



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

**DEPARTMENT OF CSE - COMPUTER SCIENCE AND DESIGN**

## **COURSE STRUCTURE AND SYLLABUS**

**For UG – R20**

**B. Tech - COMPUTER SCIENCE AND DESIGN**

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



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

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



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**DEPARTMENT OF CSE - COMPUTER SCIENCE AND DESIGN**

**COURSE STRUCTURE**

<b>I Year – I SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	HS1101	Communicative English	3	0	0	3
2	BS1101	Mathematics – I	3	0	0	3
3	BS1102	Applied Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving using C	3	0	0	3
5	ES1102	Design Drawing and Visualization	1	0	4	3
6	HS1102	English Communication Skills Laboratory	0	0	3	1.5
7	BS1103	Applied Chemistry Lab	0	0	3	1.5
8	ES1103	Programming for Problem Solving using C Lab	0	0	3	1.5
9	MC1101	Environmental Science*	2	0	0	0
<b>Total Credits</b>			<b>19.5</b>			

<b>I Year – II SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BS1201	Mathematics – II	3	0	0	3
2	BS1202	Applied Physics	3	0	0	3
3	ES1201	Digital Logic Design	3	0	0	3
4	ES1202	Python Programming	3	0	0	3
5	CS1201	Data Structures	3	0	0	3
6	BS1203	Applied Physics Lab	0	0	3	1.5
7	ES1203	Python Programming Lab	0	0	3	1.5
8	CS1202	Data Structures Lab	0	0	3	1.5
9	MC1201	Constitution of India *	2	0	0	0
<b>Total Credits</b>			<b>19.5</b>			

\*Internal Evaluation



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<b>II Year – I SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BS2101	Mathematics - III	3	0	0	3
2	CS2101	Mathematical Foundations of Computer Science	3	0	0	3
3	CS2102	Computer Graphics	3	0	0	3
4	CS2103	Multimedia and Application Development	3	0	0	3
5	CS2104	Database Management Systems	3	0	0	3
6	CS2105	Computer Graphics Lab	0	0	3	1.5
7	CS2106	Multimedia and Application Development Lab	0	0	3	1.5
8	CS2107	Database Management Systems Lab	0	0	3	1.5
9	SO2101	Mobile App Development	0	0	4	2
10	MC2101	Essence of Indian Tradition Knowledge	2	0	0	0
<b>Total Credits</b>			<b>21.5</b>			

<b>II Year – II SEMESTER</b>						
<b>S. No</b>	<b>Course Code</b>	<b>Courses</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BS2201	Probability and Statistics	3	0	0	3
2	CS2201	Computer Organization	3	0	0	3
3	CS2202	Data Warehousing and Mining	3	0	0	3
4	ES2201	Visual Design and Communication	3	0	0	3
5	HS2201	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS2203	Games Development Lab	0	0	3	1.5
7	CS2204	Data Mining using Python Lab	0	0	3	1.5
8	ES2202	Web Application Development Lab	0	0	3	1.5
9	SO2201	Digital Photography using Adobe Photoshop	0	0	4	2
<b>Total Credits</b>			<b>21.5</b>			
10	Minor	Human Computer Interaction	4	0	0	4



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<b>III B. Tech – I Semester</b>						
S.No	Course Code	Courses	Hours per week			Credits
			L	T	P	
1	PC	Compiler Design	3	0	0	3
2	PC	Operating Systems	3	0	0	3
3	PC	Human Computer Interaction	3	0	0	3
4	Open Elective/Job Oriented	<b>Open Elective-I</b> Open Electives offered by other departments/ Optimization in Operations Research(Job oriented course)	3	0	0	3
5	PE	<b>Professional Elective-I</b> 1. Software Engineering 2. Object Oriented Analysis and Design 3. DevOps 4. Internet of Things	3	0	0	3
6	PC	Operating Systems & Compiler Design Lab	0	0	3	1.5
7	PC	Human Computer Interaction Lab	0	0	3	1.5
8	SO	<b>Skill Oriented Course - III</b> 1. Animation course: Animation Design <b>OR</b> 2. Continuous Integration and Continuous Delivery using DevOps	0	0	4	2
9	MC	Employability Skills-I	2	0	0	0
10	PR	<b>Summer Internship 2 Months(Mandatory) after second year(to be evaluated during V semester</b>	0	0	0	1.5
<b>Total credits</b>						<b>21.5</b>
10	Minor	Visual Design and Communication	4	0	0	4



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<b>III B. Tech – II Semester</b>						
S.No	Course Code	Courses	Hours per week			Credits
			L	T	P	
1	PC	Computer Networks	3	0	0	3
2	PC	Computer Aided Design	3	0	0	3
3	PC	Design and Analysis of Algorithms	3	0	0	3
4	PE	<b>Professional Elective-II</b> 1. Deep Learning 2. Software Project Management 3. Distributed Systems 4. Network Programming	3	0	0	3
5	Open Elective/Job Oriented	<b>Open Elective-II</b> Open Electives offered by other departments/ MEAN Stack Development (Job Oriented Course)	3	0	0	3
6	PC	Computer Networks Lab	0	0	3	1.5
7	PC	Computer Aided Design Lab	0	0	3	1.5
8	PC	Algorithms for Efficient Coding Lab	0	0	3	1.5
9	SO	<b>Skill Oriented Course - IV</b> 1. Big Data: Spark <b>OR</b> 2. MEAN Stack Technologies- Module I-HTML 5, JavaScript, Node.js, Express.js and TypeScript	0	0	4	2
10	MC	Employability skills-II	2	0	0	0
<b>Total credits</b>						<b>21.5</b>
<b>Industrial/Research Internship(Mandatory) 2 Months during summer vacation</b>						
11	Minor	Computer Vision	4	0	0	4
<b>Minor courses through SWAYAM</b>			0	0	0	2



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<b>IV B. Tech –I Semester (Tentative)</b>						
S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	C
1	PE	<b>Professional Elective-III</b> 1. Reinforcement Learning 2. Nature Inspired Computing Techniques 3. Cryptography and Network Security 4. Block Chain Technologies	3	0	0	3
2	PE	<b>Professional Elective-IV</b> 1. Robotic Process Automation 2. Cloud Computing 3. Computer Vision 4. NOSQL Databases	3	0	0	3
3	PE	<b>Professional Elective-V</b> 1. Social Network Analysis 2. Recommender Systems 3. AI Chatbots 4. Data Visualization	3	0	0	3
4	Open Elective /Job Oriented	<b>Open Elective-III</b> Open Electives offered by other departments/ API and Microservices (Job Oriented Course)	3	0	0	3
5	Open Elective /Job Oriented	<b>Open Elective-IV</b> Open Electives offered by other departments/ Secure Coding Techniques (Job Oriented Course)	3	0	0	3
6	HS	Universal Human Values 2: Understanding Harmony	3	0	0	3
7	SO	1.Virtual Reality with Unity (Infosys Spring Board) <b>OR</b> 2.MEAN Stack Technologies-Module II-, Angular JS and MongoDB	0	0	4	2
8	PR	<b>Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester</b>	0	0	0	3
<b>Total credits</b>						<b>23</b>
9	Minor	Computer Aided Design	4	0	0	4
<b>Minor courses through SWAYAM</b>			0	0	0	2

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



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**Suggested Courses for MINOR Engineering in B.Tech. CSE- CSD**

**Eligibility for Minor in CSE-CSD:-**

**Note:**

1. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by CSE Department only), Student can register at any time after the completion of II B.Tech. I Sem.

S.No.	Subject Title	Credits
1	Human Computer Interaction	4
2	Visual Design and Communication	4
3	Computer Vision	4
4	Computer Aided Design	4
5	MOOCS Courses ** 1. Computer Graphics (NPTEL) <a href="https://nptel.ac.in/courses/106103224">https://nptel.ac.in/courses/106103224</a> 2. Design for Internet of Things(NPTEL) <a href="https://nptel.ac.in/courses/108108179">https://nptel.ac.in/courses/108108179</a> 3. Blockchain and its applications (NPTEL) <a href="https://nptel.ac.in/courses/106105235">https://nptel.ac.in/courses/106105235</a> 4. Design and Engineering of Computer Systems (NPTEL) <a href="https://nptel.ac.in/courses/106101234">https://nptel.ac.in/courses/106101234</a>	4
<b>Total</b>		<b>20</b>

\*\*Choose 02 MOOCS courses @ 2credits each from SWAYAM/NPTEL



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMMUNICATIVE ENGLISH (HS1101)</b>					

### Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

### Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

### Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

### Unit 1:

**Lesson-1: A Drawer full of happiness** from “**Infotech English**”, Maruthi Publications

**Lesson-2: Deliverance by Premchand** from “**The Individual Society**”, Pearson Publications. (Non-detailed)

**Listening:** Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.





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**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

**Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.

**Reading for Writing:** Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

**Vocabulary:** Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

**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.

**Pronunciation:** Vowels, Consonants, Plural markers and their realizations

**Unit 2:**

**Lesson-1: Nehru's letter to his daughter Indira on her birthday** from “**Infotech English**”, Maruthi Publications

**Lesson-2: Bosom Friend by Hira Bansode** from “**The Individual Society**”, Pearson Publications. (Non-detailed)

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

**Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

**Reading for Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

**Vocabulary:** Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

**Grammar:** Use of articles and zero article; prepositions.

**Pronunciation:** Past tense markers, word stress-di-syllabic words

**Unit 3:**

**Lesson-1: Stephen Hawking-Positivity 'Benchmark'** from “**Infotech English**”, Maruthi Publications

**Lesson-2: Shakespeare's Sister by Virginia Woolf** from “**The Individual Society**”, Pearson Publications. (Non-detailed)

**Listening:** Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

**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.

**Reading for Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

**Vocabulary:** Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20



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words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

**Grammar:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

**Pronunciation:** word stress-poly-syllabic words.

**Unit 4:**

**Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography** from “Infotech English”, Maruthi Publications

**Lesson-2: Telephone Conversation-Wole Soyinka** from “The Individual Society”, Pearson Publications.(Non-detailed)

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

**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.

**Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

**Grammar:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

**Pronunciation:** Contrastive Stress

**Unit 5:**

**Lesson-1: Stay Hungry-Stay foolish** from “Infotech English”, Maruthi Publications

**Lesson-2: Still I Rise by Maya Angelou** from “The Individual Society”, Pearson Publications.(Non-detailed)

**Listening:** Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

**Reading:** Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

**Reading for Writing:** Writing academic proposals- writing research articles: format and style.

**Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

**Grammar:** Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

**Pronunciation:** Stress in compound words

**Prescribed text books for theory for Semester-I:**

1. “Infotech English”, Maruthi Publications. (Detailed)

2. “The Individual Society”, Pearson Publications.(Non-detailed)



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**Prescribed text book for Laboratory for Semesters-I & II:**

1. “Infotech English”, Maruthi Publications. (with Compact Disc)

**Reference Books:**

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MATHEMATICS-I (BS1101)</b> <b>(Common to all Branch's for I Year B. Tech)</b>					

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

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

**UNIT – I: 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 – II: 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, Electrical circuits.

**UNIT – III: 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.

Applications: LCR circuit, Simple Harmonic motion.

**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 method.



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**UNIT – V: Multiple integrals:**

**(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, 2017.
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 Tury, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.



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	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>APPLIED CHEMISTRY (BS1102)</b>				

**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

**UNIT I: POLYMER TECHNOLOGY**

**8 hrs**

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

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

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

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

**Course Outcomes:** At the end of this unit, the students will be able to

- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

**UNIT II: ELECTROCHEMICAL CELLS AND CORROSION**

**10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H<sub>2</sub>-O<sub>2</sub>, CH<sub>3</sub>OH-O<sub>2</sub>, phosphoric acid and molten carbonate).

**Corrosion:-** Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

**Course Outcomes:** At the end of this unit, the students will be able to

- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

**UNIT III: MATERIAL CHEMISTRY**

**10 hrs**

Part I: Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).



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Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II: Nano materials:- Introduction, sol-gel method, characterization by (BrunauerEmmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

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

**Course Outcomes:** At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

**UNIT IV: SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES**  
**10 hrs**

**Part A: SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of  $sp$ ,  $sp^2$ ,  $sp^3$  and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

**Part B: 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.

**Course Outcomes:** At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

**UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY**

**8 hrs**

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

**Course Outcomes:** At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

**Text Books:**

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, DhanpatRai& Sons, Delhi, (Latest edition).
2. ShikhaAgarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand& Co, (2010).
4. ShashiChawla, “Engineering Chemistry”, DhanpatRaiPublishing Co. (Latest edition).

**Reference Books:**

1. K. SeshMaheshwaramma and MridulaChugh, “Engineering Chemistry”, Pearson India Edn, 2016.
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited, 2009.
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York, 2018.
4. B. S. Murthy, P. Shankar and others, “Textbook of Nanoscience and Nanotechnology”, University press , 2013.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
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**DEPARTMENT OF CSE - COMPUTER SCIENCE AND DESIGN**

<b>I Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101)</b>					

**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. To learn about 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 the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

**UNIT I**

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

**UNIT II**

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

**UNIT III**

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.





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**UNIT IV**

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

Processor Commands: Processor Commands.

**UNIT V**

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter- Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

**Text Books:**

- 1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE, 2019 .
- 2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson, 2015.

**Reference Books:**

- 1) Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill, 2018.
- 2) Programming in C, Ashok N. Kamthane, AmitKamthane, 3rd Ed, Pearson, 2015.
- 3) Computer Fundamentals and Programming in C, PradipDey, ManasGhosh, OXFORD, 2013.



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<b>I Year - I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>
<b>DESIGN DRAWING AND VISUALIZATION (ES1102)</b>				

**Course Outcomes:**

- Students will develop the skill & ability to observe and visually represent all the elements in their environment.
- Students will inculcate skills and develop the ability to explain the importance of precision in design through drawings using instruments/tools and concept of geometrical forms.
- Students will develop the ability to discuss orthographic projections of forms through Technical Drawings and Isometric Views of forms through Analytical Drawings and use these as a tool for visual understanding and visual representation.
- Students will develop the ability to analyse visual structure of 3D forms on 2D surfaces with an understanding of spatial concepts
- Students will develop the ability to analyse complex images and in turn develop the ability to visualise concepts, create mental imageries and articulate them visually.

**UNIT-I**

**INTRODUCTION TO DESIGN DRAWING:** Introduction to Materials, Tools & Methods, Introduction to Observation, Introduction to Perception, Introduction to Perspective – Eye level, Vanishing Point

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles. Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves. Scales: Plain scales, diagonal scales and vernier scales

**UNIT-II**

**DRAWING OF CUBES and PERSPECTIVES :** Introduction to Vanishing Points, View Point, Eye Level, Horizon, Parallel & Converging Lines, One Point Perspective, Two Point Perspective. Three Point Perspective, Perspective in the Environment, Interior Spaces and Objects.

**OBJECT DRAWING :** Introduction to other geometric forms like cylinder, cuboids etc Introduction to Object Drawing, How to observe – shape, proportions, effect of light on the objects etc.

**UNIT-III**

**PROJECTION DRAWINGS :** Orthographic Projection of Planes and Solids, Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces Projections of Solids Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

**UNIT-IV**

**ANALYTICAL DRAWING :** Isometric Projection, Architectonic Drawing

**ANALYTICAL DRAWING CONT'D :** Isometric Circles. Architectonic Planes with rounded surfaces, tube with square cross section with ellipse at different planes and tube with circular cross-section.



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**UNIT-V**

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Visualization using AutoCAD:** Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

**Text Books:**

1. Engineering Drawing by N.D. Bhatt, Chariot Publications, 2011.
2. Engineering Drawing by Agarwal&Agarwal, 2nd ed, Tata McGraw Hill Publishers, 2013.
3. Erik Olofsson, KlaraSjolen, Design Sketching, 3rd ed, KEEOS Design Books, 2007.
4. K .Morling, Geometric and Engineering Drawing, Third Edition, Graduate of the Institution of Mechanical Engineers, SI Units, Elsevier, 2010.

**References:**

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers, 3rd ed, 2011.
2. Engineering Graphics for Degree by K.C. John, PHIPublishers, 2009.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers, 2013.
4. Engineering Drawing + AutoCad K Venugopal, V. Prabhu Raja, New Age, 2010.
5. KoosEissen, RoselienSteur, Sketching: The Basics, BIS Publishers, 2011.



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<b>I Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>ENGLISH COMMUNICATION SKILLS LABORATORY (HS1102)</b>					

**TOPICS**

**UNIT I:**

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

**UNIT II:**

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

**UNIT III:**

Stress in compound words, rhythm, intonation, accent neutralisation.

**UNIT IV:**

Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

**UNIT V:**

Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

**Prescribed text book:** “Infotech English”, Maruthi Publications.

**References:**

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>APPLIED CHEMISTRY LAB (BS1103)</b>					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na<sub>2</sub>CO<sub>3</sub> solution.
2. Determination of alkalinity of a sample containing Na<sub>2</sub>CO<sub>3</sub> and NaOH.
3. Determination of Mn<sup>+2</sup> using standard oxalic acid solution.
4. Determination of ferrous iron using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
5. Determination of Cu<sup>+2</sup> using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe<sup>+3</sup> by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg<sup>+2</sup> present in an antacid.
13. Determination of CaCO<sub>3</sub> present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

*Of the above experiments at-least 10 assessment experiments should be completed in a semester.*

**Outcomes:** The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

**Reference Books**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel, 5<sup>th</sup>ed, 1989.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1103)</b>					

**Course Objectives:**

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

**Course Outcomes:**

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

**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 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.



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**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.



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**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.





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<b>I Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>ENVIRONMENTAL SCIENCE (MC1101)</b>					

**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.

**UNIT I**

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – 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 - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT II**

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.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

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

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

**UNIT III**

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. 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: conservation of biodiversity.



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**UNIT IV**

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**

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. 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-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

**Text Books:**

- 1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 2) Environmental Studies, R. Rajagopalan, 2<sup>nd</sup> Edition, 2011, Oxford University Press.
- 3) 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. UdayaBhaskar, 3<sup>rd</sup>ed, Cengage Learning.
- 2) A Textbook of Environmental Studies, ShaashiChawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
- 4) Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, New Age International Publishers, 2014

**e-learning resources:**

- <http://nptel.ac.in/courses.php>
- <http://jntuk-coeerd.in/>



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<b>I Year - II Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MATHEMATICS - II (BS1201)</b>				

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

**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 – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

**Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)**

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. Singular values of a matrix, singular value decomposition (text book-3).

**UNIT – III: Iterative methods: (8 hrs)**

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

**UNIT – IV: Interpolation: (10 hrs)**

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



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interpolation formula– Newton’s divide difference formula.

**UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)**

Numerical differentiation using interpolating polynomial – 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 –Runge-Kutta method (second and fourth order).

**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.
3. David Poole, Linear Algebra- A modern introduction, 4<sup>th</sup> Edition, Cengage, 2014.

**Reference Books:**

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education, 2008.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications, 1996.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.



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I Year - II Semester		L	T	P	C
		3	0	0	3
<b>APPLIED PHYSICS (BS1202)</b> (For All Circuitual Branches like ECE, EEE, CSE etc)					

**Course Objectives:**

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

**Course Outcomes:**

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).
4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)



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5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

**Unit-I: Wave Optics**

**12hrs**

**Interference:** Principle of superposition, Interference of light, Interference in thin films (Reflection Geometry) & applications, 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, Polarization by reflection, refraction and Double refraction, Nicol's Prism, Half wave and Quarter wave plates.

**Unit Outcomes:**

*The students will be able to*

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

**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 mechanisms, 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 Outcomes:**

*The students will be able to*

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

**Unit III: Quantum Mechanics, Free Electron Theory and Band theory**

**10hrs**

**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, Density of states (3D), Fermi energy.

**Band theory of Solids:** Bloch's Theorem (Qualitative), Kronig - Penney model (Qualitative), EvsK diagram, VvsK diagram, effective mass of electron, Classification of crystalline solids,



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concept of hole.

**Unit Outcomes:**

*The students will be able to*

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

**Unit-IV: Dielectric and Magnetic Materials**

**8hrs**

**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, Piezoelectricity.

**Magnetic Materials:** Introduction, Magnetic dipole moment, Magnetization-Magnetic susceptibility and permeability, 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, Eddy currents, Engineering applications.

**Unit Outcomes:** *The students will be able to*

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Clausius-Mosotti relation in dielectrics (L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)

**Unit – V: Semiconductors and Superconductors**

**10hrs**

**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.

**Superconductors:** Introduction, Properties of superconductors, Meissner effect, Type I and Type II superconductors, BCS theory (Qualitative), Josephson effects (AC and DC), SQUIDS, High  $T_c$  superconductors, Applications of superconductors.

**Unit Outcomes:**

*The students will be able to*

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)



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**Text books:**

1. M.N.Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S.Chand Publications, 11<sup>th</sup> Edition 2019.
2. Engineering Physics” by D.K.Bhattacharya and PoonamTandon, Oxford press, 2015.
3. Applied Physics by P.K.Palanisamy SciTech publications, 2018.

**Reference Books:**

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 2013.
2. Engineering Physics by M.R.Srinivasan, New Age international publishers, 2009.
3. Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press, 2016.
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill, 2011.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2013.





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DIGITAL LOGIC DESIGN (ES1201)</b>					

**Course objectives:**

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

**Course outcomes:**

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

**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, ExclusiveOR 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.



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**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, 2013.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage, 2020.

**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.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>PYTHON PROGRAMMING (ES1202)</b>					

**Course Objectives:**

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

**Course Outcomes:**

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming

**UNIT I**

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

**UNIT II**

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement, Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

**UNIT III**

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.



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**UNIT IV**

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

**UNIT V**

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

**Text Books**

- 1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2018.
- 2) Python Programming: A Modern Approach, VamsiKurama, 1<sup>st</sup>ed, Pearson, 2018.

**Reference Books:**

- 1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press, 2018.
- 2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2013.

**e-R esources:**

[https://www.tutorialspoint.com/python3/python\\_tutorial.pdf](https://www.tutorialspoint.com/python3/python_tutorial.pdf)



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATA STRUCTURES (CS1201)</b>					

**Course Objectives:**

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

**Course Outcomes:**

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

**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, Dequeues, 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.



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**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 Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

**Text Books:**

- 1) Data Structures Using C. 2<sup>nd</sup> Edition, ReemaThareja, Oxford, 2014.
- 2) Data Structures and algorithm analysis in C, 2<sup>nd</sup>ed, Mark Allen Weiss, 1996.

**Reference Books:**

- 1) Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, Horowitz, Sahni, Universities Press, 2008.
- 2) Data Structures: A PseudoCode Approach, 2<sup>nd</sup>ed, Richard F.Gilberg, Behrouz A. Forouzon, Cengage, 2004.
- 3) Data Structures with C, Seymour Lipschutz,2<sup>nd</sup>ed, TMH

**e-R esources:**

- 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)



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>APPLIED PHYSIC LAB (BS1203)</b> <b>(For All Circuital Branches like CSE, ECE, EEE etc.)</b>					

(Any 10 of the following listed experiments)

**List of Applied Physics Experiments:**

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

**References:**

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



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>PYTHON PROGRAMMING LAB (ES1203)</b>					

**Course Objectives:**

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

**Course Outcomes:**

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

**List of Experiments:**

- 1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
- 3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
- 5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
 

```
*
**
***
****
```
- 6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and *Not close* otherwise.
- 8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
- 9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.
- 10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
- 11) In algebraic expressions, the symbol for multiplication is often left out, as in  $3x+4y$  or  $3(x+5)$ . Computers prefer those expressions to include the multiplication symbol, like





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- $3*x+4*y$  or  $3*(x+5)$ . Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
- 12) Write a program that generates a list of 20 random numbers between 1 and 100.
    - (a) Print the list.
    - (b) Print the average of the elements in the list.
    - (c) Print the largest and smallest values in the list.
    - (d) Print the second largest and second smallest entries in the list
    - (e) Print how many even numbers are in the list.
  - 13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
  - 14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,1,0,0] is 4.
  - 15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
  - 16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
  - 17) Write a function called *sum\_digits* that is given an integer num and returns the sum of the digits of num.
  - 18) Write a function called *first\_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
  - 19) Write a function called *number\_of\_factors* that takes an integer and returns how many factors the number has.
  - 20) Write a function called *is\_sorted* that is given a list and returns True if the list is sorted and False otherwise.
  - 21) Write a function called *root* that is given a number x and an integer n and returns  $x^{1/n}$ . In the function definition, set the default value of n to 2.
  - 22) Write a function called *primes* that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
  - 23) Write a function called *merge* that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    - (a) Do this using the sort method.
    - (b) Do this without using the sort method.
  - 24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
  - 25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
  - 26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called *ftemps.txt*.
  - 27) Write a class called *Product*. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get\_price* that receives the number of items to be bought and returns the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10



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and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make\_purchase* that receives the number of items to be bought and decreases amount by that much.

- 28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert\_to\_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert\_to\_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
- 29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, `c = Converter(9,'inches')`. The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call `c.feet()` and should get 0.75 as the result.
- 30) Write a Python class to implement `pow(x, n)`.
- 31) Write a Python class to reverse a string word by word.
- 32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
- 33) Write a program to demonstrate Try/except/else.
- 34) Write a program to demonstrate try/finally and with/as.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>DATA STRUCTURES LAB (CS1202)</b>					

**Course Objectives:**

The objective of this lab is to demonstrate the different data structures implementation.

**Course Outcomes:**

By the end of this lab the student is able to

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

**Exercise -1 (Searching)**

- a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
- b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

**Exercise – 2 (Sorting-I)**

- a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
- b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
- c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

**Exercise -3 (Sorting-II)**

- a) Write C program that implement radix sort, to sort a given list of integers in ascending order
- b) Write C program that implement merge sort, to sort a given list of integers in ascending order

**Exercise -4 (Singly Linked List)**

- a) Write a C program that uses functions to create a singly linked list
- b) Write a C program that uses functions to perform insertion operation on a singly linked list
- c) Write a C program that uses functions to perform deletion operation on a singly linked list
- d) Write a C program to reverse elements of a single linked list.

**Exercise -5(Queue)**

- a) Write C program that implement Queue (its operations) using arrays.
- b) Write C program that implement Queue (its operations) using linked lists

**Exercise -6 (Stack)**

- a) Write C program that implement stack (its operations) using arrays
- b) Write C program that implement stack (its operations) using Linked list
- c) Write a C program that uses Stack operations to evaluate postfix expression

**Exercise -7 (Binary Search Tree)**

- a) Write a C program to Create a BST
- b) Write a C program to insert a node into a BST.
- c) Write a C program to delete a node from a BST.
- d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.



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		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>CONSTITUTION OF INDIA (MC1201)</b>					

**Course Objectives:**

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

**Course Outcomes:**

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

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

**UNIT I**

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

**Learning outcomes:** After completion of this unit student will

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

**UNIT II**

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

**Learning outcomes:** After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government



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- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

**UNIT III**

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

**Learning outcomes:** After completion of this unit student will

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

**UNIT IV**

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

**Learning outcomes:-**After completion of this unit student will

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

**UNIT V**

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

**Learning outcomes:** After completion of this unit student will

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

**References:**

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



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**e-sources:**

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



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MATHEMATICS – III ( BS2101)</b>					

**Course Objectives:**

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

**Course Outcomes:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Second order PDE: Solutions of linear partial differential equations with constant coefficients, RHS term of the type  $e^{ax+by}$ ,  $\sin(ax+by)$ ,  $\cos(ax+by)$ ,  $x^m y^n$ .



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

**Text Books:**

- 1) B. S. Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers, 2020.
- 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, 2008.
- 2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3<sup>rd</sup> Edition, CRC Press, 2013.
- 3) Peter O' Neil, Advanced Engineering Mathematics, 7<sup>th</sup>ed, Cengage, 2011.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (CS2101 )</b>					

**Course Objectives:**

This course is designed to:

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

**Course Outcomes:**

At the end of the course student will be able to

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems



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**UNIT IV**

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

**UNIT V**

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

**Text Books:**

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill, 1997.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2008.

**Reference Books:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2<sup>nd</sup> Edition, Prentice Hall of India, 1985.
2. Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, PHI, 2018.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7<sup>th</sup> Edition, Tata McGraw Hill, 2010.

**e-Resources:**

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



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER GRAPHICS (CS2102)</b>					

**Course objectives:**

This course allows the students to:

1. Understand the fundamental concepts and theory of computer graphics
2. Understand modeling, and interactive control of 3D computer graphics applications
3. The underlying parametric surface concepts be understood
4. Learn multimedia authoring tools.

**Course outcomes:**

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

1. Use the principles and commonly used paradigms and techniques of computer graphics
2. Write basic graphics application programs including animation
3. Design programs to display graphic images to given specifications

**UNIT-I**

**INTRODUCTION:** Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

**UNIT-II**

**OUTPUT PRIMITIVES:** Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

**2-D GEOMETRICAL TRANSFORMATIONS:** Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

**UNIT -III**

**2-D VIEWING :** The viewing pipe-line, viewing coordinate reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm

**UNIT -IV**

**3-D OBJECT REPRESENTATION:** spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, Solid modeling Scalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms

**UNIT -V**

**3-D GEOMETRIC TRANSFORMATIONS:** Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting.

**COMPUTER ANIMATION:** Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification



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**Text Books:**

1. Computer Graphics C version/ Donald Hearn and M. Pauline Baker/Pearson/PHI, 2002
2. Computer Graphics Principles & Practice, Second edition in C/ Foley, VanDam, Feiner and Hughes/Pearson Education, 2013

**References:**

1. Computer Graphics Second edition, Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition, 2002.
2. Procedural elements for Computer Graphics, David F Rogers, Tata McGraw hill, 2nd edition, 1988.
3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH, 1979.
4. Computer Graphics, Steven Harrington, TMH, 1987.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MULTIMEDIA AND APPLICATION DEVELOPMENT(CS2103)</b>					

**Course Objectives:**

- This course aims to further develop students' competency in producing dynamic and creative graphic solutions for multimedia productions.
- It provides students with the basic concepts and techniques of interactive authoring.
- It also introduces students with the advanced scripting skills necessary for implementing highly interactive, rich internet applications using multimedia technologies and authoring tools.
- Students will develop aesthetic value and competencies in multimedia authoring.
- Artistic visual style and layout design are stressed, as well as the editing and integration of graphic images, animation, video and audio files.
- The course allows students to master industry-wide software and technologies to create highly interactive, rich internet applications.

**Course Outcomes:**

- Ability to apply different multimedia development tools to produce web based and stand-alone user interfaces.

**UNIT - I**

**Fundamental concepts in Text and Image:** Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, **Color in image and video:** color science, color models in images, color models in video.

**UNIT - II**

**Fundamental concepts in video and digital audio:** Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio. **Multimedia Data Compression:** Lossless compression algorithms, Lossy compression algorithms, Image compression standards.

**UNIT - III**

Basic Video compression techniques, Case study: MPEG Video Coding I, Basic Audio compression techniques, Case study: MPEG Audio compression.

**Web 2.0:** What is web 2.0, Search, Content Networks, User Generated Content, Blogging, Social Networking, Social Media, Tagging, Social Marking, Rich Internet Applications, Web Services, Mashups, Location Based Services, XML, RSS, Atom, JSON, and VoIP, Web 2.0 Monetization and Business Models, Future of the Web.

**UNIT - IV**

**Rich Internet Applications (RIAs) with Adobe Flash:** Adobe Flash- Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, Publish your flash movie, Creating special effects with Flash, Creating a website splash screen, action script, web sources.



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**Rich Internet Applications (RIAs) with Flex 3** - Introduction, Developing with Flex 3, Working with Components, Advanced Component Development, Visual Effects and Multimedia.

**UNIT - V**

**Ajax- Enabled Rich Internet Application** :Introduction, Traditional Web Applications vs. Ajax Applications, Rich Internet Application with Ajax, History of Ajax, Raw Ajax example using xml http request object, Using XML, Creating a full scale Ajax Enabled application, Dojo Tool Kit.

**Text Books:**

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004 (UNITS 1, 2, 3.)
2. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel and Harvey M Deitel, Deitel Developer Series, Pearson Education, 2008. (UNITS 4,5)

**Reference Books:**

1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications, Wiley India, 2009.
2. Multimedia Communications: Applications, Networks, Protocols and Standards, FredHalsall, Pearson Education, 2001, RP 2005.
3. Multimedia making it work, Tay Vaughan, 7<sup>th</sup> edition, TMH, 2008.
3. Introduction to multimedia communications and Applications, Middleware, Networks, K. R. Rao, Zoran, Dragored, Wiley India, 2006, RP. 2009.
4. Multimedia Computing, Communications & Applications, Ralf Steinmetz and KlaraNahrstedt, Pearson Education, 2004
5. Principles of Multimedia, Ranjan Parekh, TMH, 2006.
6. Multimedia in Action, James E. Shuman, Cengage Learning, 198, RP 2008.
7. Multimedia Systems design, Prabhat K. Andleigh, KiranThakrar, PHI, 1986.
8. Multimedia and Communications Technology, Steve Heath, Elsevier, 1999, RP 2003.
9. Adobe Flash CS3 Professional, Adobe press, Pearson Education, 2007.
10. Flash CS3 Professional Advanced, Russel Chun, Pearson Education, 2007.
11. Flash CS5, Chris Grover, O'Reilly, SPD, 2010.
12. SAMS Teach yourself Adobe flash CS3, Pearson Education, 2007.
13. Flex 4 Cookbook, Joshua Noble, et. al, O'Reilly, SPD 2010.
14. Flex3 – A beginner's guide, Michele E. Davis, Jon A. Phillips, TMH, 2008.
15. Mastering Dojo, R. Gill, C. Riecke and A. Russell, SPD, 2008.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATABASE MANAGEMENT SYSTEMS(CS2104 )</b>					

**Course Objectives:**

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

**Course Outcomes:**

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

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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



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**UNIT IV**

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

**UNIT V**

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

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

**Text Books:**

1. Database Management Systems, 3<sup>rd</sup>ed, , Raghurama Krishnan, Johannes Gehrke, TMH, 2014
2. Database System Concepts, 5<sup>th</sup>ed, Silberschatz, Korth, TMH, 2005.

**Reference Books:**

1. Introduction to Database Systems, 8<sup>th</sup>ed, C J Date, PEA, 2004.
2. Database Management System, 6<sup>th</sup>ed Ramez Elmasri, Shamkant B. Navathe, PEA, 2019.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**e-Resources:**

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





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<b>II Year – I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>COMPUTER GRAPHICS LAB (CS2105)</b>					

**Course Objectives:**

This is an introductory course on principles of computer graphics including both 2D and 3D graphics. Main objective is to give a practical exposure of raster scan graphics including line and circle drawing, polygon filling, anti-aliasing algorithms, clipping, hidden-line and hidden surface algorithms

**Course Outcomes:** The students, after the completion of the course, are expected to

- Design and develop programs for drawing Computer Graphics primitives.
- Implement different algorithms for line clipping,
- Create 3D graphical scenes using C.
- Implement image manipulation and enhancement.
- Create 2D animations using C.

**Software Requirement:**

- Turbo C / C++ compiler that supports graphics.h package.
- special DOSBOXed installer for Turbo C++ compiler

Download from following link:

[http://www.megaleecher.net/Download\\_Turbo\\_For\\_Windows](http://www.megaleecher.net/Download_Turbo_For_Windows)

**List of Experiments:**

1. Using Digital Differential Analyzer Algorithm, Write C-Program to draw a line segment between two given points.
2. Write a C program for determining pixel activation list between two given points in order to draw line segment using bresenham's Line drawing algorithm.
3. Using Midpoint circle generation algorithm, write a C-Program to generate pixel activation list for drawing a circle with a given centre of circle P(x, y) and a radius r.
4. Using Midpoint ellipse generation algorithm, write a C-Program to generate pixel activation list for drawing an ellipse.
5. Using different graphics functions available for text formatting in C-Language, Write a C program for displaying text in different sizes, different colors, different font styles.
6. Using certain graphic functions available in C-language for drawing lines, rectangles & circles, Write a C- Program which generates pixel activation list for drawing the following simple two dimensional objects.  
 i) House ii) Car iii) Fish iv) man
7. Write a C-program for performing the basic 2D transformations such as translation, Scaling, Rotation, shearing and reflection for a given 2D object?



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8.
  - i. Using the concept of flood fill algorithm, Write a C- program for filling a given rectangle object with color.
  - ii. Using the concept of Boundary fill algorithm, Write a C- program for filling a given rectangle object with color.
  - iii. Using the concept of Scan line polygon fill algorithm, write a C- program for filling a given object with color.
9. Write a C-program for performing the basic transformations such as translation, Scaling, Rotation for a given 3D object?
10. Write a C-program for generating a curve for a given set of control points.
11. Write C-programs for designing simple animations using transformations.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>MULTIMEDIA AND APPLICATION DEVELOPMENT LAB (CS2106)</b>					

**Course Outcomes:**By the end of the course, student will be able to

- Describe different realizations of multimedia tools and the way in which they are used.
- Compare various data compression schemes.
- Analyze user interface for a given application

**Multimedia Programs using FLASH**

1. Write a Program to perform motion tweening operation using flash
2. Write a Program to create a 24 spokes on a wheel using flash.
3. Write a Program to change and object shape using a shape tweening concept.
4. Write a program to create an animated e-card using adobe Flash.
5. Write a Program to create an animation to represent the Growing Moon.
6. Write a Program to create an animation to indicate a ball bouncing on Steps
7. Write a Program to simulate a ball hitting another ball.
8. Write a Program to change a circle into a square using Flash.

**Rich Internet Applications (RIA) using Adobe Flex and Ajax**

9. Write an MXML code to display Hello World using Flex.
10. Create a Flex Project using Flash Builder IDE to run Hello World Application.
11. Implement an AJAX program to fetch RSS feeds from a well-known RSS feed site. Provide a scrolling display of latest news on your page. You can use xparser.js if you like.
12. Implement an RSS-based search feature. Have a text box and a button in your page for the same. Show the results in a separate <div> which has the results as hyperlinks, which the user can click.
13. Use the Reverse AJAX technique to build a web-based chat application. The application is one-way browser-based. That is, we have a window in which one user types his messages. From other side, the second user directly updates a file on the server (instead of a browser area).
14. A file on a server has information about cricket players. The fields represent name, country, matches, runs and centuries. The fields are separated by colons (:). The front end screen has a text field in which the user can enter a country. The server returns details of all players belonging to that country in the form of one big JSON object. The client parses the JSON object and builds an HTML table to print the results. Implement the server side script and the client code.
15. Write an Ajax enabled address book web application that interacts with a web service to obtain data and to modify data in a server-side database.
16. Write a Calender web application built using Dojo toolkit



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<b>II Year – I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>DATABASE MANAGEMENT SYSTEMS LAB (CS2107)</b>				

**Course Objectives:**

This Course will enable students to

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

**Course Outcomes:**

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

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

**List of Exercises:**

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to\_char, to\_number and to\_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next\_day, add\_months, last\_day, months\_between, least, greatest, trunc, round, to\_char, to\_date)
5.
  - i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
  - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.



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

**Text Books/Suggested Reading:**

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



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
				0	0
<b>MOBILE APP DEVELOPMENT( SO2101)</b>					

**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:**

At the end of this course, students will be able to:

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

**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)

**References:**

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



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**Web References:**

1. The Complete Android N Developer Course –Udemy  
<https://www.udemy.com/course/complete-android-n-developer-course/?altsc=428526>
2. Android Development Courses on Google developers training  
<https://developers.google.com/training/android/>
3. Mobile Computing - Video course- NPTEL  
<https://nptel.ac.in/courses/106/106/106106147/#>
4. Android Tutorial – Tutorial Point <https://www.tutorialspoint.com/android/index.htm>



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		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (MC2101)</b>					

**Course Objectives:**

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

**Course Outcomes:**

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

- Understand the significance of Indian Traditional Knowledge
- Classify the Indian Traditional Knowledge
- Compare Modern Science with Indian Traditional Knowledge system.
- Analyze the role of Government in protecting the Traditional Knowledge
- Understand the impact of Philosophical tradition on Indian Knowledge System.

**Unit I**

**Introduction to Traditional Knowledge:** Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy.

**Unit II**

**Basic structure of Indian Knowledge System:** AstadashVidya- 4 Ved - 4 Upaved (Ayurved,Dhanurved,GandharvaVed&SthapthyaAdi),6vedanga(Shisha,Kalppa,Nirukha,Vykarana,Jyothisha&Chand),4upanga(Dharmashastra,Meemamsa,purana&Tharka Shastra).

**Unit III**

**Modern Science and Indian Knowledge System-Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.**

**Unit IV**

**Protection of Traditional Knowledge:** The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

**Unit V**

**Impact of Traditions:** Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain & Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala, Sthapthya, Sangeetha, NruthyaYevamSahithya





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**Reference Books :**

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
3. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya
4. Swami Jitatanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
7. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

**Web Resources:**

1. [https://www.wipo.int/wipo\\_magazine/en/2017/01/article\\_0004.html](https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html)
2. <http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf>
3. [https://www.wipo.int/edocs/mdocs/tk/en/wipo\\_grtkf\\_ic\\_21/wipo\\_grtkf\\_ic\\_21\\_ref\\_facilitators\\_text.pdf](https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf)



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>PROBABILITY AND STATISTICS (BS2201)</b>					

**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 this course, the student should be able to

- Classify the concepts of data science and its importance
- Interpret the association of characteristics and through correlation and regression tools
- Make use of the concepts of probability and their applications
- Apply discrete and continuous probability distributions
- Design the components of a classical hypothesis test
- Infer the statistical inferential methods based on small and large sampling tests

**UNIT I**

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness 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– Conditional probability and Baye’s theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

**UNIT IV**

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t,  $\chi^2$  and F-distributions – Point and Interval estimations – Maximum error of estimate.

**UNIT V**

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

**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.



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**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) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4<sup>th</sup> Edition, Academic Foundation, 2011.
- 3) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3<sup>rd</sup> Edition, Pearson, 2010.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER ORGANIZATION (CS2201)</b>					

**Course Objectives:**

The course objectives of Computer Organization are to discuss and make student familiar with

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

**Course Outcomes:**

By the end of the course, the student will

- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

**UNIT I**

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating Point Representation. Other Binary Codes, Error Detection Codes.  
 Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

**UNIT II**

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.  
 Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

**UNIT III**

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.  
 Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.



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**UNIT IV**

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

**UNIT V**

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

**Text Books:**

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGrawHill, 2002.

**Reference Books:**

1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

**Web Resources:**

1. <https://nptel.ac.in/courses/106/105/106105163/>
2. <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATA WAREHOUSING AND MINING(CS2202)</b>					

**Course Objectives:**

- To understand and implement classical models and algorithms in data warehousing and data mining.
- To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

**Course Outcomes:**

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

- Summarize the architecture of data warehouse
- Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
- Construct a decision tree and resolve the problem of model overfitting
- Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
- Apply suitable clustering algorithm for the given data set

**UNIT- I**

**Data Warehouse and OLAP Technology:** An Overview: What Is a Data Warehouse? A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

**UNIT- II**

**Data Mining:** Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.

Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)

**UNIT -III**

**Classification:** Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

**Model Overfitting:** Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan &Vipin)

**UNIT -IV**

**Association Analysis:** Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of



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Frequent Itemsets, FP-Growth Algorithm. (Tan & Vipin)

**UNIT -V**

**Cluster Analysis:** Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan & Vipin)

**Text Books:**

1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

**Reference Books:**

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

**Web Resources:**

1. NPTEL Online Course on Data Mining : [https://onlinecourses.nptel.ac.in/noc18\\_cs14/preview](https://onlinecourses.nptel.ac.in/noc18_cs14/preview)



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<b>II Year – II Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>VISUAL DESIGN AND COMMUNICATION (ES2201)</b>				

**Course Outcomes:**

- Students will develop the ability to create visual compositions using basic elements and apply appropriate principles of visual composition to communicate ideas.
- Students will begin to understand the visual language and develop the ability to perceive, visualize and communicate using visual narratives.
- Students will develop the ability to apply the visual dynamics of visual language in Typography, Photography and Videography.
- Students will begin to understand the visual dynamics that exists in visual design as a visualisation process to evolve mental imageries that represent solutions to simple communication problems.
- Students will be able to execute design solutions using appropriate software programmes.

**UNIT-I**

**INTRODUCTION TO VISUAL DESIGN:** The importance of understanding visual language and its relation in context to nature and environment

**ELEMENTS OF VISUAL LANGUAGE:** Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colour as elements of visual language.

**UNIT-II**

**INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE:** Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.

**UNIT-III**

**INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY:** Introduces Typography as a means of Communication and engages in typographical explorations to understand the technicalities, nuances and aesthetics of types. Study of visual principles of text and image composition : Layouts, Grids, Content Development and Information Hierarchy.

Application of Typography, Image and layouts in the design of signage systems, identity systems, social communications,

**UNIT-IV**

**INTRODUCTION TO PHOTOGRAPHY:** Study of photography as a medium to document, communicate and create photographic imagery. Exploring photo story as a narrative medium.

**INTRODUCTION TO VIDEOGRAPHY:** Study of videography as a medium to document, communicate and create a short 2 minute video.





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**UNIT-V**

**COMMUNICATION THEORIES, SEMIOTICS AND VISUAL PERCEPTION:** Understand the process of communication and the theories that make a difference to the development of a visual language.

**STORY TELLING, NARRATIVES AND ITS ROLE IN DESIGN:** Understand story telling and narratives as effective methods to scope problems and problem solving processes.

**Text Books:**

1. Wallschlaeger, Charles, & Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill, 1992.

**Reference Books:**

1. Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, 2007.
2. Caplin, Steve; Banks, Adam, The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, 2003
3. Demers, Owen, Digital Texturing & Painting, Publisher: New Riders Press; Bk&CD-ROM Edition, 2001.
4. Cairo, Alberto, The Functional Art. New Riders, 2013.



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	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY(HS2201)</b>				

**Course Objectives:**

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

**Course Outcomes:**

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

**UNIT I**

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

**UNIT II**

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.



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**UNIT III**

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

**UNIT IV**

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

**UNIT V**

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

**Text Books:**

- 1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

**Reference Books:**

- 1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
- 2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
- 3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
- 4) Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd
- 5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
- 6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.



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	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>GAMES DEVELOPMENT LAB (CS2203)</b>				

**Course Outcomes:**

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

- Learning how to use the various fundamentals of Unity
- Understanding how everything works in the engine
- Understanding the basic concepts of game design
- Creating and building actual sample games
- Learning how to deploy your projects to the market

**Software Requirement:**

**Unity Game Engine**

**List of Experiments:**

1. Unity Installation and Setup
2. Creating and Modifying Sprites
3. Transforms and Object Parenting
4. Creation of Internal assets
5. Saving and Loading Scenes
6. Basic Movement Scripting
7. Understanding Collisions, Rigid bodies
8. Custom Collision Boundaries
9. Understanding Prefabs and Instantiation
10. Game Object Destruction
11. Starting with UI
12. The Button and Text Element, slider
13. Materials and Shaders
14. The Particle System
15. Using the Asset Store



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>DATA MINING USING PYTHON LAB (CS2204)</b>					

**Course Objectives:**

- Practical exposure on implementation of well-known data mining algorithms
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

**Course Outcomes:**

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

- Apply preprocessing techniques on real world datasets
- Apply apriori algorithm to generate frequent itemsets.
- Apply Classification and clustering algorithms on different datasets.

**Note:** Use python library scikit-learn wherever necessary

1. Demonstrate the following data preprocessing tasks using python libraries.
  - a) Loading the dataset
  - b) Identifying the dependent and independent variables
  - c) Dealing with missing data
2. Demonstrate the following data preprocessing tasks using python libraries.
  - a) Dealing with categorical data
  - b) Scaling the features
  - c) Splitting dataset into Training and Testing Sets
3. Demonstrate the following Similarity and Dissimilarity Measures using python
  - a) Pearson's Correlation
  - b) Cosine Similarity
  - c) Jaccard Similarity
  - d) Euclidean Distance
  - e) Manhattan Distance
4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.



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**Web Resources:**

1. <https://analyticsindiamag.com/data-pre-processing-in-python/>
2. <https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93>
3. <https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e>
4. <https://www.springboard.com/blog/data-mining-python-tutorial/>
5. <https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c>
6. <https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn>
7. <https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/>
8. <https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learn-d690cbae4c5d>



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>WEB APPLICATION DEVELOPMENT LAB (ES2202)</b>					

**Course Objectives:**

- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

**Course Outcomes:**

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

- Develop Single Page Applications
- Develop NodeJS&ReactJS Reusable Service
- Store the data in MySQL
- Get acquainted with the latest web application development trends in the IT industry

**List of Experiments:**

1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js
10. Design and development of Online Auction using JSP/Node.js & React.js

**Note:** Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

**References:**

1. Jason Hunter, William Crawford , Java Servlet Programming, Second Edition, ,O'Reilly Media
2. Hans Bergsten, Java Server Pages, O'Reilly
3. <http://www.oracle.com/technetwork/java/index-jsp-135475.html>
4. <http://www.oracle.com/technetwork/java/javaee/jsp/index.html>



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<b>II Year - II Semester</b>	<b>Skill Oriented Course- II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>DIGITAL PHOTOGRAPHY USING ADOBE PHOTOSHOP ( SO2201)</b>					

**Software Requirement:**

Adobe Photoshop

**List of Experiments:**

1. Installation of Photoshop
2. Photoshop Workspace and Shortcut Keys
3. Layers in Photoshop
4. Demonstrate how to Remove Background of an Image Using Photoshop.
5. Photoshop Brush Tool and Pen Tool
6. Demonstrate how to change color in photoshop.
7. Demonstrate how to Resize a layer in Photoshop.
8. Demonstrate how to Add Fonts in Photoshop.
9. Demonstrate how to Crop an Image in Photoshop.
10. Demonstrate how to Curve Text in Photoshop.
11. Demonstrate how to Flip an Image in Photoshop.
12. Demonstrate how to Smooth Edges in Photoshop.





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	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPILER DESIGN</b>				

**Course Objectives:**

Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

**Course Outcomes:** At the end of the course, student will be able to

- Demonstrate phases in the design of compiler
- Organize Syntax Analysis, Top Down and LL(1) grammars
- Design Bottom Up Parsing and Construction of LR parsers
- Analyze synthesized, inherited attributes and syntax directed translation schemes
- Determine algorithms to generate code for a target machine

**UNIT I:**

**Lexical Analysis:** Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.

**UNIT II:**

**Syntax Analysis:** The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, **Top Down Parsing:** Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.

**UNIT III:**

**Bottom Up Parsing:** Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parsers, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.

**UNIT III:**

**Syntax Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. **Intermediate Code Generation:** Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.

**UNIT IV:**

**Run Time Environments:** Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, **Code Optimization:** The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization



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**UNIT V:**

**Code Generation:** Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

**Text Books:**

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson Publishers, 2007.

**Reference Books:**

1. Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kaufmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>OPERATING SYSTEMS</b>					

**Course Objectives:**

The objectives of this course is to

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

**Course Outcomes:**

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

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

**UNIT I:**

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

**UNIT II:**

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

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

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



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**UNIT III:**

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

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

**UNIT IV:**

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

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

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

**UNIT V:**

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

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

Case Studies: Linux, Microsoft Windows.

**Text Books:**

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

**Reference Books:**

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

**e-Resources:**

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



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>HUMAN COMPUTER INTERACTION</b>					

**Course Objectives:**

The objectives of the course is to facilitate communication between students of psychology, design, and computer science on user interface development projects, provide the future user interface designer with concepts and strategies for making design decisions, expose the future user interface designer to tools, techniques, and ideas for interface design, introduce the student to the literature of human-computer interaction and to stress the importance of good user interface design.

**Course Outcomes:**

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

- Analyze Human-Computer Interaction principle and designs in Information Systems.
- Compare various HCI designs to gain knowledge on user-centric interfaces.
- Evaluate the Internet sites considering; usability and user appreciation designs.
- Appraise social websites such as; facebook, linkedin, twitter or others from user-centric and HCI viewpoint.
- Construct conceptual basis to design HCI that includes: problems, goals, user interaction style, as well as user-centric interface design.
- Apply Information Systems tools to prototype the end-user design.
- Develop end-user interfaces incorporating problem solving solutions in HCI.

**UNIT I:**

**Introduction:** Importance of user Interface, definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface, popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user Interface popularity, characteristics, Principles of user interface.

**UNIT II:**

**Design process:** Human interaction with computers, importance of human characteristics, human consideration, Human interaction speeds, and understanding business junctions.

**UNIT III:**

**Screen Designing:** Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

**UNIT IV:**

**Windows:** New and Navigation schemes selection of window, selection of devices based and screen based controls, Components, text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.



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**UNITV:**

**Software tools:** Specification methods, interface, Building Tools, Interaction Devices, Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers

**Text Books:**

1. “The essential guide to user interface design”, Wilbert O Galitz, Wiley Dream Tech.
2. “Designing the user interface”, 3<sup>rd</sup>Edition, Ben Shneidermann, Pearson Education Asia.

**Reference Books:**

1. “Human Computer Interaction”, Alan dix, janetfincay, gregoryd, Abowd, russellbealg, pearson.
2. “Interaction Design”, PRECE, ROGERS, SHARPS. Wiley Dreamtech,
3. “User Interface Design”, SorenLauesen , Pearson Education.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>OPTIMIZATION IN OPERATIONS RESEARCH</b>					
<b>(Job oriented course)</b>					

**Course Objectives:**

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

**Course Outcomes:** At the end of the course, student will be able to

- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

**UNIT I:**

**Introduction and Classical Optimization Techniques:** Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

**Classical Optimization Techniques:** Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

**UNIT II:**

**Linear Programming :** Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.



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**UNIT III:**

**Transportation Problem:** Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel’s approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

**UNIT IV:**

**Nonlinear Programming:** Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell’s method and steepest descent method.

Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

**UNIT V:**

**Dynamic Programming:** Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

**Text Books:**

1. “Engineering optimization: Theory and practice”, S. S.Rao, New Age International (P) Limited, 3<sup>rd</sup> edition, 1998.
2. “Introductory Operations Research”, H.S. Kasene& K.D. Kumar, Springer (India), Pvt. LTd.

**Reference Books:**

1. “Optimization Methods in Operations Research and systems Analysis”, by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath& Co





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOFTWARE ENGINEERING</b> <b>(Professional Elective-I)</b>					

**Course Objectives:**

This course is designed to:

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

**Course Outcomes:**

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

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

**UNIT I:**

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

**UNIT II:**

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

**UNIT III:**

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

**UNIT IV:**

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles  
 Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component- Based



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Development.

**UNIT V:**

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

**Text Books:**

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

**Reference Books:**

1. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2. Software Engineering, UgrasenSuman, Cengage.

**e-Resources:**

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



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b> <b>(Professional Elective-I)</b>					

**Course Objectives:** The main objective is the students to

- Become familiar with all phases of OOAD.
- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation.

**Course Outcomes:** After finishing this course student will be able to:

- Analyze the nature of complex system and its solutions.
- Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
- Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
- Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
- Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

**UNIT I:**

**Introduction:** The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation

**UNIT II:**

**Introduction to UML:** Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.

**UNIT III:**

**Class & Object Diagrams:** Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

**UNIT IV:**

**Basic Behavioral Modeling-I:** Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System



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**UNIT V:**

**Advanced Behavioral Modeling:** Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams

**Case Study:** Weather Forecasting

**Text Books:**

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , “Object- Oriented Analysis and Design with Applications”, 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

**Reference Books:**

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DevOps (Professional Elective-I)</b>					

**Course Objectives:**

- Introduces the basic concepts of Information System.
- To understand The Management Control Framework and The Application Control Framework.

**Course Outcomes:** At the end of the course, student will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility.
- Describe DevOps&DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools
- Acquire the knowledge of maturity model, Maturity Assessment

**UNIT I:**

Phases of Software Development Life Cycle, Values and principles of agile software development.

**UNIT II:**

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

**UNIT III:**

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

**UNIT IV:**

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

**UNIT V:**

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

**Text Books:**

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb, 1st Edition, O'Reilly publications, 2016.
2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>INTERNET OF THINGS (Professional Elective-I)</b>					

**Course Objectives:**

From the course the student will learn

- the application areas of IOT
- the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- building blocks of Internet of Things and characteristics

**Course Outcomes:**

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

- Review Internet of Things (IoT).
- Demonstrate various business models relevant to IoT.
- Construct designs for web connectivity
- Organize sources of data acquisition related to IoT, integrate to enterprise systems.
- Describe IoT with Cloud technologies.

**UNIT I:**

**The Internet of Things-** An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles For Connected Devices, Internet connectivity, **Application Layer Protocols-** HTTP, HTTPS, FTP

**UNIT II:**

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

**UNIT III:**

Design Principles for the Web Connectivity for connected-Devices, WebCommunication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

**UNITIV:**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

**UNITV:**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio



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Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

**Text Books:**

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

**Reference Books:**

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>OPERATING SYSTEMS &amp; COMPILER DESIGN LAB</b>					

**Course Objectives:**

The main objective of this course is to implement operating systems and compiler design concept

**Course Outcomes:**

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

- Implement various scheduling, page replacement algorithms and algorithms related to deadlocks
- Design programs for shared memory management and semaphores
- Determine predictive parsing table for a CFG
- Apply Lex and Yacc tools
- Examine LR parser and generating SLR Parsing table

**List of Experiments:**

1. Simulate the following CPU scheduling algorithms:
  - a. Round Robin (b) SJF (c) FCFS (d) Priority
2. Simulate the following:
  - a) Multiprogramming with a fixed number of tasks (MFT)
  - b) Multiprogramming with a variable number of tasks (MVT)
3. Simulate the following page replacement algorithms:
  - a) FIFO b) LRU c) LFU
4. Write a C program that illustrates two processes communicating using shared memory
5. Write a C program to simulate producer and consumer problem using semaphores
6. Simulate Bankers Algorithm for Dead Lock Avoidance
7. Simulate Bankers Algorithm for Dead Lock Prevention.
8. Write a C program to identify different types of Tokens in a given Program.
9. Write a Lex Program to implement a Lexical Analyzer using Lex tool.
10. Write a C program to Simulate Lexical Analyzer to validating a given input String.
11. Write a C program to implement the Brute force technique of Top down Parsing.
12. Write a C program to implement a Recursive Descent Parser.
13. Write C program to compute the *First* and *Follow* Sets for the given Grammar.
14. Write a C program for eliminating the left recursion and left factoring of a given grammar
15. Write a C program to check the validity of input string using Predictive Parser.
16. Write a C program for implementation of LR parsing algorithm to accept a given input string.
17. Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar
18. Simulate the calculator using LEX and YACC tool.





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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>HUMAN COMPUTER INTERACTION LAB</b>					

**Course Objective:**

Able to design interfaces between people and computers.

**Course Outcomes:**

Students will be able to:

- Develop UX designs
- Test on mobile phones

**List of Experiments:**

1. Type, Color and Icon
  - a. Work with type in XD wireframes
  - b. Rectangles, Circles, Buttons and Rounded corners
  - c. Use color in Adobe XD
  - d. Add Strokes & copy & paste appearance in Adobe XD
  - e. Add Free icons for your Adobe XD & UX UI projects
2. Add interaction to your prototype in Adobe XD
3. Add Prototype animation & easing in Adobe XD
4. Display your design on XD App on iPhone & Android
5. Add auto-animations in Adobe XD
6. Share Wireframes for comments in Adobe XD
7. Create a mood board in Adobe XD
8. Add View port aka dotted line on the page in Adobe XD
9. Add & Delete guides to Adobe XD
10. Create a color palette in Adobe XD
11. Create gradients in Adobe XD
12. Save and reuse color swatches in Adobe XD
13. Add Character Styles in Adobe XD
14. Draw & edit shapes in Adobe XD
15. Use pen tool for drawing shapes

**Weblinks:**

<https://www.udemy.com/course/ui-ux-web-design-using-adobe-xd/>



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		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>ANIMATION COURSE: ANIMATION DESIGN</b> <b>(Skill Oriented Course III)</b>					

**Course Objectives:**

The main objective of this course is to understand 2-D and 3-D animation using Adobe package

**Course Outcomes:**

At the end of the Course, Student will be able to:

- learn various tools of digital 2-D animation
- understand production pipeline to create 2-D animation.
- apply the tools to create 2D animation for films and videos
- understand different styles and treatment of content in 3D model creation
- apply tools to create effective 3D modelling texturing and lighting

**List of Experiments:**

1. Adobe Photoshop:
  - a. Create your visiting card
  - b. Create Title for any forthcoming film
2. Draw Cartoon Animation using reference
3. Creating Frame by Frame animation
4. Create a scene by using Mask layers animation
5. Adobe Illustrator:
 

Packet Design (Toothpaste packet, Soap cover, any Food product)
6. Create any model of the male or female character
7. Create any Model of Cars or Bike
8. Create any Model of any animal.
9. Create any Model of any birds, fishes, and worms.
10. Create and Convert 2D objects into 3D objects
11. Create an animated 3D titling with sound
12. Create any Model some objects such as chairs, tables, fruits, utensils

**List of Augmented Experiments: (Weeks 13 – Week 16)**

(Any two of the following experiments can be performed)

1. Animate day and night scene of a street with the help of lighting
2. Create a human character using Character studio and animate the same
3. Create a natural outdoor or indoor scene.
4. Apply texture on various objects and characters

**Reference Books:**

1. Flash MX 2004, Thyagarajan Anbumani, TMH.
2. Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH.



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**Web Links:**

1. [https://onlinecourses.swayam2.ac.in/cec21\\_cs07/preview](https://onlinecourses.swayam2.ac.in/cec21_cs07/preview)
2. [https://onlinecourses.swayam2.ac.in/ugc19\\_cs09/preview](https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview)
3. [https://onlinecourses.swayam2.ac.in/ntr20\\_ed15/preview](https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview)
4. [https://youtube.com/playlist?list=PLfFk8y2fd3FjeE\\_CrFASNvDLBp3yF1Hwi](https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi)



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		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course III)</b>					

**Course Outcomes:**

At the end of the Course, Student will be able to:

- Understand the why, what and how of DevOps adoption
- Attain literacy on Devops
- Align capabilities required in the team
- Create an automated CICD pipeline using a stack of tools

**List of Exercises:**

**Note:** There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

**Exercise 1:**

Reference course name : [Software engineering and Agile software development](#)

Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.

Solve the questions [given in the reference course name](#) to gauge your understanding of the topic

**Exercise 2:**

Reference course name: [Development & Testing with Agile: Extreme Programming](#)

Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.

Solve the questions in the “Take test” module [given in the reference course name](#) to gauge your understanding of the topic

**Exercise 3:**

Module name :DevOps adoption in projects

It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.

Solve the questions given in Quiz1, Quiz2, Quiz 3

**Exercise 4:**

Module name :Implementation of CICD with Java and open source stack

Configure the web application and Version control using Git using Git commands and version control operations.



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**Exercise 5:**

Module Name: Implementation of CICD with Java and open source stack
---

Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.
--

**Exercise 6:**

Module Name: Implementation of CICD with Java and open source stack
---

Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.
---

**Exercise 7:**

Module Name: Implementation of CICD with Java and open source stack
---

Configure the Jenkins tool with the required paths, path variables, users and pipeline views.
---

**Exercise 8:**

Module name: Implementation of CICD with Java and open source stack
---

Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.
---

**Exercise 9:**

Module name: Implementation of CICD with Java and open source stack
---

Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.
---

**Exercise 10 :**

Module name: Implementation of CICD with Java and open source stack
---

In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.
--

**Exercise 11:**

Module name :Implementation of CICD with Java and open source stack
---

In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.
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**Exercise 12:**

Module name :Course end assessment
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In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.
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**Reference Books:**

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication  
[<https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835>]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication  
[<https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/1491979593>]

**Hardware and software configuration:**

1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse
6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

**Web Links:( Courses mapped to Infosys Springboard platform)**

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_013382690411003904735\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013382690411003904735_shared/overview) [Software Engineering and Agile software development]
2. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_01350157819497676810467](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350157819497676810467) [Development & Testing with Agile: Extreme Programming]
3. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_01353898917192499226\\_shared](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared) [DevOps CICD]



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		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>EMPLOYABILITY SKILLS-I</b>					

**Course Objectives:**

The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

**Course Outcomes:** The end of the course student will be able to

- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

**UNIT I:**

**Analytical Thinking & Listening Skills:** Self-Introduction, Shaping Young Minds - A Talk by AzimPremji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

**Communication Skills:** Verbal Communication; Non Verbal Communication (Body Language)

**UNIT II:**

**Self-Management Skills:** Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities

**Etiquette:** Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

**UNIT III:**

**Standard Operation Methods:** Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

**Verbal Ability:** Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

**UNIT IV:**

**Job-Oriented Skills –I:** Group Discussion, Mock Group Discussions

**UNIT V:**

**Job-Oriented Skills –II:** Resume Preparation, Interview Skills, Mock Interviews

**Text Books and 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.



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**e-resources:**

1. [www.Indiabix.com](http://www.Indiabix.com)
2. [www.freshersworld.com](http://www.freshersworld.com)





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<b>III B Tech I Sem</b>	<b>Minor</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>VISUAL DESIGN AND COMMUNICATION</b>					

**Course Objectives:**

The main objectives of the course are:

- Apply appropriate communication skills across settings, purposes, and audiences.
- Demonstrate knowledge of communication theory and application.

**Course Outcomes:**

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

- Demonstrate critical and innovative thinking.
- Display competence in oral, written, and visual communication.
- Apply communication theories.

**Unit I:**

Need for and the Importance of Human and Visual Communication. Communication as an expression, skill and process, Understanding Communication: SMRC-Model

**Unit II:**

Communication as a process. Message, Meaning, Connotation, Denotation Culture/Codes etc Levels of communication: Technical, Semantic, and Pragmatic. The semiotic landscape: language and visual communication, narrative representation

**Unit III:**

Fundamentals of Design: Definition. Approaches to Design, Centrality of Design, Elements of Design: Line, Shape, Space, Colour, Texture. Form Etc. Principles of Design: Symmetry. Rhythm, Contrast, Balance Mass/Scale etc. Design and Designers (Need, role, process, methodologies etc.)

**Unit IV:**

Principles of Visual and other Sensory Perceptions. Colour psychology and theory (some aspects) Definition, Optical / Visual Illusions Etc Various stages of design process- problem identification, search for solution refinement, analysis, decision making, and implementation.

**Unit V:**

Basics of Graphic Design. Definition, Elements of GD, Design process-research, a source of concept, the process of developing ideas-verbal, visual, combination & thematic, visual thinking, associative techniques, materials, tools (precision instruments etc.) design execution, and presentation.

**Text Books:**

1. Communication between cultures - Larry A. Samovar, Richard E. Porter, Edwin R. McDaniel & Carolyn Sexton Roy, Monica Eckman, USA, 2012
2. Introduction to Communication studies - John Fiske & Henry Jenkins 3rd edition, Routledge, Oxon 2011



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**Reference Books:**

1. An Introduction to communication studies - Sheila Steinberg, Juta & Co., Cape Town, 2007
2. One World Many Voices: Our Cultures - Marilyn Marquis & Sarah Nielsen, Wingspan Press, California, 2010



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER NETWORKS</b>					

**Course Objectives:**

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

**Course Outcomes:**

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

- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

**UNIT I:**

**Introduction:** Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.

**Physical Layer** –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

**UNIT II:**

**Data link layer:** Design issues, **Framing:** fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols:** simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

**Sliding window protocol:** One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

**UNIT III:**

**Media Access Control: Random Access:** ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

**Wired LANs:** Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit



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Ethernet, 10 Gigabit Ethernet.

**UNIT IV:**

**The Network Layer Design Issues** – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention policies, Approaches to Congestion Control, Traffic Aware Routing, Admission Control, Traffic Throttling- Load Shedding. Traffic Control Algorithm, Leaky bucket & Token bucket.

**Internet Working:** How networks differ, How networks can be connected, Tunnelling, internetwork routing, Fragmentation, network layer in the internet IP protocols, IP Version 4 protocol, IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT, Subnets-IP Version 6, The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6, Internet control protocols- ICMP, ARP, DHCP

**UNIT V:**

**The Transport Layer:** Transport layer protocols: Introduction, services, port number, User data gram protocol, User datagram, UDP services, UDP applications, Transmission control protocol: TCP services, TCP features, Segment, A TCP connection, windows in TCP, flow control, Error control, Congestion control in TCP.

**Application Layer:** World Wide Web: HTTP, Electronic mail-Architecture, web based mail, email security, TELENET, local versus remote Logging, Domain Name System: Name Space, DNS in Internet,Resolution, Caching, Resource Records, DNS messages, Registrars, security of DNS Name Servers, SNMP.

**Text Books:**

1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

**References Books:**

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER AIDED DESIGN</b>					

**Course Objectives:**

- Demonstrate basic concept of computer aided design and its applications.
- Make use of various concepts and characteristics in geometric modeling.
- Understand the mathematical representation of solids
- Analyze geometric transformations.
- Determine stress and strain in structural elements through Finite Element Analysis

**UNIT-I:**

**Introduction:** A typical product cycle, CAD tools for the design process of product cycle, CAD / CAM system evaluation criteria, Input / Output devices; Graphics Displays: Refresh display, DVST, Raster display, pixel value and lookup table, estimation of graphical memory, LCD, LED fundamentals. Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System. Line and Curve generation algorithm: DDA, Bresenham's algorithms. Graphics exchange standards and Database management systems.

**UNIT-II:**

**Curves and Surfaces:** Parametric representation of lines: Locating a point on a line, parallel lines, perpendicular lines, distance of a point, Intersection of lines. Parametric representation of circle, Ellipse, parabola and hyperbola. Synthetic Curves: Concept of continuity, Cubic Spline: equation, properties and blending. Bezier Curve: equations, properties; Properties and advantages of B-Splines and NURBS. Various types of surfaces along with their typical applications.

**UNIT-III:**

**Mathematical representation of solids:** Geometry and Topology, Comparison of wireframe, surface and solid models, Properties of solid model, properties of representation schemes, Concept of Half-spaces, Boolean operations. Schemes: B-rep, CSG, Sweep representation, ASM, Primitive instancing, Cell Decomposition and Octree encoding.

**UNIT-IV:**

**Geometric Transformations:** Homogeneous representation; Translation, Scaling, Reflection, Rotation, Shearing in 2D and 3D; Orthographic and perspective projections. Window to View-port transformation.

**UNIT-V:**

**Finite Element Analysis:** Basic procedure for solving a problem using Finite Element Analysis. 1-D Analysis: Concept of Shape function and natural coordinates, strain - displacement matrix, derivation of stiffness matrix for structural problems, properties of stiffness matrix. 1-D structural problems with elimination and penalty approaches, 1-D thermal and fluid problems



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**Text Books:**

1. Ibrahim Zied, CAD / CAM: Theory and Practice, McGraw-Hill

**Reference Books:**

1. Hearn E J and Baker M P, Computer Graphics, Pearson.
2. Chandrupatla T A and Belegundu A D, Introduction to Finite Elements in Engineering, PHI.
3. Logan D, A First Course in the Finite Element Method, Cengage.
4. David F. Rogers and J. Alan Adams, “Mathematical Elements for Computer Graphics”, McGraw-Hill.
5. S.S.Rao, “Engineering Optimization”, Wiley –Interscience. Hearn E J and Baker M P, Computer Graphics, Pearson.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>					

**Course Objectives:**

Upon completion of this course, students will be able to do the following:

- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

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

- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

**UNIT I:**

**Introduction:** Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

**UNIT II:**

**Divide and Conquer:** General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

**The Greedy Method:** The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

**UNIT III:**

**Dynamic Programming:** The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

**UNIT IV:**

**Backtracking:** The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.



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**UNIT V:**

**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

**Text Books:**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, 2<sup>nd</sup> Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, “Algorithms Design & Analysis”, Oxford University Press.

**Reference Books:**

1. Horowitz E. Sahani S: “Fundamentals of Computer Algorithms”, 2<sup>nd</sup> Edition, Galgotia Publications, 2008.
2. S. Sridhar, “Design and Analysis of Algorithms”, Oxford University Press.





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DEEP LEARNING</b> <b>(Professional Elective-II)</b>					

**Course Objectives:** At the end of the course, the students will be expected to:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

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

- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models.
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

**UNIT I:**

**Fundamentals of Deep Learning:** Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. [Text Book 2]

**UNIT II:**

**Introducing Deep Learning:** Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. [Text Book3]

**UNIT III:**

**Neural Networks:** Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. [Text Book 2]

**UNIT IV:**

**Convolutional Neural Networks:** Neural Network and Representation Learning, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. [Text Book 3]

**UNIT V:**

**Interactive Applications of Deep Learning:** Machine Vision, Natural Language processing, Generative Adversarial Networks, Deep Reinforcement Learning. [Text Book 1]



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**Deep Learning Research:** Autoencoders, Deep Generative Models: Boltzmann Machines  
Restricted Boltzmann Machines, Deep Belief Networks. [**Text Book 1**]

**Text Books:**

1. Deep Learning- Ian Goodfellow, YoshuaBengio and Aaron Courville, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, AglaéBassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

**Reference Books:**

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

**Web Link:**

1. Swayam NPTEL: Deep Learning: [https://onlinecourses.nptel.ac.in/noc22\\_cs22/preview](https://onlinecourses.nptel.ac.in/noc22_cs22/preview)



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOFTWARE PROJECT MANAGEMENT</b>					
<b>(Professional Elective-II)</b>					

**Course Objectives:**

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

**Course outcomes:**

Upon the completion of the course students will be able to:-

- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

**UNIT-I:**

**Conventional Software Management:** The waterfall model, conventional software Management performance.

**Evolution of Software Economics:** Software Economics, pragmatic software cost estimation.

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

**UNIT-II:**

**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases.

**Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

**UNIT- III:**

**Model based software architectures:** A Management perspective and technical perspective.

**Work Flows of the process:** Software process workflows, Iteration workflows.

**Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.



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**UNIT- IV:**

**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

**Process Automation:** Automation Building blocks, The Project Environment.

**Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

**UNIT-V:**

Agile Methodology, ADAPTING to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.

**Fundamentals of DevOps:** Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

**Text Books:**

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

**Reference Books:**

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, PankajJalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DISTRIBUTED SYSTEMS</b> <b>(Professional Elective-II)</b>					

**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:**

At the end of the course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

**UNIT I:**

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, Physicalclocksynchronization:NTP.

**UNIT II:**

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. Globalstate and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

**UNIT III:**

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



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classification, Algorithms for the single resource model, the AND model and the OR model.

**UNITIV:**

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.

**UNITV:**

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 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 Niranjana G. Shivaratri, McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/106/106106168/>



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>NETWORK PROGRAMMING</b> <b>(Professional Elective-II)</b>					

**Course Objectives:**

Having successfully completed this course, the student will be able to:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client-server model in networking applications.
- Practice networking commands available through the operating system

**Course Outcomes:** At the end of the course, student will be able to

- Identifying different models and sockets
- Demonstrate different TCP Echo server functions and I/O models
- Rationalize IPV4 and IPV6 Socket options
- Identifying daemon processing and Advanced input and output functions
- Analyze Broadcasting and multicasting

**UNIT I:**

**Introduction to Network Programming:** Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.

**UNIT II:**

**TCP client server:** Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.

**UNIT III:**

**UDP and Socket options: Elementary UDP sockets:** Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP.**Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.

**UNIT IV:**

**Advanced Sockets and Daemon Processes:** IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon\_init Function, inetd Daemon, daemon\_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.



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**UNIT V:**

**Broadcasting and Multicasting:** Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg\_cli function using broadcasting, race conditions, Multicasting addresses, multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multicast socket options. **Raw Sockets:** Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program

**Text Books:**

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.

**Reference Books:**

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MEAN STACK DEVELOPMENT</b> <b>(Job Oriented Course)</b>					

**Course Outcomes:**

At the end of the Course, Student will be able to:

- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

**UNIT-I:**

**HTML 5:** Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellpadding and cellspacing attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

**UNIT-II:**

**JavaScript:** Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

**UNIT-III:**

**Node.js:** Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.  
**Express.js:** Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares,



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Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

**UNIT-IV:**

**Typescript:** Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

**MongoDB:** Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

**UNIT-V:**

What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

**Text Books:**

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1<sup>st</sup> edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly.

**Reference Books:**

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, SandaSKatila, Cengage Learning.



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**Web Links:**

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_17739732834840810000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview) (HTML5)
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_18109698366332810000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview) (Javascript)
3. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_32407835671946760000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview)(Node.js & Express.js)
4. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_9436233116512678000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview)(Typescript)
5. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_20858515543254600000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview)(Angular JS)
6. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_013177169294712832113\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview) (MongoDB)



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>COMPUTER NETWORKS LAB</b>					

**Course Objectives:**

Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

**Course Outcomes:**

By the end of the course student will be able to

- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

**List of Experiments:**

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer framing methods such as
  - i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer framing method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
  - i. Packet Capture Using Wire shark
  - ii. Starting Wire shark
  - iii. Viewing Captured Traffic
  - iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
  - i. NS2 Simulator-Introduction
  - ii. Simulate to Find the Number of Packets Dropped



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- iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
- iv. Simulate to Find the Number of Packets Dropped due to Congestion
- v. Simulate to Compare Data Rate & Throughput.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>COMPUTER AIDED DESIGN LAB</b>					

**Course Objectives:**

- Ability to use the software for drafting and modeling
- Ability to create 2D and 3D models of Engineering Components

**Software Required:**

- i. AutoCAD Software
- ii. FEA Software

**List of Experiments:**

1. Installation of AutoCAD
2. AutoCAD Basics-I
  - i. Starting with AutoCAD
  - ii. Layout and sketching
  - iii. Drawing environment
3. AutoCAD Basics-II
  - i. Elements of drawing
  - ii. Draw commands
4. Plotting lines and curves using algorithms learned.
5. 2D models practice using AutoCAD
6. Isometric drawing practice using AutoCAD
7. Introductory exercise for 3-D modelling.
8. 3-D Solid figures using AutoCAD
9. Exercise for advanced 3-D modelling.
10. Exercise for 3-D editing options.
11. Exercise for Assembly modelling.
12. Exercise for FEA of 1-D structural problems.

**Reference Books:**

1. Engineering graphics with Auto CAD- R.B. Choudary, Anuradha Publishers



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>ALGORITHMS FOR EFFICIENT CODING LAB</b>					

**Course Objective:**

- To develop efficient coding for the algorithms with various inputs and algorithms

**Course Outcomes:**

By completing the course the students will be able to:

- Analyze the program execution time

**List of Experiments:**

1. Develop a program and measure the running time for Binary Search with Divide and Conquer
2. Develop a program and measure the running time for Merge Sort with Divide and Conquer
3. Develop a program and measure the running time for Quick Sort with Divide and Conquer
4. Develop a program and measure the running time for estimating minimum-cost spanning Trees with Greedy Method
5. Develop a program and measure the running time for estimating Single Source Shortest Paths with Greedy Method
6. Develop a program and measure the running time for optimal Binary search trees with Dynamic Programming
7. Develop a program and measure the running time for identifying solution for traveling salesperson problem with Dynamic Programming
8. Develop a program and measure the running time for identifying solution for 8-Queens problem with Backtracking
9. Develop a program and measure the running time for Graph Coloring with Backtracking
10. Develop a program and measure the running time to generate solution of Hamiltonian Cycle problem with Backtracking
11. Develop a program and measure the running time running time to generate solution of Knapsack problem with Backtracking



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	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>BIG DATA: SPARK</b> <b>(Skill Oriented Course)</b>				

**Course Objectives:**

The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

**Course Outcomes:**

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

- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

**List of Experiments:**

1.

<b>EXPERIMENT-1:</b>
To Study of Big Data Analytics and Hadoop Architecture
(i) know the concept of big data architecture
(ii) know the concept of Hadoop architecture
<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01256841991858585686_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01256841991858585686_shared/overview</a>

**2. Loading DataSet in to HDFS for Spark Analysis**

<b>EXPERIMENT-2:</b>
Installation of Hadoop and cluster management
(i) Installing Hadoop single node cluster in ubuntu environment
(ii) Knowing the differencing between single node clusters and multi-node clusters
(iii) Accessing WEB-UI and the port number
(iv) Installing and accessing the environments such as hive and sqoop
(We can restrict to standalone or if the facilities available can try for pseudo-distribution mode {or} fully distribution mode)
<a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01329503531746099243539_shared?collectionId=lex_auth_01329503580490137643544_shared&amp;collectionType=Collection">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01329503531746099243539_shared?collectionId=lex_auth_01329503580490137643544_shared&amp;collectionType=Collection</a>





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<b>EXPERIMENT-3:</b>
File management tasks & Basic linux commands
(i) Creating a directory in HDFS
(ii) Moving forth and back to directories
(iii) Listing directory contents
(iv) Uploading and downloading a file in HDFS
(v) Checking the contents of the file
(vi) Copying and moving files
(vii) Copying and moving files between local to HDFS environment
(viii) Removing files and paths
(ix) Displaying few lines of a file
(x) Display the aggregate length of a file
(xi) Checking the permissions of a file
(xii) Zipping and unzipping the files with & without permission pasting it to a location
(xiii) Copy, Paste commands
<a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_s_hared?collectionId=lex_auth_01256841991858585686_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_s_hared?collectionId=lex_auth_01256841991858585686_shared&amp;collectionType=Course</a>

<b>EXPERIMENT-4:</b>
Map-reducing
(i) Definition of Map-reduce
(ii) Its stages and terminologies
(iii) Word-count program to understand map-reduce
(Mapper phase, Reducer phase, Driver code)
<a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_s_hared?collectionId=lex_auth_01256841991858585686_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_s_hared?collectionId=lex_auth_01256841991858585686_shared&amp;collectionType=Course</a>

<b>EXPERIMENT-5:</b>
Implementing Matrix-Multiplication with Hadoop Map-reduce

<b>EXPERIMENT-6:</b>
Compute Average Salary and Total Salary by Gender for an Enterprise.

<b>EXPERIMENT-7:</b>
(i) Creating hive tables(External and internal)
(ii) Loading data to external hive tables from sqltables(or)Structured c.s.v using scoop
(iii) Performing operations like filterations and updations
(iv) Performing Join(inner, outer etc)
(v) Writing User defined function on hive tables
<a href="https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_01257841711418572_848_shared?collectionId=lex_auth_01258388119638835242_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_01257841711418572_848_shared?collectionId=lex_auth_01258388119638835242_shared&amp;collectionType=Course</a>



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**EXPERIMENT-8:**

Create a sql table of employees

Employee table with id,designation

Salary table (salary ,dept id)

Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents

[https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex\\_auth\\_012606909641981952143\\_shared?collectionId=lex\\_auth\\_0126052684230082561692\\_shared&collectionType=Course](https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012606909641981952143_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course)

**EXPERIMENT-9:**

(i) PysparkDefinition(Apache Pyspark) and difference between Pyspark, Scala, pandas

(ii) Pyspark files and class methods

(i) get(file name)

(ii) get root directory()

**EXPERIMENT-10 :**

Pyspark -RDD'S

(i) what is RDD's?

(ii) ways to Create RDD

(i) parallelized collections

(ii) external dataset

(iii) existing RDD's

(iv) Spark RDD's operations

(Count, foreach(), Collect, join,Cache())

[https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_3509975869549336000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3509975869549336000_shared/overview)

**EXPERIMENT-11 :**

Perform pyspark transformations

(i) map and flatMap

(ii) to remove the words, which are not necessary to analyze this text.

(iii) groupBy

(iv) What if we want to calculate how many times each word is coming in corpus ?

(v) .How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separatly on each partition and get the output of the task performed in these partition ?

(vi) unions of RDD

(vii) join two pairs of RDD Based upon their key

[https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01330150584451891225182\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330150584451891225182_shared/overview)



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<b>EXPERIMENT-12:</b>
Pysparksparkconf-Attributes and applications
(i) What is Pyspark spark conf ()
(ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

**Hardware and software configuration:**

**Hardware Configuration for each Node (Suggested)**

**Operating System:**

NAME="Red Hat Enterprise Linux Server", VERSION="7.9 (Maipo)"

**CPU Architecture:** x86\_64

**CPU op-mode(s):** 32-bit, 64-bit

**CPU(s):** 32

**RAM:** 64G

**Software Required**

Java: openjdk version "1.8.0\_202" ( installed in all nodes)

For Hive metastore – we have installed MySQL

MySQL: Ver 8.0.19 for Linux on x86\_64 (MySQL Community Server - GPL)

**Resource Links for installation**

- Hadoop Installation steps: [Apache Hadoop 3.3.2 – Hadoop: Setting up a Single Node Cluster.](#) & [Apache Hadoop 3.3.2 – Hadoop Cluster Setup](#)
- Links to download different versions of Hadoop : [Index of /hadoop/common \(apache.org\)](#) & [Index of /dist/hadoop/core \(apache.org\)](#)

**Text Books:**

1. Spark inAction,MarkoBonaci and PetarZecevic,Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes,Raju Kumar Mishra and SundarRajanRaman,Apress Media.

<b>Web Links:</b>	
1.	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133015058445189122518_2_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133015058445189122518_2_shared/overview</a>
2.	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_s_hared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_s_hared/overview</a>
3.	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126052684230082561692_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126052684230082561692_shared/overview</a>



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<b>MEAN STACK TECHNOLOGIES-MODULE I- HTML 5, JAVASCRIPT, NODE.JS, EXPRESS.JS, AND TYPESCRIPT (Skill Oriented Course)</b>				

**Course Outcomes:**

At the end of the Course, Student will be able to:

- Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
- Utilize JavaScript for developing interactive HTML web pages and validate form data.
- Build a basic web server using Node.js and also working with Node Package Manager (NPM).
- Build a web server using Express.js
- Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

**List of Exercises**

<b>1.a</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
	Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_177397328348408100_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_177397328348408100_00_shared&amp;collectionType=Course</a>
<b>1.b</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Sectioning Elements
	Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000_0_shared&amp;collectionType=Course</a>
<b>1.c</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Paragraph Element, Division and Span Elements, List Element
	Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_177397328348408100_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_177397328348408100_00_shared&amp;collectionType=Course</a>
<b>1.d</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Link Element
	Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.



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	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>1.e</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Character Entities
	Add the © symbol in the Home page footer of IEKart's Shopping application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>1.f</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> HTML5 Global Attributes
	Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>2.a</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellpadding, cellspacing attributes
	Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>2.b</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Creating Form Elements, Color and Date Pickers, Select and Datalist Elements
	Using the form elements create Signup page for IEKart's Shopping application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>2.c</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Input Elements - Attributes
	Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>2.d</b>	<b>Course Name:</b> HTML5 - The Language
	<b>Module Name:</b> Media, Iframe
	Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_17739732834840810000_shared&amp;collectionType=Course</a>
<b>3.a</b>	<b>Course Name:</b> Javascript



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	<p><b>Module Name:</b> Type of Identifiers</p> <p>Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a></p>
<b>3.b</b>	<p><b>Course Name:</b> Javascript</p> <p><b>Module Name:</b> Primitive and Non Primitive Data Types</p> <p>Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21528322245232402000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21528322245232402000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a></p>
<b>3.c</b>	<p><b>Course Name:</b> Javascript</p> <p><b>Module Name:</b> Operators and Types of Operators</p> <p>Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a></p>
<b>3.d</b>	<p><b>Course Name:</b> Javascript</p> <p><b>Module Name:</b> Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements</p> <p>Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a></p>
<b>3.e</b>	<p><b>Course Name:</b> Javascript</p> <p><b>Module Name:</b> Types of Loops</p> <p>Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a></p>
<b>4.a</b>	<p><b>Course Name:</b> Javascript</p> <p><b>Module Name:</b> Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions</p> <p>Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If</p>



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	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a>
<b>4.b</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> Working With Classes, Creating and Inheriting Classes Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a>
<b>4.c</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> In-built Events and Handlers Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course</a>
<b>4.d</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message, and a diffe
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course</a>
<b>5.a</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_181096983663328100000_shared&amp;collectionType=Course</a>
<b>5.b</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-">https://infyspringboard.onwingspan.com/web/en/viewer/web-</a>



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	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">module/lex_auth_012599811633905664460_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a>
<b>5.c</b>	<b>Course Name:</b> Javascript
	<b>Module Name:</b> Creating Modules, Consuming Modules
	Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else w
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_18109698366332810000_shared&amp;collectionType=Course</a>
<b>6.a</b>	<b>Course Name:</b> Node.js
	<b>Module Name:</b> How to use Node.js
	Verify how to execute different functions successfully in the Node.js platform.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>6.b</b>	<b>Course Name:</b> Node.js
	<b>Module Name:</b> Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>6.c</b>	<b>Course Name:</b> Node.js
	<b>Module Name:</b> Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>6.d</b>	<b>Course Name:</b> Node.js
	<b>Module Name:</b> Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_324078356719467600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_324078356719467600000_shared&amp;collectionType=Course</a>
<b>6.e</b>	<b>Course Name:</b> Node.js
	<b>Module Name:</b> File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_324078356719467600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_324078356719467600000_shared&amp;collectionType=Course</a>
<b>7.a</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Defining a route, Handling Routes, Route Parameters, Query Parameters
	Implement routing for the AdventureTrails application by embedding the necessary





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	code in the routes/route.js file. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course</a>
<b>7.b</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course</a>
<b>7.c</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Connecting to MongoDB with Mongoose, Validation Types and Defaults
	Write a Mongoose schema to connect with MongoDB.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035588775485440691_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035588775485440691_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>7.d</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Models
	Write a program to wrap the Schema into a Model object.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035593896869888662_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035593896869888662_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>8.a</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>8.b</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>8.c</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Why Session management, Cookies
	Write a program to explain session management using cookies.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_324078356719467600_00_shared&amp;collectionType=Course</a>



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<b>8.d</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Sessions
	Write a program to explain session management using sessions.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>8.e</b>	<b>Course Name:</b> Express.js
	<b>Module Name:</b> Why and What Security, Helmet Middleware
	Implement security features in myNotes application
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&amp;collectionType=Course</a>
<b>9.a</b>	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a>
<b>9.b</b>	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a>
<b>9.c</b>	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a>
<b>9.d</b>	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712910875500544904_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712910875500544904_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a>
<b>9.e</b>	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely



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	<p>manufacturer and id, where manufacturer value should be passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function should</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
10.a	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	<p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
10.b	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	<p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
10.c	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	<p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925995458560912_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925995458560912_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
10.d	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Function Types
	Declare an interface with function type and access its value.
	<p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
11.a	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category, Product as well as implementation to create a variable of this interface type.
	<p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712951652139008920_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712951652139008920_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
11.b	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Classes
	Consider the Mobile Cart application, Create objects of the Product class and place



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	<p>them into the productlist array.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
11.c	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Constructor
	<p>Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is &lt;&lt;id value&gt;&gt;".</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712954616782848927_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712954616782848927_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
11.d	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Access Modifiers
	<p>Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712953517170688931_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712953517170688931_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
12.a	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Properties and Methods
	<p>Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
12.b	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Creating and using Namespaces
	<p>Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
12.c	<b>Course Name:</b> Typescript
	<b>Module Name:</b> Creating and using Modules
	<p>Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_9436233116512678000_shared&amp;collectionType=Course</a></p>
12.d	<b>Course Name:</b> Typescript
	<b>Module Name:</b> What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.



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### Software configuration and installation

#### 1. HTML & Javascript

- Simple editors such as Notepad or go for IDEs like Visual Studio Code(recommended), Eclipse etc. which makes coding easier.
- And, to execute application, you can use any commonly used browser such as Google Chrome(recommended), Mozilla Firefox etc
- Setup details: [Environmental Setup for HTML5 - Viewer Page | Infosys Springboard \(onwingspan.com\)](#)
- [Environment Setup: Internal - Viewer Page | Infosys Springboard \(onwingspan.com\)](#)

#### 2. Node JS

Download **Node.js** from the official site

Setup details :[How to use Node.js - Viewer Page | Infosys Springboard \(onwingspan.com\)](#)

#### 3. Typescript

[Installing TypeScript - Internal - Viewer Page | Infosys Springboard \(onwingspan.com\)](#)

### Text Books:

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, Elad Elrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.

### Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

### Web Links:

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_17739732834840810000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview) (HTML5)
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_18109698366332810000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview) (Javascript)
3. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_32407835671946760000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview) (Node.js & Express.js)
4. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_9436233116512678000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview) (Typescript)



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		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>EMPLOYABILITY SKILLS-II</b>					

**Course Objectives:**

The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

**Course Outcomes:** After completion of this course

- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

**UNIT I:**

**Numerical ability I:** Number system, HCF & LCM, Average, Simplification, Problems on numbers

**Numerical ability II:** Ratio & Proportion, Partnership, Percentages, Profit & Loss

**UNIT II:**

**Arithmetical ability I:** Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.

**Arithmetical ability II:** Time & Distance, Problems on boats & Steams, Problems on Trains

**UNIT III:**

**Arithmetical ability III:** Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,

**Logical ability:** Permutations and Combination and Probability.

**UNIT IV:**

**Mensuration:** Geometry, Areas, Volumes

**UNIT V:**

**Data interpretation:** Tabulation, Bar graphs, Pie charts, line graphs

**Text Books and Reference Books:**

1. R. S. Aggarwal “Quantitative Aptitude”, Revised ed., S Chand publication, 2017  
ISBN:8121924987

**E- resources:**

1. [https://blog.feedspot.com/aptitude\\_youtube\\_channels/](https://blog.feedspot.com/aptitude_youtube_channels/)
2. [https://www.tutorialspoint.com/quantitative\\_apititude/](https://www.tutorialspoint.com/quantitative_apititude/)
3. <https://www.careerbless.com/aptitude/qa/home.php>



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		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>COMPUTER VISION</b>					

**Course Objectives:**

To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

**Course Outcomes:** After completing the course Student will be able to:

1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. Describe known principles of feature detection and matching,
3. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
4. Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

**UNIT I:**

**Introduction:** Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

**UNIT II:**

**Feature Detection and Matching:** Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

**UNIT III:**

**Structure and Motion:** Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

**UNIT IV:**

**Image Stitching:** Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

**UNIT V:**

**3D Reconstruction:** Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light



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Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

**Text Books:**

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1<sup>st</sup> Edition, 2012.

**Reference Books:**

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick & Shapiro, "Computer and Robot Vision", Vol II
3. Gerard Medioni and Sing Bing Kang "Emerging topics in computer vision" 144

**NPTEL LINK:** [https://onlinecourses.nptel.ac.in/noc22\\_ee48/preview](https://onlinecourses.nptel.ac.in/noc22_ee48/preview)





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>REINFORCEMENT LEARNING</b> <b>(Professional Elective-III)</b>					

**Course Objective:**

- Learn various approaches to solve decision problems with functional models and algorithms for task formulation, Tabular based solutions, Function approximation solutions, policy gradients and model based reinforcement learning.

**Course Outcomes:**

By completing the course the students will be able to:

- Understand basic concepts of Reinforcement learning
- Identifying appropriate learning tasks for Reinforcement learning techniques
- Understand various methods and applications of reinforcement learning

**UNIT I:**

**Introduction:** Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe

**Multi-armed Bandits:** A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper – Confidence-Bound Action Selection, Gradient Bandit Algorithm

**UNIT II:**

**Finite Markov Decision Process:** The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions,

**Dynamic Programming:** Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming

**UNIT III:**

**Monte Carlo Methods:** Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discounting-aware Importance Sampling, Per-decision Importance Sampling

**n-step Bootstrapping:** n-step TD Prediction, n-step Sarsa, n-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: n-step Q( $\sigma$ )

**UNIT IV:**

**Off-policy Methods with Approximation:** Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance

**Eligibility Traces:** The  $\lambda$ -return, TD( $\lambda$ ), n-step Truncated  $\lambda$ -return methods, Online  $\lambda$ -return Algorithm, True Online TD( $\lambda$ ), Dutch Traces in Monte Carlo Learning, Sarsa( $\lambda$ ), Variable  $\lambda$  and  $\gamma$ ,



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Off-policy Traces with Control Variables, Watkins's  $Q(\lambda)$  to Tree-Backup( $\lambda$ )

**UNITV:**

**Policy Gradient Methods:** Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFORCE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization for Continuous Actions

**Applications and Case Studies:** TD-Gammon, Samuel's Checkers Player, Watson's Daily Double Wagering, Optimizing Memory Control, Personalized Web Services

**Text Books:**

1. R. S. Sutton and A. G. Barto, "Reinforcement Learning - An Introduction," MIT Press, 2018.

**References:**

1. Szepesvári, Csaba, "Algorithms for Reinforcement Learning," United States: Morgan & Claypool, 2010.
2. Puterman, Martin L., "Markov Decision Processes: Discrete Stochastic Dynamic Programming," Germany: Wiley, 2014.

**Web References:**

1. [https://onlinecourses.nptel.ac.in/noc20\\_cs74/preview](https://onlinecourses.nptel.ac.in/noc20_cs74/preview)
2. <https://www.coursera.org/learn/fundamentals-of-reinforcement-learning>



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>NATURE INSPIRED COMPUTING TECHNIQUES</b> <b>(Professional Elective-III)</b>					

**Course Objective:**

- Learn the theoretical foundations of Nature Inspired Computing techniques, how they can be used to solve problems, and in which areas are most useful and effective.

**Course Outcomes:**

By completing the course the students will be able to:

- Understand the strengths, weaknesses and appropriateness of nature-inspired algorithms.
- Apply nature-inspired algorithms to optimization, design and learning problems.

**UNIT I:**

**Analysis of Algorithms:** Analysis of Optimization Algorithms, Nature Inspired Algorithms, Parameter Tuning and Parameter Control: Parameter Tuning, Hyper optimization, Multi objective View, Parameter Control, Simulated Annealing: Algorithm, Basic Convergence Properties, Stochastic Tunneling

**UNIT II:**

**Genetic Algorithms:** Introduction, Role of Genetic Operators, Choice of Parameters, GA Variants, **Differential Evolution:** Introduction, Differential Evolution, Variants, Choice of Parameters, Convergence Analysis, **Particle Swarm Optimization:** Swarm Intelligence, PSO Algorithm, Accelerated PSO, Binary PSO

**UNIT III:**

**Firefly Algorithms:** Firefly Behavior, Standard Firefly Algorithm Variations of Light Intensity and Attractiveness, Controlling Randomization, Firefly Algorithms in Applications

**Cuckoo Search:** Cuckoo Breeding Behavior, Levy Flights, Cuckoo Search: Special Cases of Cuckoo Search, Variants of Cuckoo Search, Global Convergence, Applications

**UNIT IV**

**Bat Algorithms:** Echolocation of Bats: Behavior of Microbats, Acoustics of Echolocation, Bat Algorithms: Movement of Virtual Bats, Loudness and Pulse Emission, Binary Bat Algorithm, Variants of the Bat Algorithm, Convergence Analysis, Applications: Continuous Optimization, Combinatorial Optimization and Scheduling, Inverse Problems and Parameter Estimation, Classifications, Clustering and Data Mining, Image Processing, Fuzzy Logic and Other Applications

**UNIT V:**

**Flower Pollination Algorithms:** Introduction, Characteristics of Flower Pollination, Flower Pollination Algorithms, Multi-Objective Flower Pollination Algorithms, Validation and Numerical Experiments: Single-Objective Test Functions, Multi-Objective Test Functions, Applications: Single-Objective Design Benchmarks, Multi-Objective Design Benchmarks



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**Text Books:**

1. “Nature-Inspired Optimization Algorithms”, Yang, Xin-She, Elsevier Science, 2014.

**References:**

1. “Nature-Inspired Computing and Optimization: Theory and Applications,” Germany: Springer International Publishing, 2017.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>					
<b>(Professional Elective-III)</b>					

**Course Objectives:**

The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

**Course Outcomes :** At the end of the course, student will be able to

- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

**UNIT I:**

**Basic Principles :** Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

**UNIT II:**

**Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

**UNIT III:**

**Asymmetric Encryption:** Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

**UNIT IV:**

**Data Integrity, Digital Signature Schemes & Key Management :** Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

**UNIT V:**

**Network Security-I:** Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPsec, System Security



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**Text Books:**

1. Cryptography and Network Security, 3<sup>rd</sup> Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4<sup>th</sup> Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1<sup>st</sup> Edition, Keith M.Martin, Oxford,2016

**Reference Books:**

1. Network Security and Cryptography, 1<sup>st</sup> Edition, Bernard Meneges, Cengage Learning,2018



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>BLOCK CHAIN TECHNOLOGIES</b> <b>(Professional Elective-III)</b>					

**Course Objectives:**

To understand block chain technology and Cryptocurrency works

**Course Outcomes:**

After the completion of the course, student will be able to

- Demonstrate the block chain basics, Crypto currency
- To compare and contrast the use of different private vs. public block chain and use cases
- Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
- Classify Permission Block chain and use cases – Hyper ledger, Corda
- Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

**UNIT I:**

**Introduction:** Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

**UNIT II:**

Hashing, public key cryptosystems, private vs public block chain and use cases, HashPuzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

**UNIT III:**

**Introduction to Bitcoin :** Bitcoin Block chain and scripts, Use cases of BitcoinBlockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

**UNIT IV:**

Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

**UNIT V:**

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.



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**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





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ROBOTIC PROCESS AUTOMATION</b> <b>(Professional Elective-IV)</b>					

**Course Outcomes:**

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

- Describe RPA, where it can be applied and how it's implemented.
- Describe the different types of variables, Control Flow and data manipulation techniques.
- Identify and understand Image, Text and Data Tables Automation.
- Describe how to handle the User Events and various types of Exceptions and strategies.
- Understand the Deployment of the Robot and to maintain the connection.

**UNIT I :**

**Introduction to Robotic Process Automation:** Scope and techniques of automation, Robotic process automation, What can RPA do, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.

**RPA Basics:** History of Automation, What is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated, RPA Advanced Concepts, Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem.

**UNIT II:**

**RPA Tool Introduction and Basics:**

**Introduction to RPA Tool:** The User Interface, Variables, Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables, Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces, Control Flow, Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity, Data Manipulation, Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data

**UNIT III:**

**Advanced Automation Concepts & Techniques:** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/ Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques, Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation,



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Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps, Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

**UNIT IV:**

**Handling User Events & Assistant Bots, Exception Handling:** What are assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.

**Exception Handling:** Debugging and Exception Handling, Debugging Tools, Strategies for solving issues, Catching errors.

**UNIT V:**

**Deploying and Maintaining The Bot:** Publishing using publish utility, Creation of Server, Using Server to control the bots, Creating a provision Robot from the Server, Connecting a Robot to Server, Deploy the Robot to Server, Publishing and managing updates, Managing packages, Uploading packages, Deleting packages

**Text Books:**

1. Alok Mani Tripathi, “*Learning Robotic Process Automation*”, Packt Publishing, 2018.

**Reference Books:**

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation, 1<sup>st</sup> Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, 1<sup>st</sup> Edition 2018.
3. Srikanth Merianda, ”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1<sup>st</sup> Edition 2018.
4. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1<sup>st</sup> Edition 2018.

**Web References:**

1. <https://www.uipath.com/rpa/robotic-process-automation>
2. <https://www.academy.uipath.com>



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<b>CLOUD COMPUTING</b> <b>(Professional Elective-IV)</b>					

**Course Objectives:**

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

**Course Outcomes:** At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

**UNIT I:**

**Systems Modeling, Clustering and Virtualization:** Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

**UNIT II:**

**Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

**UNIT III:**

**Cloud Platform Architecture:** Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

**UNIT-IV:**

**Cloud Resource Management and Scheduling:** Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.



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**UNITV:**

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

**Text Books:**

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

**Reference Books:**

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER VISION</b> <b>(Professional Elective-IV)</b>					

**Course Objectives:**

To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

**Course Outcomes:** After completing the course Student will be able to:

5. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
6. Describe known principles of feature detection and matching,
7. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
8. Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

**UNIT I:**

**Introduction:** Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

**UNIT II:**

**Feature Detection and Matching:** Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

**UNIT III:**

**Structure and Motion:** Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

**UNIT IV:**

**Image Stitching:** Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

**UNIT V:**

**3D Reconstruction:** Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light



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Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

**Text Books:**

3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
4. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1<sup>st</sup> Edition, 2012.

**Reference Books:**

4. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
5. Haralick & Shapiro, "Computer and Robot Vision", Vol II
6. Gerard Medioni and Sing Bing Kang "Emerging topics in computer vision" 158

**NPTEL LINK:** [https://onlinecourses.nptel.ac.in/noc22\\_ee48/preview](https://onlinecourses.nptel.ac.in/noc22_ee48/preview)



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>NOSQL DATABASES</b> <b>(Professional Elective-IV)</b>					

**Course Objective:** The student will be able to

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

**Course Outcomes:** At the end of the course, student will be able to

- Discuss about Aggregate Data Models
- Explain about Master-Slave Replication, Peer-to-Peer Replication
- Describe the Structure of Data, Scaling, Suitable Use Cases
- Make use of Complex Transactions Spanning Different Operations
- Identify Routing, Dispatch and Location-Based Services

**UNIT-I:**

Why NoSQL, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schema less Databases, Materialized Views, Modelling for Data Access,

**UNIT-II:**

**Distribution Models:** Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes

**UNIT-III:**

What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets.

**UNIT-IV:**

Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, Ecommerce Applications,



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When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

**UNIT-V:**

Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch and Location-Based Services, Recommendation Engines, When Not to Use

**TextBooks:**

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012

**Reference Books:**

1. Dan Sullivan, "NoSQLFor Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOCIAL NETWORK ANALYSIS</b> <b>(Professional Elective-V)</b>					

**Course Objectives:**

- Formalize different types of entities and relationships as nodes and edges and represent this information as relational data
- Plan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network data
- Interpret and synthesize the meaning of the results with respect to a question, goal or task
- Collect network data in different ways and from different sources while adhering to legal standards and ethics standards

**Course Outcomes:**

After completing the course student should:

- Know basic notation and terminology used in network science
- Be able to visualize, summarize and compare networks
- Illustrate basic principles behind network analysis algorithms
- Develop practical skills of network analysis in R programming language
- Be capable of analyzing realworld networks

**UNIT I:**

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

**UNIT II:**

Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

**UNIT III:**

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

**UNIT IV:**

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

**UNIT V:**

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments,



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Spatial and agent-based models.

**Text Books:**

1. S.Wasser man and K.Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.
2. D.Easleyand J.Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world”, Cambridge University Press, 1<sup>st</sup> edition, 2010

**ReferenceBooks:**

1. Maartenvan Steen. “Graph Theory and Complex Networks. An Introduction”, 2010.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”. Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’ReillyMedia,2011.

**e-Resources:**

- 1) <https://www.classcentral.com/course/edx-social-network-analysis-sna-9134>
- 2) <https://www.coursera.org/learn/social-network-analysis>



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>RECOMMENDER SYSTEMS</b> <b>(Professional Elective-V)</b>					

**Course Objective:**

To develop state-of-the-art recommender systems that automates a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations

**Course Outcomes:**

By completing the course the students will be able to:

- Understand the basic concepts of recommender systems
- Carry out performance evaluation of recommender systems based on various metrics
- Implement machine-learning and data-mining algorithms in recommender systems data sets.
- Design and implement a simple recommender system.

**UNIT I:**

An Introduction to Recommender Systems: Goals of Recommender Systems, Basic Models of Recommender Systems, Collaborative Filtering Models, Content-Based Recommender Systems, Knowledge-Based Recommender Systems, Domain-Specific Challenges in Recommender Systems, Advanced Topics and Applications.

**UNIT II:**

Neighborhood-Based Collaborative Filtering: Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood-Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, A Regression Modeling View of Neighborhood Methods, Graph Models for Neighborhood-Based Methods

**UNIT III:**

Model-Based Collaborative Filtering: Decision and Regression Trees, Rule-Based Collaborative Filtering, Naïve Bayes Collaborative Filtering, Latent Factor Models, Integrating Factorization and Neighborhood Models

**UNIT IV:**

Content-Based Recommender Systems: Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations

Knowledge-Based Recommender Systems: Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems.

**UNIT V:**

Evaluating Recommender Systems: Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures



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**Text Books:**

1. Charu .C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

**Reference Books:**

2. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
3. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1<sup>st</sup> ed.
4. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1<sup>st</sup> ed.
5. J. Leskovec, A. Rajaraman and J. Ullman, Mining of massive datasets, 2<sup>nd</sup> Ed., Cambridge, 2012



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>AI CHATBOTS</b> <b>(Professional Elective-V)</b>					

**Course Objectives:**

- Learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- Identify best practices for defining a chatbot use case, and use a rapid prototyping framework to develop a use case for a personalized chatbot.

**Course Outcomes:**

- Develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
- Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform.
- Deploy the finished chatbot for public use and interaction.

**UNIT I:**

Introduction: Benefits from Chatbots for a Business, A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape, Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR)

**UNIT II:**

Chatbot Development Essentials: Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent

**UNIT III:**

Building a Chatbot Solution: Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots

**UNIT IV:**

Natural Language Processing, Understanding, and Generation: Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.

**UNIT V:**

Introduction to Microsoft Bot, RASA, and Google Dialogflow: Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialogflow  
 Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise



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Data Store, Integration Module

**Text Books:**

1. Abhishek Singh, KarthikRamasubramanian, ShreyShivam, “Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks”, ISBN 978-1-4842-5034-1, Apress,2019

**Reference Books:**

1. Janarthanam and Srinu, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, KarthikRamasubramanian and ShreyShivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.



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

**DEPARTMENT OF CSE - COMPUTER SCIENCE AND DESIGN**

<b>IV B Tech I Sem</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATA VISUALIZATION (Professional Elective-V)</b>					

**Course Outcomes:**

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

- Understand basics of Data Visualization
- Implement visualization of distributions
- Write programs on visualization of time series, proportions & associations
- Apply visualization on Trends and uncertainty
- Explain principles of proportions

**UNIT I:**

**INTRODUCTION TO VISUALIZATION:** Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales- Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualizations- Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

**UNIT II:**

**VISUALIZING DISTRIBUTIONS:** Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once- Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

**UNIT III:**

**VISUALIZING ASSOCIATIONS & TIME SERIES:** Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total, Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies, Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables

**UNIT IV:**

**VISUALIZING UNCERTAINTY:** Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots



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**UNIT V:**

**PRINCIPLE OF PROPORTIONAL INK:** The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2DHistograms, Contour Lines, Common Pitfalls of Color Use-Encoding Too Much or Irrelevant Information ,Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-VisionDeficiency

**Text Books:**

1. Claus Wilke, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, 1st edition, O’Reilly Media Inc, 2019.
2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018

**Reference Books:**

1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization,O’Reilly, 2016





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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>API AND MICROSERVICES</b> <b>(Job Oriented Course)</b>					

**Course Outcomes:**

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

- Develop a Spring Data JPA application with Spring Boot
- Implement CRUD operations using Spring Data JPA
- Implement pagination and sorting mechanism using Spring Data JPA
- Implement query methods for querying the database using Spring Data JPA
- Implement a custom repository to customize a querying mechanism using Spring Data JPA
- Understand update operation using query approaches in Spring Data JPA
- Implement Spring Transaction using Spring Data JPA
- Develop RESTful endpoints using Spring REST Processing URI parameters
- Write RESTful services using Spring REST that consumes and produces data in different formats
- Handle exceptions and errors in Spring REST endpoints
- Write Spring based REST clients to consume RESTful services programmatically
- Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST application

**UNIT I:**

**Spring 5 Basics :** Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

**UNIT II:**

**Spring Boot:** Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring , Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

**UNIT III:**

**Spring Data JPA with Boot:** Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting, Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

**UNIT IV:**

**Web Services:** Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services



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**UNIT V:**

**Spring REST:** Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints

**Hardware and software configuration**

- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11, Maven 3.2 or above and MySQL 8.0 or above, Spring Tool suite, Postman

**Text Books:**

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

**Web Links [Courses mapped to Infosys Springboard platform]:**

**Infosys Springboard courses:**

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_01296689056211763272\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview) [Spring 5 Basics with Spring Boot]
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_4313461831752789500\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview) [Spring Data JPA with Boot]
3. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_012731900963905536190\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview) [Spring REST]

**Web references:**

1. <a href="#"><u>Dependency Injection in spring - javatpoint</u></a>
2. <a href="#"><u>Autowiring in Spring - javatpoint</u></a>
3. <a href="https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-springbootapplication-annotation.html"><u>https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-springbootapplication-annotation.html</u></a>
4. <a href="#"><u>Autowiring in Spring - javatpoint</u></a> , <a href="https://www.baeldung.com/spring-bean-scopes"><u>https://www.baeldung.com/spring-bean-scopes</u></a>
5. <a href="#"><u>Spring Boot Logging   How does logging works in spring boot with example (educba.com)</u></a>
6. <a href="#"><u>Spring AOP Tutorial   Aspect Oriented Programming - javatpoint</u></a>
7. <a href="#"><u>Spring Boot Best Practices (javaguides.net)</u></a>
8. <a href="#"><u>Introduction to Spring Data JPA   SpringHow</u></a>
9. <a href="https://asbnotebook.com/spring-data-jpa-crud-example/"><u>https://asbnotebook.com/spring-data-jpa-crud-example/</u></a> , <a href="https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/"><u>https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/</u></a>
10. <a href="#"><u>Pagination and Sorting using Spring Data JPA - PagingAndSortingRepository (javaguides.net)</u></a>
11. <a href="https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html"><u>https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html</u></a> , <a href="https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html"><u>https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html</u></a>
12. <a href="https://javadeveloperzone.com/spring/spring-declarative-transaction-management/"><u>https://javadeveloperzone.com/spring/spring-declarative-transaction-management/</u></a>



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13. <a href="https://javadeveloperzone.com/spring/spring-declarative-transaction-management/">https://javadeveloperzone.com/spring/spring-declarative-transaction-management/</a>
14. <a href="https://javabeat.net/spring-data-custom-repository/">https://javabeat.net/spring-data-custom-repository/</a>
15. <a href="https://www.jrebel.com/blog/jpa-application-performance-best-practices">https://www.jrebel.com/blog/jpa-application-performance-best-practices</a>
16. <a href="https://www.javatpoint.com/service-oriented-architecture">https://www.javatpoint.com/service-oriented-architecture</a> , <a href="https://www.javatpoint.com/web-services-tutorial">https://www.javatpoint.com/web-services-tutorial</a>
17. <a href="https://www.javatpoint.com/soap-web-services">https://www.javatpoint.com/soap-web-services</a> , <a href="https://www.javatpoint.com/restful-web-services">https://www.javatpoint.com/restful-web-services</a>
18. <a href="#">RESTful Web Services - javatpoint</a>
19. <a href="https://www.javatpoint.com/restful-web-services-spring-boot">https://www.javatpoint.com/restful-web-services-spring-boot</a>
20. <a href="https://www.javatpoint.com/restful-web-services-spring-boot">https://www.javatpoint.com/restful-web-services-spring-boot</a> <a href="https://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spring">https://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spring</a>
21. <a href="https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful">https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful</a>
22. <a href="https://www.baeldung.com/exception-handling-for-rest-with-spring">https://www.baeldung.com/exception-handling-for-rest-with-spring</a>
23. <a href="https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/">https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/</a>
24. <a href="https://www.javatpoint.com/restful-web-services-versioning">https://www.javatpoint.com/restful-web-services-versioning</a>
25. <a href="https://spring.io/guides/gs/rest-service-cors/">https://spring.io/guides/gs/rest-service-cors/</a>
26. <a href="https://www.javatpoint.com/restful-web-services-basic-authentication-with-spring-security">https://www.javatpoint.com/restful-web-services-basic-authentication-with-spring-security</a>
27. <a href="https://www.springboottutorial.com/rest-api-best-practices-with-java-and-spring">https://www.springboottutorial.com/rest-api-best-practices-with-java-and-spring</a>



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<b>SECURE CODING TECHNIQUES</b> <b>(Job Oriented Course)</b>					

**Course Outcomes:**

At the end of the Course, student will be able to:

- Differentiate the objectives of information security
- Understand the trend, reasons and impact of the recent Cyber attacks
- Understand OWASP design principles while designing a web application
- Understand Threat modelling
- Importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

**UNIT I:**

**Network and Information security Fundamentals:** Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack

**UNIT II:**

**Introduction to Cyber security:** Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS, A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modelling, Microsoft SDL Tool

**UNIT III:**

**Secure coding practices and OWASP Top 10:** Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing

**UNIT IV**

**Secure coding practices in C/C++ and Java:** Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design inspections, Unit Tests  
 Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security



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**UNIT V**

**Secure coding in Python:** Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests

**Text Books:**

1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies
2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.
3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022, Publisher(s): McGraw-Hill, ISBN: 9781264258215
4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky
5. OWASP 2017 Handbook,

[https://owasp.org/www-pdf-archive/OWASP\\_Top\\_10\\_2017\\_RC2\\_Final.pdf](https://owasp.org/www-pdf-archive/OWASP_Top_10_2017_RC2_Final.pdf)

**Web Links: Infosys Springboard courses**

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_012683751296065536354\\_share\\_d/contents](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683751296065536354_share_d/contents) [Network Fundamentals]
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_3388902307073574000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_3388902307073574000_shared/overview) [Introduction to cybersecurity]
3. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_0135015696571596809160](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015696571596809160) [Certified Secure Software Lifecycle Professional (CSSLP) 2019: Secure Coding Practices]
4. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_0135015689927557129660](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015689927557129660) [OWASP Top 10: Web Application Security]
5. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_01350159304097792013093](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350159304097792013093) [Defensive coding fundamentals in C and C++]
6. [https://infyspringboard.onwingspan.com/en/viewer/html/lex\\_auth\\_01350159172969267213125](https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350159172969267213125) [Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications]
7. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_01350158164493107211192/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01350158164493107211192/overview) [Security Programming: Python Scripting Essentials]

**Web references:**

1. <https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity-myths-vs-reality/>
2. <https://microage.ca/cybersecurity-layering-approach/>
3. <https://www.synopsys.com/glossary/what-is-threat-modeling.html#:~:text=Threat%20modeling%20is%20a%20structured,An%20abstraction%20of%20the%20system>
4. <https://www.microsoft.com/en-us/securityengineering/sdl/threatmodeling>
5. <https://www.checkpoint.com/cyber-hub/threat-prevention/what-is-sandboxing/>
6. <https://www.skillsoft.com/course/defensive-coding-fundamentals-for-cc-f44c02f9-1bcc-11e7-b15b-0242c0a80b07#:~:text=Defensive%20Programming%20is%20a%20methodology,%2C%20testing%2C%20and%20input%20validation>
7. <https://www.oracle.com/java/technologies/javase/seccodeguide.html>
8. <https://www.skillsoft.com/course/security-programming-python-scripting-essentials-be99adad-1f65-47a8-a4b5-6b5346072b8e>



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**DEPARTMENT OF CSE - COMPUTER SCIENCE AND DESIGN**

<b>IV B Tech I Sem</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY</b>					

### Human Values Courses

This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values 2: Understanding Harmony” is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

### Universal Human Values 2: Understanding Harmony

Course code: HSMC (H-102)

Credits: L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits

Pre-requisites: None. Universal Human Values 1 (desirable)

#### 1. Objective:

**The objective of the course is four fold:**

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

#### 2. Course Topics:

**The course has 28 lectures and 14 practice sessions in 5 modules:**

#### Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking



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**Module 2: Understanding Harmony in the Human Being - Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

**Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

13. 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
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

**Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

**Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order



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25. Competence in professional ethics: a. 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.

26. Case studies of typical holistic technologies, management models and production systems

27. 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

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

### **3. READINGS:**

#### **3.1 Text Book**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

#### **3.2 Reference Books**

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj - PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

### **4. MODE OF CONDUCT (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)**

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.





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Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials)

would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

**5. ASSESSMENT:**

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by faculty mentor: 10 marks

Self-assessment: 10 marks

Assessment by peers: 10 marks

Socially relevant project/Group Activities/Assignments: 20 marks

Semester End Examination: 50 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

**6. OUTCOME OF THE COURSE:**

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to 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.

This is only an introductory foundational input. It would be desirable to follow it up by

- a) faculty-student or mentor-mentee programs throughout their time with the institution
- b) Higher level courses on human values in every aspect of living. E.g. as a professional



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<b>IV B Tech I Sem</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>VIRTUAL REALITY WITH UNITY</b> <b>(Skill Oriented Course)</b>					

**Course Objectives:**

- Understand Concepts and components of the Unity Engine and Editor and how to set up a project ready for VR
- Learn VR elements and build a state machine through Unity's Animator
- Learn the use of universal UX concept and some specific rules for VR design using Unity
- Learn how to design an effective and solid virtual reality experience
- Master the tools and techniques that need for optimal VR performance.

**List of Experiments:**

1. Installation of Unity Hub and Unity Editor.
2. Demonstrate the overview of Unity Interface and how to create a new project.
3. Setup for VR development and Installing VRTK
4. Demonstrate how to create a test bed and emitting pointers.
5. Implementing a Teleport System
6. Creating weapons in game environment using VRTK
7. Developing Enemy AI
8. Implementing the Enemy Attack State
9. Building Levels for VR
  - i. Importing ProBuilder
  - ii. Greyboxing a level with ProBuilder
  - iii. Applying Textures to Environments
10. Demonstrate lighting the scene effectively and Implement Game Play Effects using Triggers.
11. Creating the user interface
  - i. Displaying information via Text
  - ii. Updating UI Elements Through Code
12. Creating Game Menus
  - i. Building the Main Menu
  - ii. Scripting UI Interactions

**References:**

1. <https://www.packtpub.com/product/unity-2020-virtual-reality-projects-third-edition/9781839217333>
2. <https://www.udemy.com/course/virtual-reality-with-unity/>



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<b>IV B Tech I Sem</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>MEAN STACK TECHNOLOGIES-MODULE II-ANGULAR JS AND MongoDB</b> (Skill Oriented Course)					

**Course Outcomes:**

- Build a component-based application using Angular components and enhance their functionality using directives.
- Utilize data binding for developing Angular forms and bind them with model data.
- Apply Angular built-in or custom pipes to format the rendered data.
- Develop a single page application by using synchronous or asynchronous Angular routing.
- Make use of MongoDB queries to perform CRUD operations on document database.

**List of Exercises:**

<b>1.a</b>	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Angular Application Setup</p> <p>Observe the link <a href="http://localhost:4200/welcome">http://localhost:4200/welcome</a> on which the mCart application is running. Perform the below activities to understand the features of the application.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course</a></p>
<b>1.b</b>	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Components and Modules</p> <p>Create a new component called hello and render Hello Angular on the page</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course</a></p>
<b>1.c</b>	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Elements of Template</p> <p>Add an event to the hello component template and when it is clicked, it should change the courseName.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_208585155432546000_00_shared&amp;collectionType=Course</a></p>
<b>1.d</b>	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Change Detection</p> <p>progressively building the PoolCarz application</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a></p>
<b>2.a</b>	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Structural Directives - ngIf</p> <p>Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome &lt;&lt;username&gt;&gt;" message otherwise it should</p>



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	render "Invalid Login!!! Please try again..." message <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637402260439042595_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637402260439042595_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>2.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> ngFor
	Create a courses array and rendering it in the template using ngFor directive in a list format. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>2.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> ngSwitch
	Display the correct option based on the value passed to ngSwitch directive. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>2.d</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Custom Structural Directive
	Create a custom structural directive called 'repeat' which should repeat the element given a number of times. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>3.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Attribute Directives - ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>3.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> ngClass
	Apply multiple CSS classes to the text using ngClass directive. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3459610297074182000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3459610297074182000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>3.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>4.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Property Binding



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	Binding image with class property using property binding. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>4.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Attribute Binding
	Binding colspan attribute of a table element to the class property. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>4.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>5.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>5.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>5.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Nested Components Basics
	Load CourseslistComponent in the root component when a user clicks on the View courses list button. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>6.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>6.b</b>	<b>Course Name:</b> Angular JS



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	<p><b>Module Name:</b> Passing data from Child Component to ContainerComponent</p> <p>Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on th</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a></p>
6.c	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Shadow DOM</p> <p>Apply ShadowDOM and None encapsulation modes to components.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>
	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Component Life Cycle</p> <p>Override component life-cycle hooks and logging the corresponding messages to understand the flow.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>
	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Template Driven Forms</p> <p>Create a course registration form as a template-driven form.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a></p>
7.b	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Model Driven Forms or Reactive Forms</p> <p>Create an employee registration form as a reactive form.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>
	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Custom Validators in Reactive Forms</p> <p>Create a custom validator for an email field in the employee registration form ( reactive form)</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>
8.a	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Custom Validators in Template Driven forms</p> <p>Create a custom validator for the email field in the course registration form.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>
	<p><b>Course Name:</b> Angular JS</p> <p><b>Module Name:</b> Custom Validators in Template Driven forms</p> <p>Create a custom validator for the email field in the course registration form.</p> <p><a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_2085851554325460000_00_shared&amp;collectionType=Course</a></p>



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<b>8.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Services Basics
	Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>8.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> RxJS Observables
	Create and use an observable in Angular.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_62096093639052560000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_62096093639052560000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>9.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637395317063682615_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637395317063682615_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>9.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Communicating with different backend services using Angular HttpClient
	Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_42663333617950597000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_42663333617950597000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>10.a</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_37820248525176350000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_37820248525176350000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>10.b</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Route Guards
	Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries
	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_208585155432546000000_shared&amp;collectionType=Course</a>
<b>10.c</b>	<b>Course Name:</b> Angular JS
	<b>Module Name:</b> Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press



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	F12 in the browser and click the Network tab and check the Load time <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_2085851554325460000_0_shared&amp;collectionType=Course</a>
<b>10.</b>	<b>Course Name:</b> Angular JS
<b>d</b>	<b>Module Name:</b> Nested Routes Implement Child Routes to a submodule. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&amp;collectionType=Course</a>
<b>11.</b>	<b>Course Name:</b> MongoDB Essentials - A Complete MongoDB Guide
<b>a</b>	<b>Module Name:</b> Installing MongoDB on the local computer, Create MongoDB Atlas Cluster Install MongoDB and configure ATLAS <a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course</a>
<b>11.</b>	<b>Course Name:</b> MongoDB Essentials - A Complete MongoDB Guide
<b>b</b>	<b>Module Name:</b> Introduction to the CRUD Operations Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove() <a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course</a>
<b>12.</b>	<b>Course Name:</b> MongoDB Essentials - A Complete MongoDB Guide
<b>a</b>	<b>Module Name:</b> Create and Delete Databases and Collections Write MongoDB queries to Create and drop databases and collections. <a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course</a>
<b>12.</b>	<b>Course Name:</b> MongoDB Essentials - A Complete MongoDB Guide
<b>b</b>	<b>Module Name:</b> Introduction to MongoDB Queries Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate(). <a href="https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_0132890816264519682505_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course">https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_0132890816264519682505_shared?collectionId=lex_auth_013177169294712832113_shared&amp;collectionType=Course</a>

**Text Books:**

1. Programming the World Wide Web, 7th Edition, Robert W. Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, Eyal Ladrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J. Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly





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**Software configuration and installation:**

1. Angular  
Setup details: Angular Application Setup - Internal - Viewer Page | Infosys Springboard  
(onwingspan.com)
2. MongoDB  
TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard  
(onwingspan.com)

**Web Links:**

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_20858515543254600000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview) (Angular JS)
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_013177169294712832113\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview) (MongoDB)



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<b>IV B Tech I Sem</b>	<b>Minor</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>COMPUTER AIDED DESIGN</b>					

**Course Objectives:**

- Demonstrate basic concept of computer aided design and its applications.
- Make use of various concepts and characteristics in geometric modeling.
- Understand the mathematical representation of solids
- Analyze geometric transformations.
- Determine stress and strain in structural elements through Finite Element Analysis

**UNIT-I:**

**Introduction:** A typical product cycle, CAD tools for the design process of product cycle, CAD / CAM system evaluation criteria, Input / Output devices; Graphics Displays: Refresh display, DVST, Raster display, pixel value and lookup table, estimation of graphical memory, LCD, LED fundamentals. Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System. Line and Curve generation algorithm: DDA, Bresenham's algorithms. Graphics exchange standards and Database management systems.

**UNIT-II:**

**Curves and Surfaces:** Parametric representation of lines: Locating a point on a line, parallel lines, perpendicular lines, distance of a point, Intersection of lines. Parametric representation of circle, Ellipse, parabola and hyperbola. Synthetic Curves: Concept of continuity, Cubic Spline: equation, properties and blending. Bezier Curve: equations, properties; Properties and advantages of B-Splines and NURBS. Various types of surfaces along with their typical applications.

**UNIT-III:**

**Mathematical representation of solids:** Geometry and Topology, Comparison of wireframe, surface and solid models, Properties of solid model, properties of representation schemes, Concept of Half-spaces, Boolean operations. Schemes: B-rep, CSG, Sweep representation, ASM, Primitive instancing, Cell Decomposition and Octree encoding.

**UNIT-IV:**

**Geometric Transformations:** Homogeneous representation; Translation, Scaling, Reflection, Rotation, Shearing in 2D and 3D; Orthographic and perspective projections. Window to View-port transformation.

**UNIT-V:**

**Finite Element Analysis:** Basic procedure for solving a problem using Finite Element Analysis. 1-D Analysis: Concept of Shape function and natural coordinates, strain - displacement matrix, derivation of stiffness matrix for structural problems, properties of stiffness matrix. 1-D structural problems with elimination and penalty approaches, 1-D thermal and fluid problems



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**Text Books:**

1. Ibrahim Zied, CAD / CAM: Theory and Practice, McGraw-Hill

**Reference Books:**

1. Hearn E J and Baker M P, Computer Graphics, Pearson.
2. Chandrupatla T A and Belegundu A D, Introduction to Finite Elements in Engineering, PHI.
3. Logan D, A First Course in the Finite Element Method, Cengage.
4. David F. Rogers and J. Alan Adams, “Mathematical Elements for Computer Graphics”, McGraw-Hill.
5. S.S.Rao, “Engineering Optimization”, Wiley –Interscience. Hearn E J and Baker M P, Computer Graphics, Pearson.