTION</b>															
Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines															
<b>UNIT IV: CLUSTERING ANALYSIS</b>															
Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN & OPTICS, introduction to outlier analysis															
<b>UNIT V: WEB AND TEXT MINING</b>															
Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Introduction, web mining, web content mining, web structure mining, web usage mining, Text mining, unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.															
<b>Text Books</b>															



[1]. Jiawei Han and Micheline Kamber, -Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012

**REFERENCE BOOKS:**

[1]. G.K. Gupta, -Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006

[2]. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, -Introduction to Data Mining, Second Edition Pearson Education, 2016

[3]. K.P. Soman, Shyam Diwakar and V. Ajay -Insight into Data mining Theory and Practice, Easter Economy Edition, Prentice Hall of India, 2006

**E-RESOURCES**

Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka

(2017) <https://www.youtube.com/watch?v=J326LIUrZM8&t=4s>

How Artificial Neural Network (ANN) Algorithm Work | Data Mining | Introduction To Neural

Network (2016) <https://www.youtube.com/watch?v=fwnaijgpih>.

### Course Code-Predictive Analytics

<b>Lecture – Tutorial- Practical::</b>		3	0	0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3				<b>External Marks:</b>	70

**Prerequisites:**

A strong mathematical background in probability and statistics, Proficiency with algorithms

**Course Objectives:**

- To learn the fundamental principles of analytics for business
- To visualize and explore data to better understand relationships among variables
- To understand the principles and techniques for predictive modeling
- To examine how predictive analytics can be used in decision making
- To apply predictive models to generate predictions for new data

**Course Outcomes:**

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

CO1	Understand the importance of predictive analytics
CO2	Able to prepare and process data for the models
CO3	Learn about statistical analysis techniques used in predictive models
CO4	Apply regression and classification model on applications for decision making and evaluate the performance
CO5	Build and apply time series forecasting models in a variety of business contexts

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	-		-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2		-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	2		-	-	-	-	-	-	-	3	3	-
CO4	3	3	2	2		-	-	-	-	-	-	-	2	3	-
CO5	3	2	2	2		-	-	-	-	-	-	-	3	2	-

**UNIT I :**

**Introduction:** Introduction to predictive analytics –Business analytics: types, applications-Models: predictive models –descriptive models –decision models -applications -analytical techniques

**Understanding Data:**Data types and associated techniques –complexities of data –data preparation, pre-processing –exploratory data analysis

**UNIT II:**

**Principles and Techniques:** Predictive modeling: Propensity models, cluster models, collaborative filtering, applications and limitations - Statistical analysis: Uni-variate Statistical analysis, Multivariate Statistical analysis

**UNIT III:**

**Model Selection:** Preparing to model the data: supervised versus unsupervised methods, statistical and data mining methodology, cross-validation, overfitting, bias-variance trade-off, balancing the training dataset, establishing baseline performance.

**UNIT IV:**

**Regression Models:** Measuring Performance in Regression Models -Linear Regression and Its Cousins -Non-Linear Regression Models - Regression Trees and Rule-Based Models Case Study: Compressive Strength of Concrete Mixtures

**UNIT V:**

**Classification Models:** Measuring Performance in Classification Models -Discriminant Analysis and Other Linear Classification Models - Non-Linear Classification Models - Classification Trees and Rule-Based Models – Model Evaluation Techniques

**Time Series Analysis:** Time series Model: ARMA, ARIMA, ARFIMA -Temporal mining -Box Jenkinson method, temporal reasoning, temporal constraint networks

**TEXT BOOKS:**

1. Jeffrey Strickland, Predictive analytics using R, Simulation educators, Colorado Springs, 2015
2. Max Kuhn and Kjell Johnson, Applied Predictive Modeling, 1st edition Springer, 2013

**REFERENCE BOOKS:**

1. Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive analytics for dummies, 2nd edition Wiley, 2016
2. Dinov, ID., Data Science and Predictive Analytics: Biomedical and Health Applications using R, Springer, 2018.
3. Daniel T.Larose and Chantal D.Larose, Data Mining and Predictive analytics, 2nd edition Wiley, 2015.

**E-RESOURCES:**

1. [https://kupdf.net/download/predictive-analytics-using-r\\_58c8d271ee34353a2ee0f0f8\\_pdf](https://kupdf.net/download/predictive-analytics-using-r_58c8d271ee34353a2ee0f0f8_pdf)
2. [https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-max-kuhn-kjell-johnson\\_1518.pdf](https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-max-kuhn-kjell-johnson_1518.pdf)
3. <https://cseweb.ucsd.edu/~elkan/255/dm.pdf>

### Course Code-Distributed Systems

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: C- Programming, Data Structures, Statistics fundamentals**

**Course Objectives:**

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

**Course Outcomes:**

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

CO1	Elucidate the foundations and issues of distributed system.
CO2	Illustrate the various synchronization issues and global state for distributed systems
CO3	Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
CO4	Describe the agreement protocols and fault tolerance mechanisms in distributed systems
CO5	Describe the features of peer-to-peer and distributed shared memory systems

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	--	3	--	--	--	--	--	--	
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	

**UNIT-1: Distributed Systems:** Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges, **A model of distributed computations:** A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications. **Logical Time:** A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

**UNIT-2: Message Ordering & Snapshots:** Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

**UNIT-3:Distributed Mutex & Deadlock:** Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart-Agrawala algorithm – Maekawa’s algorithm – Suzuki–Kasami’s broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp’s classification – Algorithms for the single resource model, the AND model and the OR model.

**UNIT-4:Recovery & Consensus:** Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

**UNIT-5: Peer-to-peer computing and overlay graphs:** Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry.

**Distributed shared memory:** Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

**TEXT BOOKS:**

- 1.Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
- 2.Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

**REFERENCE BOOKS:**

- 1.Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
- 2.Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
- 3.Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.

**e-Resources:**

2. <https://nptel.ac.in>
3. [https://onlinecourses.nptel.ac.in/noc21\\_cs87/preview](https://onlinecourses.nptel.ac.in/noc21_cs87/preview)

**Course Code- Social Networking and Semantics**

<b>Lecture-Tutorial- Practical::</b>	<b>3-0-0</b>				<b>Internal Marks:</b>	<b>30</b>
<b>Credits:</b>	<b>3</b>				<b>External Marks:</b>	<b>70</b>

**Prerequisites:**

- 1. Knowledge in Networks**
- 2. Knowledge in distributed databases.**

**Course Objectives:**

- To learn Web Intelligence**
- To learn Knowledge Representation for the Semantic Web**
- To learn Ontology Engineering**
- To learn Semantic Web Applications, Services and Technology**
- To learn Social Network Analysis and semantic web**

**Course Outcomes:**

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

<b>CO1</b>	Understand the basics of Semantic Web and Social Networks.
<b>CO2</b>	Ability to understand and knowledge representation for the semantic web.
<b>CO3</b>	Learn the various semantic web applications.
<b>CO4</b>	Ability to create ontology.
<b>CO5</b>	Ability to build a blogs and social networks.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PS O1</b>	<b>PS O2</b>	<b>PS O 3</b>
<b>CO1</b>	3	3	2	2	-	-	-	-	-	-	-	-			
<b>CO2</b>	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2
<b>CO3</b>	3	2	3	2	-	-	-	-	-	-	-	3	3	2	3
<b>CO4</b>	3	2	3	2	-	-	-	-	-	-	-	3	3	2	3
<b>CO5</b>	3	2	3	2	-	-	-	-	-	-	-	3	3	2	3

**UNIT I :**

Introduction to the Semantic Web and Social Networks:

The Semantic Web- Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

Social Network Analysis- What is network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis.

**UNIT II:**

Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's

Web, The Next Generation Web. Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

**UNIT III:**

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL),UML,XML/XML Schema. Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping.

**UNIT IV:**

Logic, Rule and Inference Engines. Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base .

XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

**UNIT V:**

What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks.

Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features

**TEXT BOOKS:**

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley interscience,2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer,2007

**REFERENCE BOOKS:**

- 1.Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, Rudi Studer, Paul Warren, John Wiley & Sons.
- 2.Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
- 3.Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
- 4.Programming the Semantic W eb, T.Segaran, C.Evans, J.Taylor,O'Reilly, SPD.

**E-RESOURCES:**

1. <https://www.semanticscholar.org/>
2. <https://info.sice.indiana.edu/>



**Course Code: Computer vision**

<b>Lecture</b>	3	<b>Internal Marks:</b>	30
<b>Tutorial</b>	0		
<b>Credits</b>	3	<b>External Marks:</b>	70

**Course Objectives:**

- To build an understanding on detailed models of image formation
- To expose the students to image feature detection and matching.
- To introduce fundamental algorithms for pattern recognition
- To introduce various classification techniques
- To expose the students to various structural pattern recognition and feature extraction techniques.

**Course Outcomes:**

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

CO1	Students should be able to appreciate the detailed models of image formation.
CO2	Analyse the techniques for image feature detection and matching.
CO3	Apply various algorithms for pattern recognition.
CO4	Examine various clustering algorithms.
CO5	Analyse structural pattern recognition and feature extraction techniques.

**Contribution of Course Outcomes towards achievement of Program**

**Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	–	–	–	–	–	–	–	–	–	–	–
CO2	2	–	–	–	–	–	–	–	–	–	–	–
CO3	2	–	2	–	–	–	–	–	–	–	–	–
CO4	2	2	2	–	–	–	–	–	–	–	–	2
CO5	2	–	–	–	2	–	–	–	–	–	–	2

**UNIT I**

Image formation and Image model- Components of a vision system- Cameras- camera model and camera calibration- Radiometry- Light in space- Light in surface- Sources, shadows and shading. Multiple images- The Geometry of multiple views- Stereopsis- Affine structure from motion- Elements of Affine Geometry Affine structure and motion from two images- Affine structure and motion from multiple images- From Affine to Euclidean images.

**UNIT II**

High level vision- Geometric methods- Model based vision- Obtaining hypothesis by pose consistency, pose clustering and using Invariants, Verification.

**UNIT III**

Introduction to pattern and classification, supervised and unsupervised learning, Clustering Vs classification, Bayesian Decision Theory- Minimum error rate classification Classifiers, discriminant functions, decision surfaces- The normal density and discriminant functions for the Normal density.

**UNIT IV**

**Lineardiscriminantbasedclassifiersandtreeclassifiers**

Lineardiscriminantfunctionbasedclassifiers-Perceptron-MinimumMean SquaredError(MME)method,SupportVectormachine,DecisionTrees: CART, ID3

**UNIT: V**

**Unsupervised Methods** Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures, K-means algorithm.

**RecentAdvancesinPatternRecognition** Neuralnetworkstructuresforpattern recognition, Pattern classification using Genetic Algorithms.

**TEXT BOOKS:**

1. Bernd Jahne and Horst HauBecker, Computer vision and Applications, Academic press, 2000.
2. David A. Forsyth & Jean Ponce, Computer vision – A Modern Approach, Prentice Hall, 2002.

**REFERENCE BOOKS:**

1. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. R.O.Duda,P.E.HartandD.G.Stork,PatternClassification,JohnWiley, 2001.
3. RichardHartleyandAndrewZisserman,MultipleViewGeometryinComputerVision,Second Edition, Cambridge University Press, 2004.
4. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

**E-RESOURCES:**

- 1.<https://towardsdatascience.com/everything-you-ever-wanted-to-know-about-computer-vision-heres-a-look-why-it-s-so-awesome-e8a58dfb641e>
- 2.<https://www.simplilearn.com/computer-vision-article>
- 3.<https://www.javatpoint.com/computer-vision>

**Course Code- Universal Human Values**

<b>Lecture – Tutorial- Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

**Prerequisites: NIL**

**Course Objectives:**

To help the student to see the need for developing a holistic perspective of life.

To sensitise the student about the scope of life – individual, family (inter-personal relationship), society and nature/existence Strengthening self-reflection.

To develop more confidence and commitment to understand, learn and act accordingly.

**Course Outcomes:**

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

CO1	Describe more aware of themselves, and their surroundings (family, society, nature)
CO2	Illustrate more responsibility in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind
CO3	Show better critical ability
CO4	Exhibit sensitivity to their commitment towards what they have understood (human values, human relationship and human society)
CO5	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

**Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	--	--	--	--	--	2	--	2	--	--	--	--
CO2	--	--	--	--	--	2	--	2	--	--	--	--
CO3	--	--	--	--	--	2	--	2	--	--	--	--
CO4	--	--	--	--	--	2	--	2	--	--	--	--
CO5	--	--	--	--	--	2	--	2	--	--	--	--

UNIT-1: Introduction - Need, Basic Guidelines, Content and Process for Value Education: pose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self- exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels

UNIT-2: Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health

UNIT-3: Understanding Harmony in the Family and Society- Harmony in HumanHuman Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co- existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

UNIT-4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence

Unit –V: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

**TEXTBOOKS:**

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

**REFERENCE BOOKS:**

Jeevan Vidya: Ek Parichaya by A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values by A.N.Tripathi, New Age Intl. Publishers, New Delhi, 2004.

The Story of Stuff (Book).

4. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi

# **FUNCTIONAL ENGLISH FOR 21<sup>st</sup> CENTURY LEARNING**

## **UNIT – I**

**NATURE OF TECHNICAL COMMUNICATION** – Introduction – The Process of Communication – Levels of Communication – The Flow of Communication – Importance of Technical Communication – Skills required for Communication – Barriers to Communication – Style in Technical Communication

## **UNIT – II**

**FUNCTIONAL GRAMMAR** – Major Tense forms – Active & Passive Voice – Reported Speech – Concord – Types of Sentences based on Clauses – Transformation of Sentences – Tag Questions – Connectives

## **UNIT – III**

**VERBAL COMMUNICATION** – Basics of Verbal Communication – Working with Customers – Formal Communication Skills – Informal Communication – Making Formal Presentations – Interviews – Group Discussions

**WRITTEN COMMUNICATION** – Techniques of Clear Writing – E-mail & Memo Writing, Developing Reports & Proposals, Writing for Employment, Professional Communication

## **UNIT – IV**

**21<sup>st</sup> CENTURY LEARNING SKILLS** – Critical Thinking – Creativity – Collaboration – Lateral Thinking – Disruptive Thinking – Decision Making

## **UNIT – V**

**21<sup>st</sup> CENTURY LITERACY AND LIFE SKILLS** – Information Literacy – Media Literacy – Technology Literacy – Flexibility – Leadership – Initiative – Productivity – Self Management

### **Books for Reference:**

1. Technical Communication – Principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Effective Communication Skills, Kulbushan Kumar, Khanna Publishing House, Delhi
3. Communication Skills, Pushpalata, Sanjay Kumar, Oxford University Press
4. Effective Technical Communication by M. Ashraf Rizvi
5. 21<sup>st</sup> Century Skills and Education, Rajak Anupam, LAP Lambert Academic Publishing
6. The Seven Habits of Highly Effective People, Stephen Covey, Robert Publishers

**Course Code- Data Science Lab**

<b>Lecture – Tutorial- Practical::</b>													<b>Internal Marks:</b>	15		
<b>Credits:</b>													<b>External Marks:</b>	35		
<b>Prerequisites: Linear Algebra, Descriptive Statistics, Python.</b>																
<b>Course Objectives: To learn various Summary, Descriptive, Supervised, Unsupervised, and Reinforcement Machine learning techniques and their outcomes.</b>																
<b>Course Outcomes:</b>																
<b>Upon successful completion of the course, the student will be able to:</b>																
CO1	Able to Implement Descriptive Statistics and Correlation.															
CO2	Able to generate E.D.A and visualize plots.															
CO3	Able to build Several Classification Models.															
CO4	Able to implement Various Regression Models.															
CO5	Able to Implement Collaborative Filtering and Q-Learning approach.															
<b>Contribution of Course Outcomes towards the achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>																
	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>				
CO1	3	1	1	1	1	1					1		1	1	3	
CO2	1	2	3	1	1						1		1	1	1	
CO3	1	1	3	1	1						1		3	3	1	
CO4	3	3	1	3	3	3					1		1	3	1	
CO5	3	3	1	3	3	3					1		1	3	1	
<b>List of Experiments</b>																

1. Implement Descriptive Statistics, Correlation.
2. Implement E.D.A., Scatter, and Distributed Plots.
3. Implement T-test and ANOVA.
4. Implement Decision tree and Random Forest Classifications.
5. Implement Support Vector and XG-Boost algorithms.
6. Implement Logistic Regression and Navie-Bayes Classifications.
7. Implement Linear and Multiple Regressions.
8. Implement Decision tree and Random Forest Regressions.
9. Implement Support Vector and Gradient Descent Regressions.
10. Implement LASSO and Ridge Regressions.
11. Implement Collaborative Filtering.
12. Implement Q-Learning.

#### **TEXT BOOKS:**

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”, PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O’Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013.
4. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012

#### **REFERENCE BOOKS**

- 1David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013

#### **E-RESOURCES**

- 2<https://nptel.ac.in/courses/106106179>

Offering Department	OE-1	OE-2	OE-3	OE-4
CSE	Data Structures	OOPS through C++	Database Management Systems	Artificial Intelligence
CSE	-	Software Engineering	-	Data Science

### OPEN ELECTIVE I- DATA STRUCTURES

<b>Lecture - Tutorial- Practical::</b>	2-0-2	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70

#### Prerequisites:

#### C- Programming

#### Course Objectives:

- 1 To impart basic knowledge of data structures.
  - 2 Be familiar with basic techniques of algorithm analysis
  - 3 Be familiar with writing recursive methods
  - 4 To understand concepts about searching and sorting techniques
  - 5 To design and implementation of various basic and advanced data structures like stacks, queues, lists, trees and graphs.
  - 6 To introduce various techniques for representation of the data in the real world.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

#### Course Outcomes:

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

C01	Ability to illustrate the concepts of algorithm apply the learning concepts to design data structure for the given problem definition.
C02	Ability to design applications using stacks and queues and implements various types of queues
C03	Analyze and implement operations on linked list and demonstrate their applications
C04	Ability to analyze and implement operations on trees
C05	Ability to demonstrate various operations on binary search trees and its applications
C06	Ability to evaluate the properties and operations on graphs and implement the graph



applications

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3
CO3	3	2	3	2	-	-	-	-	-	-	-	3
CO4	3	2	3	2	-	-	-	-	-	-	-	3
CO5	3	2	3	2	-	-	-	-	-	-	-	3
CO6	3	2	3	2	-	-	-	-	-	-	-	3

**UNIT I : Data Structures, Recursion, Searching, and Sorting.**

**Data Structures:** Definition, Types of Data Structures, Arrays, structures, self-referential structures, Operations, Algorithm analysis Time Complexity and Space Complexity.

**Recursion:** Definition, Linear and Binary recursions, Iteration vs. Recursion.

**Searching:** Linear Search, Binary Search.

**Sorting:** Basic concepts, Divide-and-Conquer approach, Insertion Sort, Merge Sort, Quick Sort, and Heap Sort.

**UNIT II: Linked Lists, Stacks, and Queues.**

**Linked Lists:** Introduction, types of Linked Lists, operations, inserting a node in Single Linked List, deleting a node in Single Linked List, searching a node in Single Linked List, inserting, deleting, and searching a node in Double Linked List.

**UNIT III: Stacks and Queues**

**Stacks:** Introduction, operations, applications, Stacks implementation using Arrays, Stacks implementation using Linked List, Expression Conversion: Infix to Postfix, Infix to Prefix.

**Queues:** Introduction, operations, applications, Queues implementation using Arrays, Queues implementation using Linked Lists, Circular Queue. Priority Queues

**UNIT IV: Trees.**

Basic Tree Concepts, Terminology, operations, Tree traversals, **Binary Trees:** definition, properties, Binary Tree representations, operations, **Binary Search Tree:** definition, properties, applications, Inserting, Deleting, and Searching element in Binary Search Tree,

**Threaded Binary Tree:** definition, properties, Inserting a Node into a Threaded Binary Tree,

**Heaps:** Definition of a Max Heap, properties.

**UNIT V: Graphs.**

**Graphs:** Introduction, Terminology, Representation of graphs, types of graphs, applications, operations, Graph transversal techniques: Breadth First Search (BFS), Depth First Search (DFS), implementations. **Minimum Spanning Tree (MST):** definition, Prim's algorithm, Kruskal's algorithm, **Shortest paths:** Basic Concepts, Dijkstra's algorithm

**TEXT BOOKS:**

1. Fundamentals of DATA STRUCTURES in C, Horowitz,Sartaj Sahani, Susan Anderson – Freed, University Press

2.Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage

**REFERENCE BOOKS:**

1. Data Structures using C, 2<sup>nd</sup> Edition, by A. K. Sharma, Pearson India
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Data Structures and Algorithms, 2008, G.A.V.Pai, TMH
4. DATA STRUCTURE USING C, [Udit Agarwal](#), KATSON Books
5. Data Structures using C, Reema Thareja, Oxford

#### **E-RESOURCES:**

1. [https://en.wikipedia.org/wiki/Data\\_structure](https://en.wikipedia.org/wiki/Data_structure)
2. [https://www.tutorialspoint.com/data\\_structures\\_algorithms/data\\_structures\\_basics](https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics)
3. <http://nptel.ac.in/courses/106103069/>

#### **List of Programs:**

1. Write a recursive C program to find the Factorial of an integer.
2. Write a recursive C program to calculate the GCD of two numbers
3. Write a non-recursive C program to implement Linear Search technique.
4. Write a non-recursive C program to implement Binary Search
5. Write C program that implement Insertion sort, to sort elements in an ascending order.
6. Write C program that implement Merge sort, to sort elements in an ascending order.
7. Write C program that implement Quick sort, to sort elements in an ascending order.
8. Write a C program to insert a node in a Single Linked List.
9. Write a C program to delete a node in a Single Linked List.
10. Write C program that implement Stack (its operations) using arrays.
11. Write C program that implement Queue (its operations) using arrays.



C04	3	2	-	-	-	-	-	-	-	-	-	2
C05	3	3	3	3	-	-	-	-	-	-	-	3

### UNIT I : Overview of C++,Classes and Objects.

**An Overview of C++:** The Origins of C++, Object Oriented Programming Concepts, Differences between Object-Oriented Programming and Procedure Oriented Programming, Advantage of OOP- Object Oriented Language, C++ fundamentals, The C++ Keywords, The General Form of a C++ Program

**Classes and Objects:** Classes & Methods, Friend Functions, Friend Classes, Inline Functions, Constructors, Destructors, Parameterized Constructors, Static Class Members, static Methods, Static Classes, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment

1. Create a class HUGEINT by which we would be able to use much wider range of integers. Perform addition operation on two HUGEINTs.
2. Create a Friend Function to sum two numbers of a class and Friend Class to perform other arithmetic operations.
3. Create a class TIME with appropriate data members to represent TIME. Construct a class implementation section to compare two TIMEs which return the later TIME, to increment TIME by one second, to decrement TIME by one second and appropriate constructors to create TIME objects and also implement destructor of TIME class.

### UNIT II: Arrays, Pointers, References and the Dynamic Allocation, Function and Operator Overloading.

**Arrays, Pointers, References and the Dynamic Allocation:** Arrays of Objects, Pointers, References, Dynamic Allocation Operators.

**Function Overloading:** Function Overloading, Overloading Constructor Functions, Copy Constructors, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity.

**Operator Overloading:** Creating Member Operator Function, Overloading Using a Friend Function, Overloading new delete, Overloading Special Operators & Comma Operator

1. Demonstrate Call by value, Call by address and Call by reference.
2. Create a class to demonstrate Function overloading.
3. Define Complex class. Allow possible operations on Complex by overloading operators (Arithmetic (+,-,\*) and unary '-').

### UNIT III: Inheritance

**Inheritance:** Base-Class Access Control, Inheritance and protected members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes.

### UNIT IV: Virtual Functions & Polymorphism, Templates

**Virtual Functions & Polymorphism:** Virtual Functions, The Virtual Attribute is inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early Vs Late Binding.

**Templates:** Generic Functions, Applying Generic Functions, Generic Classes, Type name

and export Keywords, Power of Templates.

1. Demonstrate all possible types of inheritance.
2. Calculate areas of various polygons demonstrating polymorphism.
3. Implement different types of stacks using Templates.

#### **UNIT V: Exception Handling, Introducing Standard Template Library.**

**Exception Handling:** Fundamentals, Derived-Class Exceptions, Exception Handling Options, Understanding terminate() and unexpected(), uncaught\_exception(), exception and bad\_exception Classes, Applying Exception Handling.

**Introducing Standard Template Library:** An Overview of STL

1. Demonstrate exception handling ( catch and catch all).
2. Demonstrate rethrowing of exceptions.
3. Write a Program to implement List and List Operations

#### **TEXT BOOKS:**

1. The Complete Reference - C++ - Herbert Schildt, 4/e, Tata McGraw Hill.
2. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

#### **REFERENCE BOOKS:**

1. Bjarne Stroustrup, "The C++ Programming Language", Special Edition, Pearson Education.
2. C++ - How to Program – Dietel&Dietel
3. Programming in C++ - Barkakati
4. Mastering C++ by Venugopal
5. A First Book of C++, Gary Bronson, Cengage Learning.

#### **E-RESOURCES:**

1. [https://swayam.gov.in/nd1\\_noc19\\_cs38/preview](https://swayam.gov.in/nd1_noc19_cs38/preview) ,
2. [https://swayam.gov.in/nd1\\_noc19\\_cs39/preview](https://swayam.gov.in/nd1_noc19_cs39/preview)
3. <https://www.w3schools.com/cpp/>
4. <http://www.cplusplus.com/doc/tutorial/>
5. <https://www.tutorialspoint.com/cplusplus/index.htm>
6. <https://www.guru99.com/cpp-tutorial.html>
7. <https://www.programiz.com/cpp-programming>

#### **List of Programs**

1. Write a program with constructor function and another for destruction function.
2. Write a program to explain function overloading with different number of arguments.
3. Write a program to explain function overloading with type, order, and sequence of arguments.
4. Write a program on overloading operator++
5. Write a program for overloading operator++ and operator—using friend functions.
6. Write a program to explain Single inheritance
7. Write a program to explain multiple inheritance
8. Write a program to explain virtual functions.

## SOFTWARE ENGINEERING

### (Open Elective-II)

<b>Lecture – Tutorial- Practical::</b>	3	0	0	<b>Internal Marks:</b>	3 0
<b>Credits:</b>	3			<b>External Marks:</b>	7 0

**Prerequisites:**

Programming and problem solving, General Aptitude

**Course Objectives:**

1. To study pioneer of Software Development Life Cycle, Development models and Agile Software development.
2. To study the concepts related to analysis, design concepts of software development
3. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
4. To discuss various software testing strategies viz., unit test; integration, regression, and system testing and validation testing
5. To learn the process of improve the quality of software work products.
6. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

**Course Outcomes:**

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

CO1	Understand the basic concepts of Software engineering and applications
CO2	Compare different software engineering process models
CO3	Analyze the principles of requirement Engineering
CO4	Create design models for software Engineering projects
CO5	Apply different testing techniques

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3
CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--
CO4	--	2	--	--	--	--	--	--	--	3	--	--	2	--
CO5	--	--	2	--	--	--	--	--	--	2	--	--	--	3

## UNIT I :

**Software and Software Engineering:** The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, The Essence of Practice, General Principles, Software Myths.

**The Software Process:** Software Engineering, Software Process, Generic process model, Prescriptive process model, specialized, unified process, Agile development, Agile Process, Extreme Programming, Other agile Process models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

## UNIT II:

**Agile Development:** Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.

**Principles that guide practice,** Software Engineering Knowledge, Principles That Guide Process, Principles That Guide Practice, Principles That Guide Each Framework Activity, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles

**Understanding Requirements:** Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

## UNIT III:

**Requirements Modeling:** Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

**Requirements Modeling:** Flow, Behavior, Patterns, And Web apps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirement modeling for WebApps.

## UNIT IV:

**Design Concepts:** Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

**Architectural Design:** Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs.

**Modeling Component-Level Design:** What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps.

**Performing User Interface Design:** The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

## UNIT V:

**Software Testing Strategies:** A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.

**Testing Conventional Applications:** Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.

## TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Ian Sommerville, "Software Engineering". 9th ed, Pearson Education. 2011.

## REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering". 2 ed, PHI. 2009
2. Rajib Mall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices", 2008.

## E-RESOURCES:

1. <http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf>
2. <http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf>
3. <http://sites.computer.org/ccse/SE2004Volume.pdf>
4. <http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF>
5. [http://www.dau.mil/pubs/pdf/SEFGuide\\_01-01.pdf](http://www.dau.mil/pubs/pdf/SEFGuide_01-01.pdf)
6. <https://nptel.ac.in/courses/106101061/2>
7. <https://nptel.ac.in/courses/106101061/5>

## DATA BASE MANAGEMENT SYSTEMS

<b>Lecture - Tutorial- Practical::</b>	3-0-0						<b>Internal Marks:</b>	30
<b>Credits:</b>	3						<b>External Marks:</b>	70

**Prerequisites:**

Basic Database, Data Structures, Mathematics

**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- Learn and practice data modelling using the entity-relationship and developing database designs
- To master the basics of SQL and construct queries using SQL.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access
- Learn the concepts of transaction management and how they provide security and consistency
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Course Outcomes:**

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

CO1	Ability to define, understand the database management system structure
CO2	Ability to apply as relational algebra to find solutions to a broad range of queries.
CO3	Ability to create applications using various normal forms, functional dependencies, validating and identifying anomalies
CO4	Will be able to explain the principle of transaction management design.
CO5	Understands and applies indexing mechanisms in databases

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	--	2	--	--	--	--	--	--	2	2	2
CO2	3	3	3	--	--	--	--	--	--	--	2	2	2	2
CO3	3	3	--	--	3	2	--	--	--	--	2	2	3	2
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2

**UNIT I :**

**DATABASE SYSTEM APPLICATIONS:**

Database System Applications, Purpose of Database Systems, File Systems versus a DBMS, View of Data – Data



Abstraction, Instances and Schemas, Data Models, Data Independence, Database Users and Administrators, 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:**

**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 AND CALCULUS:**

Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus.

**UNIT III:**

**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:**

**OVERVIEW OF TRANSACTION MANAGEMENT:**

The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

**CONCURRENCY CONTROL:**

Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

**CRASH RECOVERY:**

Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery.

**UNIT V:**

**OVERVIEW OF STORAGE AND INDEXING:**

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. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3<sup>rd</sup> Edition,2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant .Navathe,Pearson Education,2008.

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

**E-RESOURCES:**

- 1.<https://www.javatpoint.com/dbms-tutorial>
- 2.<https://www.tutorialspoint.com/dbms/index.htm>
- 3.<https://www.geeksforgeeks.org/dbms/>

**Course Code- Data Science**

<b>Lecture - Tutorial- Practical::</b>	3-0-0					<b>Internal Marks:</b>	0
<b>Credits:</b>	3					<b>External Marks:</b>	0

**Prerequisites:**

- Course Objectives:**
- Building the fundamentals of data science.
  - Imparting design thinking capability to build big-data
  - Developing design skills of models for big data problems
  - Gaining practical experience in programming tools for data sciences
  - Empowering students with tools and techniques used in data science

**Course Outcomes:**

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

C 1	Apply data visualisation in big-data analytics
C 2	Utilise EDA, inference and regression techniques
C 3	Utilize Matrix decomposition techniques to perform data analysis
C 4	Apply data pre-processing techniques
C 5	Apply Basic Machine Learning Algorithms

**Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
C 1	3	--	--	2	--	2	--	--	--	--	--	--	3	3	--
C 2	3	--	--	2	3	--	--	3	--	--	--	--	--	2	--
C 3	--	3	--	--	--	--	--	3	--	--	--	--	2	--	2
C 4	--	--	--	--	3	--	--	--	3	--	--	--	3	2	--
C 5	3	--	3	--	--	--	--	3	--	--	--	--	2	3	3

**UNIT I : Introduction to Data Science**

Big Data and Data Science - Big Data Analytics, Business intelligence vs Big data, big data frameworks, Current landscape of analytics, data visualisation techniques, visualisation software, Exploratory Data Analysis (EDA), statistical measures, Basic

tools (plots, graphs and summary statistics) of EDA, Data Analytics Lifecycle, Discovery

## **UNIT II: Basic Statistical Inference and Regression models**

Developing Initial Hypotheses, Identifying Potential Data Sources, EDA case study, testing hypotheses on means, proportions and variances, Regression models: Simple linear regression, least-squares principle, MLR, logistic regression, Multiple correlation, Partial correlation

## **UNIT III: Linear Algebra Basics**

Matrices to represent relations between data, Linear algebraic operations on matrices – Matrix decomposition: Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

## **UNIT IV: Data Pre-processing and Feature Selection**

Data cleaning - Data integration - Data Reduction - Data Transformation and Data Discretization, Feature Generation and Feature Selection, Feature Selection algorithms: Filters- Wrappers - Decision Trees - Random Forests

## **UNIT V: Basic Machine Learning Algorithms**

Classifiers - Decision tree - Naive Bayes - k-Nearest Neighbors (k-NN), k-means – SVM Association Rule mining – Ensemble methods

### **TEXT BOOKS:**

1. Mining of Massive Datasets. v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman., Cambridge University Press. (2019). (free online)
2. Big Data Analytics, paperback 2nd ed., Seema Acharya, Subhasini Chellappan, Wiley (2019).

### **REFERENCE BOOKS:**

1. Jacob T. VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Publications, 2016
2. Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
3. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
4. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
5. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.
6. Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014).
7. "Data Mining: Concepts and Techniques", Third Edition, 2 Jiawei Han, Micheline• Kamber and Jian Pei, ISBN 0123814790,(2011).
8. Big Data and Business Analytics, Jay Liebowitz, CRC press (2013)
9. Data mining methods, 24 nd edition, C. Rajan, Narosa (2016)

### **RESOURCES:**

www.NPTEL.com

**Course Title: Artificial Intelligence**

<b>Lecture–Tutorial–Practical::</b>	3-0-0	<b>Internal Marks:</b>	30
<b>Credits:</b>	3	<b>External Marks:</b>	70
<b>Prerequisites: None</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>To learn the difference between optimal reasoning vs human like reasoning</li> <li>To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities</li> <li>To learn different knowledge representation techniques</li> <li>To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing</li> </ul>			
<b>Course Outcomes:</b>			
<b>Upon Completion of the course, the students will be able to</b>			
CO1 Possess the ability to formulate an efficient problem space for a problem expressed in English.			
CO 2 Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.			
CO3 Possess the skill for representing knowledge using the appropriate technique			
CO4 Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing			
CO5 Apply the knowledge to develop the solutions for real life problems CO6 Develop new algorithms to contribute to the research arena			
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)</b>			

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2

**Unit–I**

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. Problem Solving –State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem,ExhaustiveSearches,HeuristicSearchTechniques,Iterative-DeepeningA\*,ConstraintSatisfaction

**UNIT II:**

LogicConceptsandLogicProgramming:Introduction,PropositionalCalculus,Propositional Logic,NaturalDeduction System, Resolution Refutation in Propositional Logic, Predicate Logic,Logic Programming. RepresentingKnowledgeUsingRules:Logicprogramming,ProceduralVsDeclarativeknowledge,Forward VsBackwardReasoning,Matching,ControlKnowledge

**UNIT III:**

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge RepresentationusingSemanticNetwork,ExtendedSemanticNetworksforKR, Knowledge Representation usingFrames,Conceptualdependencies,Scripts

**UNIT IV:**

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems;  
Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-space search–partial-order planning–planning graphs–planning and acting in the real world

**UNIT V:**

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools, Expert System Shells. AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog

**Text Book:**

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

**REFERENCE BOOKS:**

1. Artificial Intelligence, George FLuger, Pearson Education Publications
2. Artificial Intelligence: A modern Approach, Russell and Norvig, Prentice Hall
3. Artificial Intelligence, Robert Schalkoff, Mcgraw-Hill Publications
4. Artificial Intelligence and Machine Learning, Vinod Chandra S.S., Anand Hareendran S.

**E-RESOURCES**

1. [https://onlinecourses.nptel.ac.in/noc22\\_cs56/preview](https://onlinecourses.nptel.ac.in/noc22_cs56/preview)
2. <https://nptel.ac.in/courses/106105077>
3. <https://nptel.ac.in/courses/106102220>
4. [https://onlinecourses.nptel.ac.in/noc19\\_me71/preview](https://onlinecourses.nptel.ac.in/noc19_me71/preview)
5. <https://nptel.ac.in/courses/106106126>