CMR TECHNICAL CAMPUS
UGC AUTONOMOUS
B. Tech. I Year Syllabus

Common for ECE, CSE[AIML] & CSE[DS]

I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	22MA101BS	Matrices and Calculus	3	1	0	4
2	22PH102BS	Applied Physics	3	1	0	4
3	22CS103ES	Programming for Problem Solving	3	0	0	3
4	22EN104HS	English for Skill Enhancement	3	0	0	3
5	22CS105ES	IT Workshop	0	0	3	1.5
6	22PH106BS	Applied Physics Laboratory	0	0	3	1.5
7	22CS107ES	Programming for Problem Solving Laboratory	0	0	2	1
8	22EN108HS	English Language and Communication Skills Laboratory	0	0	2	1
9	22CS109ES	Basic Elements of Engineering and Technology	0	0	2	1
		Induction Programme				
Total			**12**	**2**	**12**	**20**

II SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	22MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	22CH202BS	Engineering Chemistry	3	1	0	4
3	22CS203ES	Data Structures	3	0	0	3
4	22EC204ES	Basic Electrical and Electronics Engineering	3	1	0	4
5	22ME205ES	Computer Aided Engineering Graphics	1	0	2	2
6	22CH206BS	Engineering Chemistry Laboratory	0	0	2	1
7	22CS207ES	Data Structures Laboratory	0	0	2	1
8	22EC208ES	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1
9	22CH209MC	Environmental Science	3	0	0	0
Total			**16**	**3**	**8**	**20**

CMRTECHNICAL CAMPUS
UGC AUTONOMOUS
B.Tech. II Year Syllabus (w. e. f. A.Y. 2022-23)

Computer Science and Engineering (Data Science)

III SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22DS301PC	Discrete Mathematics	3	1	0	4
2	22EC302ES	Digital Electronics	3	0	0	3
3	22DS303PC	Programming with Python	3	0	0	3
4	22DS304PC	Computer Organization and Architecture	3	0	0	3
5	22DS305PC	Object Oriented Programming through Java	3	0	0	3
6	22DS306PC	Python Lab	0	0	3	1.5
7	22DS307PC	Object Oriented Programming through Java Lab	0	0	3	1.5
8	22DS308PC	Data visualization- R Programming/ Power BI	0	0	2	1
9	22EN309MC	Gender Sensitization Lab	0	0	2	0
		Total	**15**	**1**	**10**	**20**

IV SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22MA401BS	Computer Oriented Statistical Methods	3	0	0	3
2	22DS402PC	Database Management Systems	3	0	0	3
3	22DS403PC	Operating Systems	3	0	0	3
4	22MB404HS	Business Economics & Financial Analysis	3	0	0	3
5	22DS405PC	Software Engineering	3	0	0	3
6	22DS406PC	Database Management Systems Lab	0	0	2	1
7	22DS407PC	Operating Systems Lab	0	0	2	1
8	22DS408PC	Node JS/ React JS/ Django	0	0	2	1
9	22DS409PC	Real-time Research Project/ Societal Related Project	0	0	4	2
10	22EN410MC	Constitution of India	3	0	0	0
		Total	**18**	**0**	**10**	**20**

CMRTECHNICAL CAMPUS UGC
AUTONOMOUS
B. Tech. III Year Syllabus (w. e. f. A.Y. 2022-23)

Computer Science and Engineering (Data Science)

V SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22DS501PC	Introduction to Data Science	3	1	0	4
2	22DS502PC	Big Data Analytics	3	0	0	3
3	22DS503PC	Computer Networks	3	0	0	3
4		Professional Elective - I	3	0	0	3
5		Professional Elective - II	3	0	0	3
6	22DS504PC	R Programming Lab	0	0	2	1
7	22DS505PC	Big Data Analytics Lab	0	0	2	1
8	22DS506PC	Computer Networks Lab	0	0	2	1
9	22DS507PC	ETL-Kafka/Talend	0	0	2	1
10	22DS508MC	Intellectual Property Rights	3	0	0	0
		Total	**18**	**1**	**08**	**20**

VI SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22DS601PC	Machine Learning	3	0	0	3
2	22DS602PC	Algorithms Design and Analysis	3	0	0	3
3	22DS603PC	Automata Theory and Compiler Design	3	0	0	3
4		Professional Elective - III	3	0	0	3
5		Open Elective - I	3	0	0	3
6	22DS604PC	Machine Learning Lab	0	0	2	1
7	22EN605HS	Advanced English Communication Skills Lab	0	0	2	1
8		Professional Elective - III Lab	0	0	2	1
9	22DS606PC	Industrial Oriented Mini Project/ Summer Internship/ Skill Development Course (UI design-Flutter)	0	0	4	2
10	22CH607MC	Environmental Science	3	0	0	0
		Total	**18**	**0**	**10**	**20**

Environmental Science in VI Sem Should be Registered by Lateral Entry Students Only.

*MC – Pass/Fail

Professional Elective – I

22DS511PE	Data Warehousing and Business Intelligence
22DS512PE	Artificial Intelligence
22DS513PE	Web Programming
22DS514PE	Image Processing
22DS515PE	Computer Graphics

Professional Elective - II

22DS521PE	Spatial and Multimedia Databases
22DS522PE	Information Retrieval Systems
22DS523PE	Software Project Management
22DS524PE	DevOps
22DS525PE	Computer Vision and Robotics

Professional Elective - III

22DS631PE	Software Testing Methodologies
22DS632PE	Data Visualization Techniques
22DS633PE	Scripting Languages
22DS634PE	Mobile Application Development
22DS635PE	Cryptography and Network Security

Professional Elective - III Lab

22DS631PL	Software Testing Methodologies Lab
22DS632PL	Data Visualization Techniques Lab
22DS633PL	Scripting Languages Lab
22DS634PL	Mobile Application Development Lab
22DS635PL	Cryptography and Network Security Lab

[#] Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Open Elective - I

22DS611OE	Fundamentals of Data Science
22DS612OE	R Programming

Open Elective - II

22DS721OE	Data Mining
22DS722OE	Data Analytics

Open Elective - III

22DS831OE	Introduction to Social Media Mining
22DS832OE	Data Visualization using Python

Matrices and Calculus

B. Tech. I Semester **L T P C**

Subject Code: 22MA101BS **3 1 0 4**

Pre-requisites: Mathematical Knowledge at pre-universitylevel

Course Objectives: To learn

1. Types of matrices, their properties and concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form.
3. Apply geometrical approach to the mean value theorems and their application to the mathematical problems and evaluation of improper integrals using Beta and Gamma functions.
4. Utilize partial differentiation, concept of total derivative and finding maxima and minima of function of two and three variables.
5. Evaluation of multiple integrals and their applications.

Course Outcomes:

After completion of this course, the students will be able to:

1. Use the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigenvectors and reduce the quadratic form to canonical form using orthogonal transformation.
3. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.
4. Applythe extreme values of functions of two variables with/ without constraints.
5. Compute multiple integrals and applythe concept to find areas, volumes.

UNIT-I: Matrices **[12 Lectures]**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations: solving system of Homogeneous and Non-Homogeneous equations, Gauss -elimination method, Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors **[12 Lectures]**

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

UNIT-III: Calculus **[12 Lectures]**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem (without proof) with their Geometrical Interpretation and applications, Cauchy's Mean Value Theorem (without proof), Taylor's series for single variable.

Definition of improper integral: Definition of Beta and Gamma functions, properties, other forms of Beta functions, Relation between Beta and Gamma functions and their applications.

UNIT-IV: Multivariable Calculus (Partial Differentiation and Applications) [12 Lectures]

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

UNIT-V: Multivariable Calculus (Integration) [12 Lectures]

Evaluation of Double integrals (Cartesian and Polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple integrals: Change of variables (Cartesian to polar) for double integrals.

Applications: Areas and volumes bydouble integrals.

TEXT BOOKS:

1. T.K.V.Iyengar, B.Krishna Gandhi, Engineering Mathematics, S.Chand Publishers, 19th edition,2020
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition,2018.
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering mathematics, Narosa Publications, 6th Edition, 2020.

REFERENCE BOOKS:

1. Erwin kreyzig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publications, Reprint,2008.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S.Chand publishers, 2014.

Web Links:

1. https://www.mooc-list.com/tags/matrix
2. https://www.mooc-list.com/tags/mean-value-theorem

Applied Physics

B. Tech. I Semester **L T P C**

Subjects Code: 22PH102BS **3 1 0 4**

Prerequisites: 10 + 2 physics

Course Objectives: The objectives of this course for the student are to:

1. Understand the basic principles of quantumphysics and band theory of solids.
2. Summarize the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Studythe fundamental concepts related to the dielectric and magnetic materials.
4. Identifythe importance of nanoscale, quantumconfinement and various fabrications techniques.
5. Explain the characteristics of lasers and optical fibres.

Course Outcomes:

After completion of this course, the students will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identifythe role of semiconductor devices in science and engineering Applications.
3. Explorethefundamental properties of dielectric and magnetic materials for their applications.
4. Interpret the features and applications of nanomaterials.
5. Relate various aspects of Lasers and Optical fibres and their applications in diverse fields.

UNIT-I: QUANTUM PHYSICS AND SOLIDS [15 Lectures]

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation, Planck's radiation law, Wein's and Rayleigh-Jean's law, Stefan-Boltzmann's law, Photo electric effect, De Broglie hypothesis, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger wave equation, Particle in one dimensional potential box.

Solids: Free electron theory (Drude and Lorentz, Sommerfield - qualitative), Fermi-Dirac distribution, Periodic potentials - Bloch's theorem, Kronig-Penney model (qualitative), E-K diagram, Effective mass of electron, Origin of energy bands- classification of solids.

UNIT-II: SEMICONDUCTORS AND DEVICES [15 Lectures]

Introduction to semiconductors, Intrinsic and extrinsic semiconductors - carrier concentration, Direct and indirect band gap semiconductors, Hall effect, Construction, Principle of operation and characteristics of P-N Junction diode, Zener diode, Bipolar junction transistor (BJT), LED, PIN diode, Avalanche photodiode (APD) and Solar cells.

UNIT-III: DIELECTRIC AND MAGNETIC MATERIALS [10 Lectures]

Dielectric Materials: Basic definitions, Electronic and ionic polarizations, Ferroelectric, Piezoelectric and Pyroelectric materials - applications.

Magnetic Materials: Hysteresis - soft and hard magnetic materials, Magnetostriction, Magneto resistance, Bubble memory devices, Magnetic field sensors and Multiferroics, Applications of magnetic materials.

UNIT-IV: NANO TECHNOLOGY [10 Lectures]

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-Gel, Precipitation, Combustion methods, Top-down fabrication: Ball milling, Physical vapor deposition (PVD), Chemical vapor deposition (CVD), XRD, SEM & TEM, Applications of nanomaterials.

UNIT-V: LASER AND FIBER OPTICS [15 Lectures]

Lasers: Laser beam characteristics, three quantum processes, Einstein coefficients and their relations, Lasing action, Pumping methods, Ruby laser, Nd-YAG laser, He-Ne laser, Semiconductor laser, Applications of laser.

Fiber Optics: Introduction to optical fibers, Total internal reflection, Construction of optical fiber, Numerical aperture, Acceptance angle, Classification of optical fibers, Losses in optical fiber, Optical fiber for communication system, Applications of optical fibers.

TEXT BOOKS:

1. M.N.Avadhanulu, P.G.Kshirsagar & TVS. Arun Murthy" A Textbook of Engineering Physics"- S.Chand Publications, 11th Edition, 2019.
2. Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson Publication, 2019.
3. Donald A, Neamen, Semiconductor Physics and Devices-Basic Principle–Mc Graw Hill, 4thEdition, 2021.
4. B.K.Pandeyand S.Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Narasimha Reddy Katta, Essentials of Nanoscience & Nanotechnology, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. H.C.Verma, QuantumPhysics, TBS Publication, 2ndEdition2012.
2. Halliday, Resnick and Walker, John Wiley & Sons, Fundamentals of Physics 11thEdition, 2018.
3. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 2019.
4. S.L.Gupta and V.Kumar, Elementary Solid State Physics, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya – Nano Materials, New Age International, 1stEdition, 2007.

Web Links:

1. https://youtu.be/TcmGYe39XG0
2. https://youtu.be/JA3sCmrv11M
3. https://youtu.be/qUEbxTkPIWI

Programming for Problem Solving

B. Tech. I Semester	L	T	P	C
Subject Code: 22CS103ES	3	0	0	3

Prerequisites: Basic knowledge on mathematics & problem solving skills.

Course Objectives:

1. Design solutions to simple engineering problem by applying the basic programming principles of C language and basic mathematical knowledge.
2. Implement the programs using conditional statements and loops.
3. Develop simple C programs to illustrate the applications of different data types such as arrays, pointers, functions.
4. Develop the programs of searching and sorting techniques using Arrays.

Course Outcomes: After completion of this course, the students will be able to:

1. Illustrate and explain the basic computer concepts, algorithms, flowcharts and programming principles of C Language.
2. Develop C programs to solve simple mathematical and decision making problems.
3. Understand, distinguish and implement arrays, strings and structures to write C programs.
4. Understand the concepts of pointers and files using C programs.
5. Decompose a problem into functions and to develop modular reusable code.
6. Understand the Searching and sorting problems.

UNIT – I: [10 Lectures]

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, types of computer languages, compilers, creating, compiling and executing a program etc., Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart with examples.

Introduction to C Programming Language: History, Basic Structure of a C program, variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion, Bitwise operations: Bitwise AND, OR, XOR and NOT operators. I/O: Simple input and output with scanf and printf.

UNIT - II: [12 Lectures]

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

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

Strings: Introduction to strings, handling strings as array of characters, basic string handling functions available in C .

Structures: Defining structures, initializing structures, Nested structures, Array of structures

Unions: Defining Unions, initializing unions, basic program on union. Enumeration data type.

UNIT - III: [10 Lectures]

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

Pre-processor: Commonly used Pre-processor commands like include, define, undef, if, ifdef,fndef
Files: Text and Binary files, Creating and Reading and writing text and binary files, appending data to existing files, Random access using fseek, ftell and rewind functions.

UNIT - IV: [12 Lectures]

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

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions, Storage classes (auto, extern, static and register), The main method and command line arguments.

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

UNIT - V: [8 Lectures]

Basic searching in an array of elements (linear and binary search techniques).Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, 3rd edition,2006.
2. Jeri R. Hanlyand Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson,2006.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,Prentice Hall of India
2. R.G. Dromey, How to solve it byComputer, Pearson(16thImpression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, PearsonEducation.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill,4thEdition

Web Links:

1. https://nptel.ac.in/courses/106104074
2. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
3. https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx
4. https://www.programiz.com/c-programming.

English for Skill Enhancement

B. Tech. I Semester **L T P C**

Subject Code: 22EN104HS **3 0 0 3**

Prerequisites: Basic knowledge in Grammar as well as in prose

Course Objectives:

This course will enable the students to:

1. Improve the language proficiencyof students in English with an emphasis on Vocabulary,Grammar, Reading and Writing skills
2. Develop studyskills and communication skills in various professional situations.
3. Equip students to studyengineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes:

After completion of the course, the students will be able to:

1. Understand the importance of vocabularyand sentence structures.
2. Demonstrate their understanding of the rules of functional grammar.
3. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
4. Develop comprehension skills from the known and unknown passages.
5. Acquire basic proficiency in reading and writing modules of English.

UNIT – I [8 Lectures]

Chapter entitled '*Toasted English*' byR.K. Narayan from *"English: Language, Context and Culture"* published byOrient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes -Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives- Synonyms and Antonyms
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT – II [7 Lectures]

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture"published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT – III **[8 Lectures]**

Chapter entitled 'Lessons from Online Learning' by F. Haider Alvi, Deborah Hurst et al from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT – IV **[8 Lectures]**

Chapter entitled 'Art and Literature' by Abdul Kalam from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations and Acronyms in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- EssayWriting-Writing Introduction and Conclusion -Précis Writing.

UNIT – V **[7 Lectures]**

Chapter entitled 'Go, Kiss the World' by Subroto Bagchi from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabularyand their Usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum arecovered in the syllabus of ELCS Lab Course.

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B. Tech. First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.
- **Note**: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. Interchange Series. Introduction, 1,2,3. Cambridge University Press. (2022)
3. Wood, F.T. Remedial English Grammar. Macmillan. (2007).

4. Chaudhuri, Santanu Sinha. Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd. (2018).Technical Communication. Wiley India Pvt. Ltd. (2019).
5. Vishwamohan, Aysha. English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd. (2013).
6. Swan, Michael. Practical English Usage. Oxford University Press. Fourth Edition. (2016).

Web Links:

UNIT I

Vocabulary - Prefixes and Suffixes

WL1:https://nptel.ac.in/courses/109106094/23

WL2:http://teacher.scholastic.com/reading/bestpractices/vocabulary/pdf/prefixes_suffixes.pdf

Synonyms and Antonyms

WL3:https://www.google.com/search?q=Synonyms+an+Antonyms+-+nptel+videos&nfpr=1&sa=X&ved=0ahUKEwi7pbzfluXfAhXBEbwKHXOqC4oQvgUILCgB&biw=1024&bih=657

WL4:https://scoop.eduncle.com/synonyms-antonyms-for-competitive-exams

GRAMMAR - Common errors in Prepositions

WL5:https://nptel.ac.in/courses/109104030/Module12/Lecture39.pdf

WL6:https://nptel.ac.in/courses/109104030/Module12/Lecture38.pdf

WL7:https://www.englishpractice.com/common-mistakes/common-errors-prepositions-3

Techniques of Effective reading

WL8:https://nptel.ac.in/courses/109106129/5

WL9:https://nptel.ac.in/courses/109106129/15

WL10:https://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/

UNIT II

GRAMMAR - Common errors in Noun and Pronoun agreement

WL11:https://nptel.ac.in/courses/109104030/Module12/Lecture39.pdf

common errors and Rules of Subject-verb agreement

WL12:https://nptel.ac.in/courses/109106094/8

https://www.grammarbook.com/grammar/subjectVerbAgree.asp

Techniques for improving comprehension skills

WL13:**https://nptel.ac.in/courses/109106129/5**

WL14:**https://joshkaufman.net/3-simple-techniques-to-optimize-your-reading-comprehension-and-retention/**

UNIT III

English Language

Vocabulary-Affixes

WL15:http://www.prefixsuffix.com/rootchart.php

English words from Foreign languages

WL16:https://www.fluentu.com/blog/english/english-words-from-other-languages/

WL17:https://en.oxforddictionaries.com/explore/foreign-words-and-phrases/

Misplaced modifiers

WL18:https://www.grammar-monster.com/glossary/misplaced_modifier.htm

Reading

WL19:http://www.bbc.co.uk/skillswise/topic/skimming-and-scanning

WL20:http://www.bbc.co.uk/skillswise/video/skimming-and-scanning

Writing

WL21:https://writeshop.com/choosing-vocabulary-to-describe-a-place/

Writingformal letters

WL22:https://nptel.ac.in/courses/109104031/14

UNIT IV
Vocabulary
WL23:https://www-pub.iaea.org/MTCD/DSS/OASISGlossary.pdf
WL24:https://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Composite%20Materials/pdf/Glossory.pdf
WL25:https://nptel.ac.in/courses/117105083/pdf/ssg_m2l2.pdf

Reading
WL26:https://nptel.ac.in/courses/109106066/module6/lecture12/lecture12.pdf

Writing
WL27:https://nptel.ac.in/courses/109106094/29
WL28:https://nptel.ac.in/courses/109106066/module3/lecture6/lecture6.pdf

UNIT - V
Vocabulary
WL29:https://nptel.ac.in/courses/109106066/module1/lecture1/lecture1.pdf

Grammar - Common errors
WL30:https://www.engvid.com/english-resource/50-common-grammar-mistakes-in-english/

Reading
WL31:https://nptel.ac.in/courses/109106066/module6/lecture12/lecture12.pdf

Writing
WL32:https://nptel.ac.in/courses/109104031/17
WL33:https://nptel.ac.in/courses/109107121/31

IT Workshop

B. Tech. I SEM **L T P C**

Subject Code: 22CS105ES **0 0 3 1.5**

Course Objectives:

1. The IT Workshop is a traininglab course to get training on PC Hardware, Internet &Worldwide Web and Productivitytools for documentation, Spreadsheet computations andPresentation.
2. To introduce to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers, hardware and software level troubleshooting process.
3. To introduce connecting the PC on to the internet from home and workplace and effectively usage of the internet, Usage of web browsers, email, newsgroups and discussion forums.
4. To get knowledge in awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
5. To introducethe usage of Productivitytools in craftingprofessional word documents, excel spreadsheets and power point presentations using open office tools.

Course Outcomes:

After completion of this course, the students will be able to:

1. Applyknowledge for PC hardware and computer parts.
2. Applyknowledge for computer assembling and software installation.
3. Abilityhow to solve the trouble shooting problems.
4. Applythe tools for preparation of project certificate, Creating a Newsletter.
5. Applythe tools for preparation of PPT, Documentation and budget sheet etc.

PC Hardware: The students should work on working PC to disassemble and assemble to working condition and install operating system like Linux or any other on the same PC. Students are suggested to work similar tasks in the laptop scenario wherever possible.

Problem 1: Every student should identify the peripherals of a computer, components in a CPUand its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Problem 2: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

Problem 3: Hardware Troubleshooting: Students have to be given a PC which does not bootdue to improper assembly or defective peripherals. They should identify the problem and fixit to get the computer back to working condition.

Problem 4: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. Internet & World Wide Web.

Problem 5: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finallystudents should demonstrate how to access the websites and email.

Problem 6: Web Browsers, Surfing the Web: Students customize their web browsers with

the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug- ins like Macro media Flash and JRE for applets should be configured

Problem 7: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

Problem 8: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Problem 9: Develop home page: Student should learn to develop his/her home page using HTMLconsisting of his/her photo, name, address and education details as a table and his/her skill set as a list. Productivitytools: Word Orientation: An overview of Microsoft (MS) office /equivalent (FOSS) tool word should be learned: Importance of MS office / equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that should be covered in each, using and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Problem 10: Using and Word to create project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

Problem 11-Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: - Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Calculating GPA - Features to be covered: - Cell Referencing, Formulae in spread sheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyperlinking, Count function, Sorting, Conditional formatting.

Problem 12: Creating Power Point: Student should work on basic power point utilities and tools in Latex and MS Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts.

REFERENCEBOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education. LaTeX Companion – Leslie Lamport, PHI/Pearson.
2. Comdex Information Technologycourse tool kit Vikas Gupta, WILEY Dreamtech
3. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

Applied Physics Laboratory

B. Tech I Semester **L T P C**

Subject Code: 22PH106BS **0 0 3 1.5**

Prerequisites: Practical physics at basic level.
Co-Prerequisite: A course on 'Applied physics laboratory'.

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, BJT, LED, solar cell, Hall effect and measurement of energy gap and resistivity of semiconductor materials.
3. To understand the characteristics of dielectric constant of a given material and studythe behavior
   of B-H curve of ferromagnetic materials.
4. Understand the Characteristics of Laser and optical fiber measurements.
5. Understanding the method of Mechanical oscillator (Torsional) and electrical oscillator (LCR).

Course Outcomes:

After completion of this course, the students will be able to:

1. Know the determination of the Planck's constant using Photoelectric effect.
2. Appreciate quantum physics in semiconductor devices, optoelectronics and identifythe material whether it is n-type or p-type by Hall experiment.
3. Gain the knowledge of applications of dielectric constant and understand the variation of magnetic field and behavior of hysteresis curve.
4. Gain the knowledge of Characteristics of Laser and optical fiber measurements.
5. Carried out data analysis.

LIST OFEXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. To studythe resonant frequency, bandwidth and quality factor of series and parallel LCR circuits.
3. To studythe V-I characteristics of a p-n junction diode.
4. a. To studythe V-I characteristics of solar cell.
   b. To studythe V-Icharacteristics of light emitting diode (LED).
5. Determination of energygap of a semiconductor.
6. a. Determination of the V-Icharacteristics of the given LASER beam.
   b. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
7. Determination of dielectric constant of a given material.
8. StudyB-H curve of a magnetic material.
9. Determination of the resistivityof semiconductor bytwo probe method.
10. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
11. Input and output characteristics of BJT(CE,CB & CC configurations).
12. Understanding the method of least squares torsional pendulum as an example.

Note: *Any 8 experiments are to be performed.*

REFERENCEBOOK:

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

Programming for Problem Solving Laboratory

B. Tech. I Semester **L T P C**

Subject Code: 22CS107ES **0 0 2 1**

Co-requisites: A course on Programming for problem solving.
Pre-requisites: Basic knowledge on mathematics & problem solving skills.

Course Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems byunderstanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.

Course Outcomes:

After completion of this course, the students will be able to:

1. Develop C programs for simple numerical problems.
2. Applythe knowledge of conditional statements and loops in programs.
3. Implement the programs using the concepts of arrays, structures, pointers and files.
4. Create the programs using functions and recursive functions.
5. Implement searching and sorting algorithms.

Practice sessions:

a) Write a simple program that prints the results of all the operators available in C (including pre/ post increment, bitwise and/or/not, etc.). Read required operand values from standard input.

b) Writeasimpleprogramthatconvertsonegivendatatypetoanotherusingautoconversionand casting. Take the values from standard input.

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.

b) Write the program for the simple, compound interest.

c) Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

d) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5
5 x 2 =10
5 x 3 =15

e) Write a C programfor binary equivalent to a positive number 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

b) Write a program that finds if a given number is a prime number

c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
e) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
f) Write a C program to find the roots of a Quadratic equation.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
c) Write a C program that uses functions to perform the following:
d) Addition of Two Matrices
e) Multiplication of Two Matrices
f) Transposeofamatrixwithmemorydynamicallyallocatedforthenewmatrixasrowandcolumn counts may not be the same.
g) Write C programs that use both recursive and non-recursive functions
h) To find the factorial of a given integer.
i) To find the GCD (greatest common divisor) of two given integers.
j) To find x^n

Files:

a) Write a C program to displaythe contents of a file to standard output device.
b) Write a C program which copies one file to another file..
c) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program to implement string handling functions.
b) Write a C Program to find the length of a given string without using strlen() function.
c) Write a C Program to concatenate two string without using a function.

Miscellaneous:

a) Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * *
                                 4 4 4 4    *
                                            * *
                                            *
```

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Keyvalue in a given List of integers using linear search method.
b) Write a C program that uses non-recursive function to search for a Keyvalue in a given Sorted list of integers using binary search method.

c) Write a C program that implements the Bubble sort method to sort a given list ofIntegers in ascending order.

d) Write a C program that sorts the given array of integers using selection sort in descending order

e) Write a C program that sorts the given arrayof integers using insertion sort in ascending order

TEXT BOOKS:

1. Jeri R. Hanlyand Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson,2013.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition),2006.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition,McGraw-Hill.

English Language and Communication Skills Lab

B. Tech. I Semester **L T P C**

Subject Code: 22EN108HS **0 0 2 1**

Prerequisites: Basic Knowledge in speech sounds as well as formal and informal communication

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluencyof students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews.

Course Outcomes:

After completion of this course, the students will be able to:

1. Pronounce English sounds according to standard pronunciation
2. Understand the nuances of English language through audio- visual experience and practice
3. Speak with clarityand confidence which in turn enhances their employability skills
4. Neutralize their accent for intelligibility
5. Participate in discussion and presentation effectively and confidently

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a) Computer Assisted Language Learning (CALL) Lab
b) Interactive Communication Skills (ICS) Lab

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that theymayappreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessarytraining in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
    - Oral practice
    - Describingobjects/situations/people
    - Role play– Individual/Group activities
    - Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and communication Skills Lab**.

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types

***Practice*:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English**.**

Practice: **Ice-**Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave –Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Listening Skills: Barriers- Effective Listening.

Practice: Minimal Pairs-Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice*:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise- III

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV

CALL Lab:

Understand: Errors in Pronunciation-Neutralization of Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise –

VCALL Lab:

Understand: Listening for General and Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Introduction to Group Discussion

Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High FidelityHeadphones

2. **Interactive Communication Skills (ICS) Lab :**

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford UniversityPress

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easyby Darling Kindersley.
- Punctuation Made Easyby Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd. (2022).
2. Shobha, KN & Rayen, J. Lourdes. *Communicative English – A workbook.* Cambridge University Press. (2019).
3. Kumar, Sanjay & Lata, Pushp. *Communication Skills: A Workbook.* Oxford University Press. (2019).
4. Board of Editors.*ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd. (2016).
5. Mishra, Veerendra et al. *English Language Skills: A Practical Approach.* Cambridge University Press. (2020).

WEB LINKS:

Listening Skills Lecture nptel
WL1:https://www.youtube.com/watch?v=JIKU_WT0Bls

NPTEL on role-play and conversation skills
WL2:https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcDQrs

NPTEL on syllables
WL3:https://www.youtube.com/watch?v=4V2CwQJ8pgc

NPTEL on listening for general details
WL4:https://www.youtube.com/watch?v=xY7z3nZOHqk&list=PLzJaFd3A7DZtnTdtOxvjO3GLPd1WVe6oq&index=17

NPTEL on stress shifts
WL 5: https://www.youtube.com/watch?v=_KHtfvob4j4

NPTEL on weak forms and strong forms
WL6:https://www.youtube.com/watch?v=VM0cNDxBySc&list=PL0P6HKIuShRnJeZjhAOy-2NejNjeC2_x2

WL7:NPTEL on Intonation
https://www.youtube.com/watch?v=A6aE4nceJt8

Basic Elements of Engineering Technology

B. Tech. I Semester **L T P C**

Subject Code: 22CS109ES **0 0 2 1**

Objectives:

- Exploring different engineering technologies and their applications.
- Students should able to learn various 3d printing technologies.
- Knowledge towards Assembling and testing of robots.
- Understanding functionality of 3Dprinters and their application.
- Developingteam work and in sight towards different disciplines of Engineering.

Module I: Internet of Things

Overview of IoT and Architecture: Brief History, evolution of IoT, Architecture, trends in the Adoption of IoT, Societal Benefits of IoT, Risks, Privacy, Security, Embedded Systems Components, Micro-controller Architecture and Properties and Installing and Setting up the Arduino and Raspberry Pi (RPi) development environment. Build Simple IoT Applications by using Arduino or RPi.

Module II: Robotics

Introduction, Different types of robots, Components of a Robot, Working principle of robots, Applications of robots in various fields, Innovation challenges, Scope of robotics research & its current trends, assembling and testing of Robot.

ModuleIII:3D Printing

Introduction, Product Design & Development, 3D Scanning & Printing using different types of materials. Components of 3D Printer, Applications of 3D printed products in various fields, Hands on Experience on 3D printing Machine.

ModuleIV: Softwareand Post Processing

Cura, Flash print, 3dslicer, Tinkercad, Meshmixer. 3d printing parameters, print Speed, Layer Height, Infill density.Acetone bathing, Support Structure Removing.

Module V: Case Studies

Students has to submit a report by doing a study on various Engineering applications related to Manufacturing, Retail, Automotive, Logistics, Healthcare, Entertainment and E-Governance.

REFERENCE BOOKS:

1. PC Hardware-A Handbook –KateJ. Chase PHI(Microsoft)
2. ITEssentialsPCHardwareandSoftwareCompanionGuideThirdEditionbyDavid Anfinsonand Ken Quamme.– CISCO Press, Pearson Education.
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015,ISBN: 9788173719547.

4. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace,O'Reilly (SPD),2014,ISBN: 9789350239759
5. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression,2010.
6. DebSR.andDebS.,—RoboticsTechnologyandFlexibleAutomation‖,TataMcGr awHill Education Pvt.Ltd,2010.
7. MikellP Groover,—Automation, Production Systems,and computerintegrat edManufacturing‖,PrenticeHall, 2001.
8. CheeKaiChua, KahFaiLeong,3DPrintingandAdditiveManufacturing: Principles andApplications: Fourth Edition of Rapid Prototyping.
9. Andreas Gebhardt, Understanding Additive Manufacturing: RapidPrototyping, Rapid Tooling, Rapid Manufacturing.

Ordinary Differential Equations and Vector Calculus

B. Tech. II Semester **L T P C**

Subject Code: 22MA201BS **3 1 0 4**

Pre-requisites: Mathematical Knowledge at pre-universitylevel

Course Objectives: To learn

1. Methods of solving the differential equations of first order differential equations.
2. Methods of solving the differential equations of higher order differential equations.
3. Concept, properties of Laplace transforms and Solving ordinarydifferential equations using Inverse Laplace transforms techniques.
4. The physical quantities of vector valued functions involved in engineering field
5. The basic properties and their applications to line and surface integrals.

Course outcomes: After learning the contents of this paper the student must be able to

1. Identifywhether the given differential equation of first order is exact or not.
2. Solve higher order differential equations.
3. Use Laplace transforms techniques to find the derivatives and integrals of given functions & inverse Laplace transforms techniques for solving ODE's
4. Analyze vector and scalar point functions.
5. Evaluate the line and surface integrals and converting them from one to another

UNIT-I: First Order ODE [12 Lectures]

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates).

Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order [12 Lectures]

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax},sinax, cosax, polynomials in x, $e^{ax}V(x)$and $xV(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Laplace transforms [16 Lectures]

Laplace Transforms: First shifting theorem and Change of scale property, Multiplication by' t' and division by 't', Laplace transforms of derivatives and integrals .Laplace transform of periodic functions. Inverse Laplace transforms: First Shifting theorem, Change of Scale Property, Inverse Laplace transforms of derivatives and Integrals, convolution theorem(without proof). Applications: Solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation [10 Lectures]

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration **[10 Lectures]**

Line, Surface &Volume integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S.Grewal, Higher Engineering Mathematics,KhannaPublishers,36th Edition,2021
2. R.K.JAIN, S.R.K.Iyengar,Advanced Engineering Mathematics,.Narosa Publishing House, 4th Edition New Delhi,2020
3. T.K.V.Iyengar, B.Krishna Gandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, S.Chand Publishing

REFERENCE BOOKS:

1. Kreyszing,Advanced Engineering Mathematics,.JohnWiley&Sons, 9th Edition 2006.
2. G.B.Thomas and R.L.Finney, Calculus and Analytic geometry,9th Edition,Pearson,Reprint,2002.
3. H.K.Dass and Er.Rajnish verma,Higher Engineering Mathematics,S Chand and Company Limited,New Delhi.
4. N.P.Bali and Manish Goyal,A text book of Engineering Mathematics, Laxmi Publocations,Reprint,2008

Web Links:

1. https://nptel.ac.in
2. https://onlinecourses.nptel.ac.in

Engineering Chemistry

B. Tech. II Semester **L T P C**

Subject Code: 22CH202BS **3 1 0 4**

Prerequesities: Engineering chemistryknowledge in school and college level.

Course Objectives:

To bring adaptabilityto new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.

1. To include the importance of water in industrial usage.
2. Analyze the properties and applications of industrial polymers.
3. Fundamental aspects of batterychemistry, significance of corrosion its control to protect the structures.
4. To imbibe the basic concepts of petroleum and its products.
5. To acquire required knowledge about engineering materials like cement, smart materials andLubricants.

Course Outcomes:

After completion of this course, the students will be able to:

1. Identifythe basic properties of water and its usage in domestic andindustrial purposes.
2. Learn the fundamentals and general properties of polymers and other engineeringmaterials. Apply in day to day life.
3. Make use of basic knowledge of electrochemical procedures related to corrosionand its control.
4. Interpret the concepts of petroleum products and cement, Smartmaterials.
5. Find potential applications of chemistry and practical utility in order to becomegood engineers and entrepreneurs.

UNIT - I: Water Chemistry [8 Lectures]

Introduction to hardness of water – Estimation of hardness of water by complexometric method and numerical problems. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation – Removal of F^- ion in water by Nalgonda method. Desalination of water – Reverse osmosis.

UNIT – II : Polymers [8 Lectures]

Definition – Classification of polymers with examples – Types of polymerization –addition (free radical addition) and condensation polymerization with examples – Nylon 6:6.

Plastics: Definition and characteristics - thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite.

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, andThiokol rubber.

Biodegradable polymers: Concept and advantages - poly vinyl alcoholand their applications.

Conducting polymers: Characteristics and Classification with examples - mechanism Of conduction intrans - polyacetylene and applications of conducting polymers.

UNIT - III: Batteries & Corrosion [8 Lectures]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Construction, working and applications of Lithium, Lithium ion and Zn-air battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells-Construction and applications of Methanol Oxygen fuel cell.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods. Metallic coating methods: Galvanization, Tinning and Eelectroplating

UNIT - IV: Energy Sources: [8 Lectures]

Introduction, Classification- Calorific value of fuel – HCV, LCV- Dulongs formula. solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Trans esterification, advantages.

UNIT - V: Engineering Materials: [8 Lectures]

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Polyacryl amides, Polyvinyl amides.

Lubricants: Classification of lubricants with examples-characteristics Of good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure) properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. P.C. Jain and M. Jain, Engineering Chemistry by Dhanpatrai Publishing Company, 2010.
2. Rama Devi, Venkata Ramana Reddy and Rath, Engineering Chemistry by Cengage learning,2016.
3. Jaya Shree Anireddy, Textbookof Engineering Chemistry by Wiley Publications.
4. M. Thirumala Chary, E. Laxminarayana and K.Shashikala, A text book of Engineering Chemistry by Pearson Publications, 2021.

REFERENCE BOOKS:

1. Shikha Agarwal, Engineering Chemistry by Cambridge University Press, Delhi 2015.
2. Shashi Chawla, Engineering Chemistry by Dhanpatrai and Company (P) Ltd. Delhi 2011.

Web Links

1. https://nptel.ac.in/courses/122106030
2. https://in.coursera.org/learn/corrosion
3. https://onlinecourses.nptel.ac.in/noc20_cy21/preview
4. https://archive.nptel.ac.in/courses/103/105/103105110/

Data Structures

B. Tech. II Semester **L T P C**

Subject Code: 22CS203ES **3 0 0 3**

Prerequisites: A Course on "Programming for problem solving".

Course Objectives:

1. Exploring basic data structures such as stacks and queues.
2. Introduces a varietyof data structures such as hash tables.
3. Discussion of search trees.
4. Understand the sorting algorithms.
5. Introduces pattern matching algorithms

Course Outcomes:

After completion of this course, the students will be able to:

1. Explain the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
2. Discuss hashing and different collision resolve techniques.
3. Design programs using a varietyof data structures including binarysearch trees, heaps trees and AVL-trees.
4. Design programs on sorting and graphs.
5. Applydifferent searching techniques on Non linear data structure

UNIT–I **[10 Lectures]**

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

UNIT–II **[6 Lectures]**

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

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

UNIT–III **[8 Lectures]**

Search Trees: Binary Search Trees, Definition, Implementation, Operations-Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations–Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT–IV **[8 Lectures]**

Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sorting: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT–V **[8 Lectures]**

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer – Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXTBOOKS:

1. E. Horowitz, S. Sahni and Susan Anderson Freed, *Universities Press*. Fundamentals of Data Structures in C, 2nd Edition,2008.
2. A. S. Tanenbaum, Y. Langsam, and M. J.Augenstein,PHI/Pearson Education. Data Structures using C ,2004.

REFERENCE BOOKS:

1. R. F. Gilberg and B.A. Forouzan, Cengage *Learning.* Data Structures: A Pseudocode Approach with C, 2nd Edition 2016.

WEB LINKS:

1. https://nptel.ac.in/courses/106102064
2. https://www.programiz.com/dsa/data-structure-types
3. https://www.coursera.org/learn/data-structures

Basic Electrical & Electronics Engineering

L T P C

B. Tech. II Semester
Subject Code: 22EC204ES **3 1 0 4**

Prerequisites:

Course Objectives:

1. To introduce the concepts of electrical circuits and its components.
2. To studyand understand the different types of DC, AC single & three phase circuits.
3. To studyand understand the different types of DC, AC machines and Transformers.
4. To introduce the concepts of diodes & transistors.
5. To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

After completion of this course, the students will be able to:

1. Identifythe basic DC electrical circuits.
2. Evaluate the basic single phase and three phase AC circuits.
3. Analyze the working principles of Electrical Machines.
4. Classifythe concepts of diodes & Rectifiers.
5. Compare the knowledge of various transistor configurations, characteristics and applications.

UNIT- I: **[14 Lectures]**

D.C. CIRCUITS: Introduction, Types of elements, Definitions, Ohm's law and its limitations, Passive elements R-L-C, Energy sources-Ideal and practical, Series and Parallel combination of Resistances, Inductances and Capacitances, Star-Delta Transformation, Source transformation, Kirchhoff's Laws, Mesh analysis, Nodal analysis.

UNIT-II: **[12 Lectures]**

A.C. CIRCUITS: Representation of sinusoidal waveforms, Instantaneous value, Peak value, Average and RMS value, Form factor and Peak factor for sinewave, Rectifier output, Saw tooth and Square Waveforms, Phasor representation, Real power, Reactive power, Apparent power, Power factor, Analysis of single- phase ac circuits RL, RC, RLC series combination. Three phase balanced circuits, Voltage and current relationship in star and delta connections.

.

UNIT – III: **[14 Lectures]**

TRANSFORMERS: Construction, Types, Working principle of Single-phase transformer, EMF equation, Equivalent circuit, Losses in transformers, Efficiency and Condition for maximum efficiency.

DC& AC Machines: Construction, Working Principle of DC generator, EMF equation, Types, Working principle of DC motor, Torque equation, Three phase induction motor construction and working, Slip and Rotor current frequency.

UNIT – IV: **[10 Lectures]**

DIODES: Principle of Operation, Diode current equation, Volt-Ampere characteristics, Static and dynamic resistances, Diffusion and Transition capacitances. Half Wave Rectifier, Full Wave Rectifier-Center-Tap and Bridge Rectifier, Ripple factor, Rectification efficiency, Peak

Inverse Voltage, Transformer Utilisation Factor, Simple problems. Zener diode characteristics, Zener diode as voltage regulator.

UNIT – V: [10 Lectures]

Bipolar junction Transistor: Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Current amplification factor, Relation between α and β, Comparison of CE, CB and CC configurations. SCR Construction, Operation and V-I characteristics.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. V.K. Mehta, Rohit Mehta, Principles of Electrical Engineering and Electronics – S.Chand Publications, 2nd Edition,2014.

REFERENCE BOOKS:

1. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits – PEI/PHI, 9th Ed, 2006.
2. J. Millman and C. C. Halkias, SatyabrataJit, Electronic Devices and Circuits – TMH, 2/e, 1998.
3. William Hayt and Jack E. Kemmerly, Engineering circuit analysis- McGraw Hill Company, 6th edition,2012.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

Web Links:

1. www.youtube.com/watch?v=vh_aCAHThTQ
2. www.electricaleasy.com/2014/03/electrical-transformer-basic.html
3. www.youtube.com/watch?v=Unh99Qn7CmI
4. www.youtube.com/watch?v=d_LOXUEFA-o
5. www.electricaleasy.com/2022/09/construction-and-working-of-dc-generator.html.

Computer Aided Engineering Graphics

B. Tech. II Semester **L T P C**

Subject Code: 22ME205ES **1 0 2 2**

Pre-requisites: Computer Aided Engineering Graphics course of first year of study.

Course Objectives: To learn

1. To provide basic concepts in engineering drawing. To develop the abilityof visualization of objects through technical drawings
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw projections of solids and pictorial views of solids and to draw surfaces development
   of solid for prisms, pyramids, cone and cylinder.
4. To draw isometric views of solids and orthographic projections of solids.
5. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

Course outcomes:

After completion of this course, the students will be able to:

1. Applycomputer aided drafting tools to sketch the conventions and the methods of drawings, engineering curves and scales
2. Identifyand draw the projections of points, lines and planes in different types of projections. manually and by using computer aided drafting tools
3. Analyze the need of projections of solids (prisms, pyramids, cone and cylinder) manually and by using computer aided drafting tools.
4. Evaluate and interpret engineering drawings for development of surfaces to Right Regular Solids-prism, manually and by using computer aided drafting tool.
5. Change the conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting tool.

UNIT- I: INTRODUCTION TO ENGINEERING DRAWING [12 Lectures]

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid. Scales – Plain and Diagonal. Introduction to CAD Software commands and practice.

UNIT -II: ORTHOGRAPHIC PROJECTIONS [12 Lectures]

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. manually and by using computer aided drafting

UNIT –III: PROJECTIONS OF SOLIDS [12 Lectures]

Projections of Regular Solids – Prism, Cylinder, Pyramid and Cone. manually and by using computer aided drafting.

UNIT- IV: DEVELOPMENT OF SURFACE [12 Lectures]

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone. manually and by using computer aided drafting

UNIT –V: ISOMETRIC PROJECTIONS: [12 Lectures]

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions –Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Conversion of Isometric Views to Orthographic Views and Vice-versa. manually and by using computer aided drafting

Note: - Internal exam and The End Semester Examination will be conducted by using Auto Cad Software.

TEXTBOOKS:

1. N.D. Bhatt / Charotar, Engineering Drawing, Publisher: ***Charotar*** Publishing House · GenreJanuary 2019.
2. T. Jeyapoovan, Vikas: Engineering Drawing and graphics Using AutoCAD Third Edition S. Chand and company Ltd. January 2010.
3. N. S. Parthasarathyand Vela Murali/ Engineering Drawing/Oxford publications. 12th june 2015.
4. K Balaveera Reddy et al –Computer Aided Engineering Drawing, CBS Publishers. 2015.

REFERENCE BOOKS:

1. M. B. Shah, B.C. Rane / Engineering Drawing, Pearson. 2009
2. K Balaveera Reddy et al – Computer Aided Engineering Drawing, CBS Publishers. 2015
3. Basant Agrawal and C M Agrawal, Engineering Drawing, Third Edition McGraw Hil.2019
4. K Balaveera Reddyet al –Computer Aided Engineering Drawing -CBS Publishers. 2015.

WEBLINKS:

1. https://www.youtube.com/watch?v=ANEvQyt3PnU
2. https://www.youtube.com/watch?v=rp3swbAYZJU
3. https://www.youtube.com/watch?v=ga1ud9yQl4I
4. http://www.digimat.in/nptel/courses/video/105104148/L04.html
5. https://engineeringvideolectures.com/course/758

Engineering Chemistry Laboratory

B. Tech. II Semester **L T P C**

Subject Code: 22CH206BS **0 0 2 1**

Pre-requesities : To bring adaptabilityto new developments in engineering chemistrylab and acquire the knowledge in practical skills

Course Objectives:

The course consists of experiments related to the principles of chemistryrequired for engineering student. The student will learn:

1. Estimation of hardness of water to checkits suitabilityfor drinking purpose.
2. To perform estimations of acids and bases using conductometry and potentiometry methods.
3. To prepare polymers such as Bakelite and nylon-6.6 in the laboratory.
4. Learn skills related to the lubricant properties such as saponification value,surface tension and viscosity of oils.
5. Applythe skills in rate of corrosion to solve engineering problems.

Course Outcomes:After completion of this course, the students will be able to:

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Perform methods such as conductometry and potentiometry in order to find out the concentrations or equivalence points of acids and bases.
3. prepare polymers like bakelite and nylon-6.6
4. Estimations of saponification value, surface tension and viscosity of lubricant oils.
5. Find the rate of corrosion of mild steel in various conditions.

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometrymethod.
II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
III. **Potentiometry:** Estimation of the concentration of an acid by Potentiomentry Estimation of the amount of Fe^{+2} by Potentiomentry.

I. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon – 6.6

II. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

III. Corrosion: Determination of rate of corrosion of mild steel in the presenceand absence of inhibitor.

IV. **Virtual lab experiments**

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. B. Ramadevi and P. Aparna, Engineering chemistry Lab manual for by S Chand Publications, New Delhi (2022).
2. Vogel's text book of practical organic chemistry 5th edition.
3. A.I. Vogel, Inorganic Quantitative analysis by ELBS Publications.
4. V.K. Ahluwalia, College Practical Chemistry by Narosa Publications Ltd. New Delhi (2007).

Web Links

1. www.youtube.com/watch?v=FCQ26RQBZLg
2. https://www.youtube.com/watch?v=-GS6uoFf3qQ
3. https://www.youtube.com/watch?v=Y48UgKi33Ps
4. https://www.youtube.com/watch?v=TC1M-XDHfDI

Data Structure Laboratory

B. Tech. II Semester **L T P C**

Subject Code: 22CS207ES **0 0 2 1**

Prerequisites: A Course on "Programming for problem solving".

Course Objectives:

1. It provides an understanding of linear data structures such as stacks and queues.
2. It provides an understanding of non linear data structures like tress and graphs.
3. It provides an understanding of linear and binarysearch algorithms.
4. It provides an understanding of sorting algorithms.

Course Outcomes:

After completion of this course, the students will be able to:

1. Implement various linear data structures.
2. Implement various non linear data structures.
3. Compare various searching and sorting algorithms.
4. Abilityto implement trees and graphs traversals.

LIST OF EXPERIMENTS

1. Write a program that uses functions to perform the following operations on single linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that uses functions to perform the following operations on double linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal

3. Write a program that uses functions to perform the following operations on circular linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal

4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers

5. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers

6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Bubble sort ii) Selection sort iii) Insertion sort

7. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers:
   i) Linear search ii) Binary search

8. Write a program to implement the tree traversal methods.

9. Write a program to implement the graph traversal methods.

TEXT BOOKS:

1. E. Horowitz, S. Sahni and Susan Anderson Freed, *Universities Press*. Fundamentals of Data Structures in C, 2nd Edition,2008.
2. A. S. Tanenbaum, Y. Langsam, and M. J.Augenstein,PHI/Pearson Education. Data Structures using C ,2004.

REFERENCE BOOKS:

1. R. F. Gilberg and B.A. Forouzan, Cengage *Learning.* Data Structures: A Pseudocode Approach with C, 2nd Edition,2016.

WEB LINKS:

1. https://nptel.ac.in/courses/106102064
2. https://www.programiz.com/dsa/data-structure-types
3. https://www.coursera.org/learn/data-structures

Basic Electrical & Electronics Engineering Lab

B.Tech. II Semester **L T P C**
Subject Code 22EC208ES **0 0 2 1**

Prerequisites: Mathematics
Corequisites: Basic Electrical and Electronics Engineering

Course Objectives:

1. To Analyze a given network byapplying various electrical laws.
2. To Analyze the performance of single phase transformers.
3. To Analyze the performance of transformers, DC and AC machines.
4. To introduce the concepts of diodes and transistors.
5. To impart the knowledge of various types of Rectifiers.

Course Outcomes:

After completion of this course, the students will be able to:

1. Verifythe Ohms law, KCL, KVL with practical approach.
2. Estimate the performance calculations of single phase transformers.
3. Analyze the Performance characteristics of DC and AC machines through various testing methods.
4. Compare the characteristics of different types of diodes and transistors.
5. Evaluate the performance of Rectifiers with and without filters.

SECTION A: ELECTRICAL ENGINEERING:

1. Verification of Ohm's law.
2. Verification of KCLand KVL.
3. Brake test on DC Shunt motor.
4. Brake test on 3-phase Induction motor.
5. Load Test on Single-Phase Transformer.
6. Measurement of Voltage, Current and Real Power in Primary and Secondary circuits of a Single Phase Transformer.
7. No Load Characteristics of 3 phase Alternator.

SECTION B: ELECTRONICS ENGINEERING:

1. 1. Studyand operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies iv) CRO
2. PN Junction Diode Characteristics A)Forward bias B) Reverse bias
3. Zener Diode CharacteristicsA)Forward bias B) Reverse bias
4. Input and Output characteristics of BJT in CE Configuration.
5. Half wave Rectifier without and with Filters .
6. Full wave Rectifier without and with Filters .
7. Note: Total 10 experiments are to be conducted.

(Minimum Five experiments from PART-A, Five experiments from PART-B)

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.

2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,”Basic Electrical Engineering”, S. Chand, 2 nd Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.

Web links: -

1. .https://www.youtube.com/watch?v=Ki60DB0I3W4&list=PLwymdQ84KI-x0T05PcG6D_2rhbWV_O9 3B&index=2
2. https://www.youtube.com/watch?v=W-AqhZLm7h4
3. https://www.youtube.com/watch?v=UkH4CaAsG6Q
4. https://www.youtube.com/watch?v=Hfkd7UFSIF0
5. https://www.youtube.com/watch?v=i9wbWYtm2cI
6. https://www.youtube.com/watch?v=UdaATCmDfYU
7. https://www.youtube.com/watch?v=1IZIjIf3NDw
8. https://www.youtube.com/watch?v=X-i1MevYcpM
9. https://www.youtube.com/watch?v=syZgyPLHyp8
10. https://www.youtube.com/watch?v=QGawHsg4NpQ

Environmental Science

B. Tech. II Semester **L T P C**

Subject Code: 22CH209MC **3 0 0 0**

Prerequisites:

NoneCourse

Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understandingthe impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

Course Outcomes: After completion of this course, the students will be able to:

1. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Analyze and synthesize scientific data to characterize and evaluate the status of atleast one type of ecological system and apply skills of measurement, spatial orientation, sampling, and data analysis to characterize natural resource phenomena
3. Create awareness on the basic philosophyof science, concepts and scope.
4. Evaluate consequences of human exposure to pollution and its impacts to environmental quality.
5. Comprehending the statutoryand regulatorymechanisms pertaining to environment in India and understanding judicial response to environmental issues in India.

UNIT-I **[10 Lectures]**

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnifications, ecosystem value, services and carrying capacity, Field visits.

UNIT-II. **[7 Lectures]**

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

UNIT-III **[7 Lectures]**

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV **[10 Lectures]**

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of

modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater

Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and MontréalProtocol. NAPCC-GoI Initiatives.

UNIT-V [**8 Lectures**]

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wildlife Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. **EIA:** EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Footprint, Life Cycle assessment (LCA), Lowcarbon lifestyle.

TEXTBOOKS:

1. Erach Bharucha , Textbook of Environmental Studies for Undergraduate Courses, The Orient Black swan, 2nd edition , 1 January 2015.
2. R. Rajagopalan, Environmental Studies , Oxford UniversityPress,3rd edition, April, 2015

REFERENCE BOOKS:

1. Richard T. Wright, Environmental Science: towards a sustainable future , Benjamin Cummings Pub Co,13th edition, 17 January 2016.
2. Gilbert M. Masters and Wendell P. Ela, Environmental Engineering and science, Pearson, 3rd edition, 15 December 2006.
3. Daniel B. Botkin & Edward A. Keller, Environmental Science , Wiley publishing,8th edition,2012.
4. Anubha Kaushik, Environmental Studies , New age international publishers, 4th Edition, 1 January 2012
5. Dr. M. AnjiReddy, Textbook of Environmental Science and Technology,BS Publications, 31 october 2014.
6. Y. Anjaneyulu , Introduction to Environmental Science , BS.Publications, 1 January 2004

Web links:

1. https://onlinecourses.nptel.ac.in
2. https://archive.nptel.ac.in
3. https://onlinecourses.swayam2.ac.in
4. https://onlinecourses.nptel.ac.in
5. https://onlinecourses.nptel.ac.in

Discrete Mathematics

B. Tech. III Semester **L T P C**

3 1 0 4

Subject Code: 22DS301PC

Prerequisites: An understanding of Mathematics in general is sufficient**.**

Course Objectives:

1. To understand and construct precise mathematical proofs.
2. To use logic and set theoryto formulate precise statements.
3. To analyze and solve counting problems on finite and discrete structures.
4. To describe methods of counting and able to solve recurrence relations.
5. To apply graph theoryin solving computing problems.

Course Outcomes: After completion of this course, the students will be able to:

1. Construct precise mathematical proofs.
2. Use logic and set theoryto formulate precise statements.
3. Analyze and solve counting problems on finite and discrete structures.
4. Solve counting problems and recurrence relations.
5. Apply graph theoryin solving computing problems.

UNIT – I **[10 Lectures]**

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT – II **[6 Lectures]**

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT – III **[6 Lectures]**

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as PartiallyOrdered Sets, Boolean Algebra.

UNIT – IV **[8 Lectures]**

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT – V **[8 Lectures]**

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits,Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, *McGraw-Hill, 1st ed.*
2. Joe l. Mott, Abraham Kandel, Teodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, *Prentis Hall of India, 2nd ed.*

REFERENCE BOOKS:

1. Ralph.P. Grimald, Discrete and Combinatorial Mathematics - an applied introduction, *Pearsoneducation, 5th edition.*
2. Thomas Kosy, Discrete Mathematical Structures, *Tata McGraw Hill publishing co.*

Digital Electronics

B.Tech. III Semester Subject

L	T	P	C
3	0	0	3

Code: 22EC302ES

Pre-requisite: Basic Electrical and Electronics Engineering

Course Objectives:

1. To Compare common forms ofnumber representation in logic circuits.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits.
4. Todesign sequential logiccircuits.
5. To know various memories and logic families.

CourseOutcomes: Upon completing this course, the student will be able to

1. Compare the numerical information in different forms and Boolean Algebra theorems.
2. Apply the various simplification methods to simplify the given Boolean function.
3. Analyze and design various combinational logic circuits.
4. Learn the concepts of sequential circuits.
5. Illustratevarious memories and logic families.

UNIT – I: **[10 Lectures]**

NUMBER SYSTEMS: Number Systems, Number base conversions, Binary, Octal, Decimal, and Hexadecimal Numbers, Complements of Numbers, Binary codes: Weighted and Non weighted codes.

BOOLEAN ALGEBRA: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, Universal Gates.

UNIT – II: **[8 Lectures]**

GATE – LEVEL MINIMIZATION: The map method, Three-variable map, Four- variable map, product of sums simplification and Sum of Products Simplification using K- map, Don't-care conditions, NAND and NOR implementation.

UNIT – III: **[10 Lectures]**

COMBINATIONAL LOGIC: Combinational Circuits, Design procedure, Design of Half Adder, Full Adder, Half Subtractor, Full Subtractor, BCD Adder, Magnitude Ccomparator, Decoders, Encoders, Multiplexers, and Demultiplexers.

UNIT – IV: **[8 Lectures]**

SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops, Design Procedure**,** state Reduction and Assignment, Registers, shift Registers, synchronous counters, Asynchronous Counters, Ring Counter, Johnson Counter.

UNIT – V: **[8 Lectures]**

MEMORIES AND LOGIC FAMILIES

Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array, Programmable Array logic. AND, OR and

NOT Gates using Diodes, Classification of Integrated circuits, comparison of various logic families.

TEXT BOOKS:

1. M. Morris Mano, Digital Design, 3rd Edition, Pearson Education/PHI, 2021.
2. Albert Paul Malvino Donald P. Leach, Digital Principles and Applications, 2nd Edition, TATA McGraw Hill, 1976.
3. A. Anand Kumar, Pulse and Digital Circuits, 2nd Edition, PHIPublications,2012.

REFERENCE BOOKS:

1. Zvi. Kohavi, Switching and Finite Automata Theory, 3rd Edition,Tata McGraw Hill, 2009.
2. C.V.S. Rao, Switching and Logic Design, 1st Edition, Pearson Education, 2005.
3. Donald D.Givone, Digital Principles and Design, Tata McGraw Hill, Edition, 2017.

WEBLINKS:

1. http://nptel.ac.in/courses/117/106/117106086/ (By Prof. Goutam Saha, Electronics & Electrical Communication Engineering Dept, IIT Kharagpur).
2. www.nptelvideos.in/2012/12/digital-circuits-and-systems.html(By Prof. Santanu
3. Chattopadhyay, Electronics & Electrical Communication Engineering Dept, IIT Kharagpur).
4. https://www.smartzworld.com/notes/switching-theory-and-logic-design-stld/.

PROGRAMMING WITH PYTHON

B.Tech. III Semester **L T P C**
3 0 0 3

Subject Code: 22DS303PC
Prerequisites: Basic knowledge on C Programming**.**

Course Objectives:

1. Learn Syntax and Semantics in Python.
2. Explore the arrays and strings in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Handle Files, Modules, and exceptions in Python.
5. Implement Object Oriented Programming concepts in Python.

Course Outcomes: After completion of this course, the students will be able to:

1. Examine Python syntax and semantics, flow control.
2. Demonstrate proficiency in handling Strings and Arrays.
3. ApplyPython Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Conduct experiments on file handling, exception handling, and modules.
5. Interpret the concepts of Object-Oriented Programming as used in Python.

UNIT - I **[8 Lectures]**

Introduction to Python: History, Features, Applications, First Python Program, Variables, Data Types, Numbers, Operators, Input and Output statements.
Control Statements: Conditional Statements, A Word on Indentation, Looping Statements, the else Suite, break, continue, pass, assert, return.

UNIT – II **[6 Lectures]**

Arrays in Python: Arrays, Types of Arrays, Working with Arrays using numpy, Creating Arrays, Operations on Arrays, Attributes of an Array, The reshape() Method, The flatten() Method, Matrices in numpy, Matrix Addition and Multiplication.
Strings and Characters: Creating Strings, Operations on Strings, Working with Characters, Sorting Strings, Searching Strings.

UNIT – III **[8 Lectures]**

Functions in Python: Defining a Function, Calling a Function, Parameters, Recursive Functions.
List: Creating Lists using range() Function, Operations on Lists, Methods to Process List, Sorting the List Elements.
Tuple: Creating Tuples, Accessing the Tuple Elements, Operations on Tuple, Functions to Process Tuples.
Dictionaries: Operations on Dictionaries, Dictionary Methods, Sorting the Elements of a Dictionary using Lambdas, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions.

UNIT – IV **[10 Lectures]**

Files in Python: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules.
Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules.
Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

UNIT – V **[8 Lectures]**

OOPS using Python: Classes and Objects, Inheritance and Polymorphism, Abstract Classes and Interfaces.

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

TEXT BOOKS:

1. WesleyJ. Chun, Core Python Programming, Second Edition, Pearson, 2006.
2. R. Nageswara Rao Core Python Programming, Dream Tech Press, 2018.

REFERENCE BOOKS:

1. Reema thareja, Python Programming using problem solving approach, *Oxford University Press*, 2019.
2. Dietel and Dietel, Python How to Program, 2002.

WEB LINKS:

1. https://nptel.ac.in/courses/106106145
2. https://onlinecourses.nptel.ac.in/noc20_cs83/preview
3. https://www.visualpathedu.com/home/course/core-python/1
4. https://www.visualpathedu.com/home/course/advanced-python/3
5. https://www.udemy.com/topic/python/free/
6. https://www.coursera.org/specializations/python

COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech. III Semester. **L T P C**
3 0 0 3

Subject Code: 22DS304PC
Prerequisites: A Course on "Digital Logic Design and Microprocessors".

Course Objectives:
1. Introduce principles of computer organization and the basic architectural concepts.
2. Explore the basic organization, design, and programming of a simple digital computer.
3. Introduces simple register transfer language to specifyvarious computer operations.
4. Describing memoryorganization and I/O systems.
5. Introduce pipelining and vector processing.

Course Outcomes: After completion of this course, the students will be able to:
1. Identityof computer organization architecture.
2. Analyze the basics of instruction sets and their functionality.
3. Evaluate arithmetical operations by using data.
4. Demonstrate the functional units of the computer.
5. Design a pipeline for consistent execution of instructions.

UNIT–I **[10 Lectures]**
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.

UNIT–II **[8 Lectures]**
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.
Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

UNIT–III **[8 Lectures]**
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, floating – point Arithmetic operations.

UNIT–IV **[6 Lectures]**
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

UNIT–V **[8 Lectures]**
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Cache Coherence.

TEXT BOOKS:

1. M. Moris Mano, Computer System Architecture, *Third Edition, Pearson/PHI, 2016.*
2. William Stallings, Computer Organization and Architecture, *6th ed, Pearson/PHI, 2010.*

REFERENCE BOOKS:

1. Car Hamacher, ZvonksVranesic, SafeaZaky, Computer Organization, Vth Edition, McGraw Hill,
   2002.
2. Andrew S.Tanenbaum, Structured Computer Organization, 4th Edition, PHI/Pearson, 2003.
3. B. Ram, Computer Fundamentals Architecture and Organization, 5th ed., New Age International Publications, 2000.

WEB LINKS:

1. https://nptel.ac.in/courses/106105163
2. https://onlinecourses.nptel.ac.in/noc20_cs64/preview
3. https://www.udemy.com/topic/computer-architecture/

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech. III Semester **L T P C**
3 0 0 3

Subject Code: 22DS305PC
Prerequisites: Basic knowledge on C Programming**.**

Course Objectives:

1. To introduce the object-oriented programming concepts.
2. To introduce the implementation of packages and interfaces
3. To introduce the concepts of exception handling and multithreading.
4. To introduce the concepts of collection framework.
5. To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcomes: After completion of this course, the students will be able to:

1. Solve real world problems using OOP techniques.
2. Applythe packages and interfaces, streams in I/O.
3. Examine development of exceptions, multithreaded applications with synchronization.
4. Analyze the usage of collection framework.
5. Design GUI based applications using applets and swings.

UNIT–I **[10 Lectures]**

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

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

UNIT–II **[8 Lectures]**

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

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

UNIT–III **[6 Lectures]**

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

Multi-threading- Differences between thread-based multitasking and process-based multi-tasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT–IV **[6 Lectures]**

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hash table, Properties, Stack, Vector More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

UNIT–V **[10 Lectures]**

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

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

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls – Jlabel and Image Icon, JTextField.

The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS:

1. Herbert Schildt, Java The complete reference, 9th edition, *McGraw Hill Education (India) Pvt. Ltd*, 2014.
2. T. Budd, Understanding Object-Oriented Programming with Java, updated edition, *Pearson Education*, 2000.

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch, An Introduction to programming and OO design using Java, *John Wiley & sons*, 2007.
2. Y. Daniel Liang, Introduction to Java programming, *Pearson Education*, 1998.
3. P. Radha Krishna, Object Oriented Programming through Java, *University Press*, 2007.
4. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, *Oxford University Press*, 2018.
5. R. A. Johnson, An Introduction to Java Programming and Object-oriented Application Development, *Cengage Learning*, 2012.

WEB LINKS:

1. https://nptel.ac.in/courses/106105191
2. https://www.visualpathedu.com/home/course/core-java-training/175
3. https://www.visualpathedu.com/home/course/advanced-java-training/176
4. https://www.coursera.org/specializations/object-oriented-programming
5. https://www.upgrad.com/blog/java-free-online-course/
6. https://www.edx.org/course/java-programming-fundamentals
7. https://education.oracle.com/java/java/pFamily_48

PYTHON LAB

B.Tech. III Semester.

L	T	P	C
0	0	3	1.5

Subject Code: 22DS306PC

Prerequisites: Basic knowledge on C Programming and students should install Python

Co-requisite: A Course on "Programming with Python".

Course Objectives:

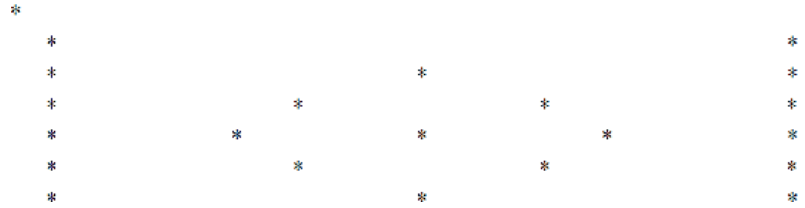
1. To learn basic data types, operators, use of procedural statements like assignments, conditional statements, loops and function calls.
2. To make use of functions and string operations.
3. To work with the data structures like lists, set, dictionaries and tuples in python.
4. To acquire knowledge on object-oriented programming concepts in python.
5. To implement file handling and error handling mechanisms.

Course Outcomes: After completion of this course, the students will be able to:

1. Practice the basic concepts of python programming.
2. Applyfunctions to design modular programming and perform string operations.
3. Analyze various data structures like lists, set, dictionaries and tuples in python.
4. Implement object-oriented programming concepts using python.
5. Build applications using file handling and error handling techniques.

List of Programs:

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]
10. Write a Python program to construct the following pattern, using a nested for loop



11. Write a Python script that prints prime numbers less than20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow (x,n)
20. Write a Python class to reverse a string word by word.

TEXT BOOKS:

1. WesleyJ. Chun, Core Python Programming, Second Edition, Pearson, 2006.
2. R. Nageswara Rao Core Python Programming, Dream Tech Press, 2018.

REFERENCE BOOKS:

1. Python Programming using problem solving approach, Reema thareja, Oxford University Press, 2019.
2. Dietel and Dietel, Python How to Program, 2002.

WEB LINKS:

1. https://nptel.ac.in/courses/106106145
2. https://onlinecourses.nptel.ac.in/noc20_cs83/preview
3. https://www.visualpathedu.com/home/course/core-python/1
4. https://www.visualpathedu.com/home/course/advanced-python/3
5. https://www.udemy.com/topic/python/free/
6. https://www.coursera.org/specializations/python

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech. III Semester **L T P C**
0 0 3 1.5

Subject Code: 22DS307PC
Prerequisites: Basic knowledge on C Programming.

Co-requisite: A Course on "OOPS Through Java".

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using the java collection framework.
3. To write multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.

Course Outcomes: After completion of this course, the students will be able to:

1. Write programs for solving real world problems using the java collection framework.
2. Write programs using abstract classes.
3. Write multithreaded programs.
4. Write GUIprograms using swing controls in Java.
5. Impart hands-on experience with java programming.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the useof the Eclipse platform.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to addmore problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project,add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for thedigits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. A) Develop an applet in Java that displays a simple message.

   B) Develop an applet in Java that receives an integer in one text field, and computes its factorialValue and returns it in another text field, when the button named "Compute" is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters twonumbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Resultfield when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throwa Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

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

TEXT BOOKS:

1. P.J. Deitel and H. M. Deitel Java for Programmers, 10th Edition *Pearson education.*
2. Bruce Eckel, Thinking in Java, *Pearson Education.*
3. D. S. Malik and P. S. Nair, Java Programming, *Cengage Learning.*
4. CayS. Horstmann and G Cornell, Core Java, *Volume 1, 9th edition, Pearson.*

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley & sons, 2007.
2. Y. Daniel Liang, Introduction to Java programming, Pearson Education, 1998.
3. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford UniversityPress, 2018.
4. R. A. Johnson, An Introduction to Java Programming and Object-oriented Application Development, Cengage Learning, 2012.

WEB LINKS:

1. https://nptel.ac.in/courses/106105191
2. https://www.visualpathedu.com/home/course/core-java-training/175
3. https://www.visualpathedu.com/home/course/advanced-java-training/176
4. https://www.coursera.org/specializations/object-oriented-programming
5. https://www.upgrad.com/blog/java-free-online-course/
6. https://www.edx.org/course/java-programming-fundamentals
7. https://education.oracle.com/java/java/pFamily_48

DATA VISUALIZATION – R PROGRAMMING/ POWER BI

B. Tech. III Semester **L T P C**
0 0 2 1

Subject Code: 22DS308PC

Course Objectives:

1. Effective use of Business Intelligence (BI) technology(Tableau) to applydata visualization
2. To discern patterns and relationships in the data.
3. To build Dashboard applications.
4. To communicate the results clearly and concisely.
5. To be able to work with different formats of data sets.

Course Outcomes: After completion of this course, the students will be able to:

1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real world problems.

Lab Problems:

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations,Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau,creating basic charts(line, bar charts, Tree maps),Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculationsand fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Toolsand Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels,customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for differentdisplays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:

1. Brett Powell, Microsoft Power BI cookbook, 2nd edition.
2. Roger D. Peng, R Programming for Data Science.
3. The Art of R Programming byNorman *Matloff Cengage Learning India.*

GENDER SENSITIZATION LAB

B.Tech. III Semester **L T P C**
0 0 2 0

Subject Code: 22EN309MC

Course Objectives:

1. To develop students' sensibilitywith regard to issues of gender in contemporary India.
2. To introduce students to information about some keybiological aspects of genders.
3. To expose the students to debates on the politics and economics of work.
4. To help students reflect criticallyon gender violence.
5. To expose students to more egalitarian interactions between men and women

Course outcomes: After completion of this course the student will be able to :

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life.

UNIT-I: UNDERSTANDING GENDER **[4 Lectures]**

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

UNIT-II: GENDER ROLES AND RELATIONS **[4 Lectures]**

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

UNIT-III: GENDER AND LABOUR **[4 Letures]**

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

UNIT – IV: GENDER - BASED VIOLENCE **[4 Lectures]**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT-V: GENDER AND CULTURE **[4 Lectures]**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa ParksThe Brave Heart

TEXT BOOKS:

Writers: A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu
Published by: Telugu Academy, Telangana Government
Year: 2015

REFERENCE BOOKS:

1. Dr Rajpal Singh, Dr Anupama Sihag, Gender Sensization: Issues and Challenges, Raj Publications 2019.

WEB LINKS:

1. http://ncw.nic.in/sites/default/files/Booklet-%20Gender%20Sensitization_0.pdf
2. 2.http://gmmrcg.in/Content/284_464_7.1.1%20weblink%20annual%20gender%20sensitization%20action%20plan.pdf

COMPUTER ORIENTED STATISTICAL METHODS

B.Tech. IV Semester

L	T	P	C
3	0	0	3

Subject Code: 22MA401BS

Pre-requisites: Mathematical Courses of first year of study

Course Objectives: To learn

1. The concept of Probability and Random variables
2. The Probability distributions of discrete and continuous random variables
3. The sampling theory, testing of hypothesis and making statistical inferences.

Course outcomes: After completion of this course, the student will be able to:

1. Apply the concepts of probabilityand Random variables
2. Analyse the concept of Probabilitydistributions to some case studies
3. Formulate and solve problems by applystatistical methods for analyzing experimental data.
4. Demonstrate the concept of estimation and distinguish regression analysis and to compute and interpret the coefficient of correlation.
5. Examine the given statistical hypothesis

UNIT - I: Probability and Random Variable **10 Lectures**

Review of Probability, Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions. Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables

UNIT-II : Discrete and Continuous Distributions **10 Lectures**

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

UNIT-III: Sampling Distribution **10 Lectures**

Fundamentals of Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution and Chi-square Distribution.

UNIT-IV: Estimation, Simple Linear Regression and Correlation **10 Lectures**

Estimation: Point and interval estimations, criteria of good estimator, estimations for means and properties.

Simple Linear Regression and Correlation: Introduction of linear regression, the simple Linear Regression Model, least squares and fitted model, Inferences concerning the regression coefficients, Prediction, Simple Linear regression case study.

UNIT-V: Tests of Hypothesis **10 Lectures**

Statistical Hypothesis: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions.

Small Sample tests: Student-t-test for single mean, difference of means and F-test for equality of two variances, Chi-Square test for goodness of fit and independence of attributes.

TEXT BOOKS:

1. Dr.T.K.V. Iyengar, B.Krishna Gandhi, S. RanganathamandDr.M.V.S.S.N.Prasad, Probability and statistics , S.Chand, EigthRevisesed edition ,2020.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, S.Chand publications, 12th revised edition ,2020 .
3. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi,2014.

REFERENCE BOOKS:

1. Sheldon M Ross, Probabilityand statistics for Engineers and scientists, 6th edition, academic press, 2020.
2. Miller and Freund's, Probabilityand Statistics for Engineers, 8th Edition, Pearson Educations, 2015.

WEBLINKS:

1. **https://youtu.be/r1s**
2. **https://youtu.be/enDYkFxJE9W**
3. **https://youtu.be/VVYLpmKRfQ8**

DATABASE MANAGEMENT SYSTEMS

B.Tech. IV Semester **L T P C**
3 0 0 3

Subject Code: 22DS402PC
Prerequisites: A course on "Data Structures".

Course Objectives:

1. Understand the basic concepts and the applications of database systems.
2. Introducing relational databases.
3. Basics of SQL and construct queries using SQL.
4. Topics include transaction control and concurrency control.
5. Understand storage structures and access techniques.

Course Outcomes: After completion of this course, the students will be able to:

1. Analyze the logical design concepts of the database.
2. Design the physical model of a database and its operations.
3. Apply the knowledge of SQL to construct the queries for efficient data access and manipulation.
4. Implement transaction processing and concurrency control.
5. Examine different indexing mechanisms and database storage access.

UNIT – I **[10 Lectures]**

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model

UNIT – II **[6 Lectures]**

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/alteringtables and views.
Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT – III **[8 Lectures]**

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL,triggers and active databases.
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT – IV **[8 Lectures]**

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

UNIT – V **[8 Lectures]**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata Mc GrawHill 3rd Edition, 2002.
2. Silberschatz, Korth, Database System Concepts, McGrawhill, V edition, 1980.

REFERENCE BOOKS:

1. Peter Rob & Carlos Corone, Database Systems design, Implementation, and Management, l7th Edition, 1993.
2. Elmasri Navrate, Fundamentals of Database Systems, Pearson Education, 2011.
3. C.J. Date, An Introduction to Database Systems, Pearson Education, 2004.
4. S. Shah and V. Shah, Oracle for Professionals, The XTeam, SPD, 2008.
5. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI, 2004.
6. M. L. Gillenson, Fundamentals of Database Management Systems, WileyStudent Edition, 2011.

WEB LINKS:

1. https://nptel.ac.in/courses/106105175
2. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs91/preview
4. https://www.visualpathedu.com/home/course/oracle-database-development/113
5. https://www.mygreatlearning.com/database-management-system/free-courses
6. https://www.coursera.org/learn/database-management
7. https://www.coursera.org/learn/sql-practical-introduction-for-querying-databases

OPERATING SYSTEMS

B.Tech. IV Semester **L T P C**
3 0 0 3

Subject Code: 22DS403PC

Prerequisites:

1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

Course Objectives:

1. Introduce the OS concepts, their services and process concepts.
2. Describe the CPU scheduling algorithms and deadlocks.
3. Understand the process communication and management systems.
4. Design the memorymanagement systems.
5. Understand the file system and its operations

Course Outcomes: After completion of this course, the students will be able to:

1. Demonstrate the basic concepts of Operating Systems.
2. Implement various process scheduling algorithms and deadlock techniques.
3. Examine various and process management concepts.
4. Applymemorymanagement strategies and page replacement algorithms.
5. Analyze file management and disk management aspects of operating systems.

UNIT – I **[10 Lectures]**

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT – II **[10 Lectures]**

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recoveryfrom Deadlock

UNIT – III **[8 Lectures]**

Process Management and Synchronization - The Critical Section Problem, SynchronizationHardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors **Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT – IV **[6 Lectures]**

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

UNIT – V **[6 Lectures]**

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

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Principles, 7th Edition, John Wiley, 2006.
2. W. R. Stevens, Advanced programming in the UNIX environment, Pearson education, 1992.

REFERENCE BOOKS:

1. O Stallings, Operating Systems – Internals and Design Principles, Fifth Edition, Pearson Education/PHI, 2005.
2. Crowley, Operating System A Design-oriented Approach, TMH, 1996.
3. Andrew S. Tanenbaum, Modern Operating Systems, 2nd edition, Pearson/PHI, 1992.
4. Kernighan and Pike, UNIX programming environment, PHI/Pearson Education, 1983.
5. U. Vahalia, UNIX Internals -The New Frontiers, Pearson Education, 1995.

WEB LINKS:

1. https://nptel.ac.in/courses/106105214
2. https://onlinecourses.nptel.ac.in/noc21_cs88/preview
3. https://www.coursera.org/specializations/codio-introduction-operating-systems
4. https://www.coursera.org/learn/os-power-user
5. https://www.codecademy.com/learn/fundamentals-of-operating-systems
6. https://www.nesoacademy.org/cs/03-operating-system

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. IV Semester **L T P C**
3 0 0 3

Subject Code: 22MB404HS

Prerequisites: None

Course Objective:

1. Understand the basic Business types, the impact of the Economy Businesses and Firms specifically.
2. Learn the market demand and supply.
3. Analyze the Business from the Financial Perspective.
4. Preparing account statements and balance sheets.
5. Analyze the fund flow and cash flows.

Course Outcome: After completion of this course, the students will be able to:

1. Understand the various Forms of Business and the impact of economic variables on the Business.
2. Comprehend the demand and supplyanalysis.
3. Explore the usage of marketing and pricing of a product.
4. Maintainingthe financial accounts of a firm or company.
5. Monitoring the accounts through ratios.

UNIT – I: Introduction to Business and Economics **[10 Lectures]**

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II: Demand and Supply Analysis **[10 Lectures]**

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT - III: Production, Cost, Market Structures & Pricing **[10 Lectures]**

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting: [6 Lectures]

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts(Simple Problems).

UNIT - V: Financial Ratios Analysis: [6 Lectures]

Concept of Ratio Analysis, Importance and Types of Ratios, LiquidityRatios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

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

REFERENCE BOOKS:

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

SOFTWARE ENGINEERING

B.Tech. IV Semester **L T P C**
3 0 0 3

Subject Code: 22DS405PC
Prerequisites: Familiarity with at least one computer programming language.

Course Objectives:
1. Understanding the end-user requirements.
2. Build system models based on the requirements.
3. Design architectural process.
4. Strategic approach for testing methodologies.
5. Understanding software qualitymanagement.

Course Outcomes: After completion of this course, the students will be able to:
1. Make use of the software development life cycle principles and process models.
2. Construct the software requirements specifications with relevant use-cases.
3. Analyze the project management strategies and various components to build the architecture using suitable design strategies.
4. Estimate the best coding standards and testing strategies to develop high qualitysoftware products.
5. Design metrics for process and products with the help of risk and qualitymanagement.

UNIT – I **[10 Lectures]**
Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

UNIT – II **[8 Lectures]**
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

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

UNIT – III **[6 Lectures]**
Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT – IV **[6 Lectures]**
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT – V **[8 Lectures]**
Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.

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

TEXT BOOKS:

1. Roger S. Pressman, Software Engineering, A practitioner's Approach, 6th edition, Mc Graw Hill International Edition, 2015.
2. Sommerville, Software Engineering, 7th edition, Pearson Education, 2004.
3. Grady Booch, James Rambaugh, Ivar Jacobson, The unified modeling language user guide, Pearson Education, 1999.

REFERENCE BOOKS:

1. James F. Peters, Witold Pedrycz, Software Engineering: an Engineering approach, John Wiley, 2000.
2. Waman S Jawadekar, Software Engineering principles and practice, The Mc Graw-Hill Companies, 2004.
3. Meiler page-Jones, Fundamentals of object-oriented design using UML, Pearson Education, 2000.

WEB LINKS:

1. https://nptel.ac.in/courses/106105182
2. https://www.coursera.org/learn/introduction-to-software-engineering
3. https://www.coursera.org/specializations/software-engineering
4. https://www.edx.org/course/software-engineering-introduction

DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. IV Semester **L T P C**
0 0 2 1

Subject Code: 22DS406PC

Prerequisites:

1. Familiaritywith data structures, elementaryset theory, relations and functions.
2. Students should install MySql.

Co-requisites: Course on "Database Management Systems".

Course Objectives:

1 To Introduce ER data model, database design and normalization.
2 To Learn SQL basics for data definition and data manipulation.
3 To introduce various procedures in SQL.
4 To practice different triggers in SQL.
5 To introduce cursors in SQL.

Course Outcomes: After completion of this course, the students will be able to:

1. Demonstrate the database design using ER Diagrams.
2. Develop SQL Queries to manipulate the data in the database.
3. ApplyProcedural Language constructs to execute a block of SQL statements.
4. Design various triggers for different data using SQL.
5. Implement cursors using SQL.

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
7. B. Nested, Correlated subqueries
8. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
9. Triggers (Creation of insert trigger, delete trigger, update trigger)
10. Procedures
11. Usage of Cursors

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata Mc GrawHill 3rd Edition, 2002.
2. Silberschatz, Korth, Database System Concepts, McGrawhill, V edition, 1980.

REFERENCE BOOKS:

1. Peter Rob & Carlos Corone, Database Systems design, Implementation, and Management, l7th Edition, 1993.
2. Elmasri Navrate, Fundamentals of Database Systems, Pearson Education, 2011.
3. C.J. Date, An Introduction to Database Systems, Pearson Education, 2004.
4. S. Shah and V. Shah, Oracle for Professionals, The XTeam, SPD, 2008.
5. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI, 2004.
6. M. L. Gillenson, Fundamentals of Database Management Systems, Wiley Student Edition, 2011.

WEB LINKS:

1. https://nptel.ac.in/courses/106105175
2. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs91/preview
4. https://www.visualpathedu.com/home/course/oracle-database-development/113
5. https://www.mygreatlearning.com/database-management-system/free-courses
6. https://www.coursera.org/learn/database-management
7. https://www.coursera.org/learn/sql-practical-introduction-for-querying-databases

OPERATING SYSTEMS LAB

B.Tech. IV Semester **L T P C**
0 0 2 1

Subject Code: 22DS407PC

Prerequisites:

1. A course on "Programming for Problem Solving".
2. A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:

1. To understand design aspects of operating system concepts through simulation.
2. To Introduce basic Unix commands, system call interface for process management.

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

1. Examine different operating system concepts.
2. Develop C programs using Unix system call.
3. Illustrate the following IPC mechanisms
4. Simulate Page Replacement Algorithms.
5. Demonstrate Deadlock management.

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) RoundRobin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close,fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores usingUNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b)Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne , John Wiley,Operating System Principles- 7th Edition,
2. W.R.Stevens ,Advanced programming in the Unix environment, Pearson education 3rd Edition 2013.

REFERENCE BOOKS:

1. William Stallings, Operating Systems – Internals and Design Principles, Pearson Education/PHI, Fifth Edition–2005.
2. Crowley, Operating System - A Design Approach, TMH. 1996
3. Andrew S Tanenbaum, Modern Operating Systems, Pearson/PHI, 2nd edition.
4. Kernighan and Pike, UNIX Programming Environment, PHI/Pearson Education 2016
5. U. Vahalia, UNIX Operating System: The New Frontiers, Pearson Education 2006

WEB LINK:

1. https://nptel.ac.in/courses/106108101
2. https://www.nptel.ac.in/courses/106/105/106105214

NODE JS/ REACT JS/ DJANGO

B.Tech. IV Semester **L T P C**
0 0 2 1

Subject Code: 22DS408PC
Prerequisites: Object Oriented Programming through Java, HTML Basics

Course Objectives:

1. To implement the static web pages using HTML and do client-side validation using JavaScript.
2. To design and work with databases using Java
3. To develop an end-to-end application using java full stack.
4. To introduce Node JS implementation for server-side programming.
5. To experiment with single page application development using React.

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

1. Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC
3. Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 andexperiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand-alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed inexperiment 1 and the database created in experiment 5.
8. Maintaining the transactional historyof anyuser is veryimportant. Explore the various sessiontracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS,path, event.
10. Develop an express web application that can interact with REST API to perform CRUDoperations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation usingchart.js
14. Create a TODO application in react with necessary components and deploy it into github.

REFERENCE BOOKS:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2ndEdition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node, 2nd Edition, A Press.

CONSTITUTION OF INDIA

B.Tech. IV Semester **L T P C**
3 0 0 0

Subject Code: 22EN410MC

Prerequisites: None

Course Objectives:

1. Introduction of constitution and it's evolution.
2. To know the fundamentals of Constitution
3. To analyse the fundamental rights and duties of Indian constitution
4. To know the governance of government and administration
5. To appraise the role organs of government.

Course Outcomes: After Completion of this course, the students will be able to:

1. Outline the evolution of Constitution.
2. Relate constitutional fundamentals with the present Era.
3. Analyse Liberalism Federalism and Socialism.
4. Infer the knowledge of Administration and Governance.
5. Appraiseand addressthe roleof governments.

UNIT-1 **[5 Lectures]**

Historyof Making of the Indian Constitution-Historyof Drafting Committee.

UNIT- 2 **[5 Lectures]**

Philosophyof the Indian Constitution-Preamble Salient Features

UNIT- 3 **[3 Lectures]**

Contours of Constitutional Rights&Duties-FundamentalRights

- Rightto Equality
- RighttoFreedom
- Rightagainst Exploitation
- RighttoFreedomofReligion
- CulturalandEducationalRights
- RighttoConstitutionalRemedies
- DirectivePrinciplesofStatePolicy
- FundamentalDuties

.

UNIT-4 **[6 Lectures]**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powersand Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications , Powers and Functions

UNIT -5 **[6 Lectures]**

Local Administration: District's Administration head: Role and Importance, Municipalities:Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position androle. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grassroot democracy, Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:

1. Dr. M.V. Pylee India's Constitution, 16th Edition, S. Chand 2016.
2. Dr. S. N.Busi, Dr.B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P.Jain, Indian Constitutional Law, 7thEdn., Lexis Nexis, 2018.
4. D.D. Basu, Introduction to the Constitution of India, 23rd Edn Lexis Nexis,2018.

Web Links:

1. https://youtu.be/4tI4QXhzqNU
2. https://youtu.be/TXhSrKJ1ahk
3. https://www.youtube.com/live/0FAdfh6NVtA?feature=share
4. https://youtu.be/vq2Q1_v6TNU

INTRODUCTION TO DATA SCIENCE

B. Tech. V Semester

L	T	P	C
3	1	0	4

Subject Code: 22DS501PC

Prerequisites:
1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Data Structures."

Course Objectives:
1. To Learn concepts, techniques and tools deal with various facets of data science practice, including data collection and integration
2. To understand the basic types of data and basic statistics
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists
4. To learn about iterative programming in R
5. To identify the importance of data visualization techniques

Course Outcomes: After the completion of the course the student will able to:
1. Discuss a flow process for data science problems.
2. Identify types of data and basic Statistical Description.
3. Create vectors, matrices and list using R
4. Develop R codes using iterative programming
5. Correlate results to the solution approach

UNIT - I **[10 Lectures]**

Introduction: Definition of Data Science, Big Data and Data Science hype, Datafication, Current Landscape of Perspectives, Statistical Inference, Populations and Samples, Statistical Modeling, Probability Distributions, Fitting a Model, Over Fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II **[10 Lectures]**

Types of Data: Attribute, Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attributes, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete vs. Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency, Mean, Median, and Mode, Measuring the Dispersion of Data, Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III **[9 Lectures]**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Sub Setting.

Matrices: Creating and Naming Matrices, Matrix Sub Setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors, Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Sub Setting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List, Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

UNIT- IV **[9 Lectures]**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT- V **[9 Lectures]**

Plotting and Visualization: A Brief Matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in Pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Regression: Linear Regression Analysis, Multiple Linear Regression.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch,Pearson Eduation.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/introduction-to-data-science/
2. https://onlinecourses.nptel.ac.in/noc24_cs54/preview

BIG DATA ANALYTICS

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS502PC

Pre-requisites: A Course on "Data Analytics".

Course Objectives:

1. To provide the knowledge of principles and techniques for Big data Analytics.
2. To know Hadoop environment and the concepts of HDFS.
3. To learn the concepts of MapReduce programming and NoSQL.
4. To understand the fundamental concepts of MongoDB.
5. To explore the concepts of Pig, Hive, Spark and HBase.

Course Outcomes: After completion of this course, the students will be able to:

1. Learn the importance of big data analytics and its types
2. Perform analytics on big data
3. Proficiency in big data storage and processing in Hadoop
4. Data analytics through MongoDB
5. Explore various frameworks of Big Data.

UNIT – I **[10 Lectures]**

Types of Digital Data: Classification of Digital Data,
Introduction to Big Data: Evolution of Big Data, Definition of Big Data, Traditional Business Intelligence vs Big Data, Coexistence of Big Data and Data Warehouse.
Big Data Analytics: Introduction to Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Big Data Analytics Importance, Data Science, Terminologies used in Big Data Environments.

UNIT – II **[10 Lectures]**

Hadoop: Features of Hadoop, Key Advantages of Hadoop, Versions of Hadoop, Overview of Hadoop Ecosystem, Hadoop Distributions. Need of Hadoop, Hadoop vs. SQL, Integrated Hadoop Systems Offered by Leading Market Vendors, Cloud-Based Hadoop Solutions, RDBMS vs. Hadoop, Distribution Computing Challenges, Hadoop Overview.
HDFS: HDFS Daemons, Anatomy of File Read, Anatomy of File Write, Replica Placement Strategy, Working with HDFS Commands, Special Features of HDFS.

UNIT – III **[8 Lectures]**

Processing Data with Hadoop, Introduction to MapReduce Programming, MapReduce Example, Mapper, Reducer, Combiner, Partitioner.
NoSQL: Types of NoSQL Databases, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs. NoSQL, NewSQL, Comparison of SQL, NoSQL and NewSQL.

UNIT – IV **[8 Lectures]**

Introduction to MongoDB, Necessity of MongoDB, Terms used in MongoDB and RDBMS, Datatypes in MongoDB, MongoDB Query Language. Introduction to Cassandra, Features of Cassandra, CQL Datatypes, CQLSH, Key Spaces, CRUD Operations, Collections, TTL, Alter Commands, Import and Export, Querying System Tables.

UNIT – V **[8 Lectures]**

Hive: Installing Hive, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data.
Spark: Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run.
HBase: HBasics, Installation, Clients, Building an Online Query Application.

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

REFERENCE BOOKS:

1. Chandramouli Subramanian, Asha A Geroge, C R Rene Robin, big data analytics, University press.
2. Tom White, "Hadoop: The Definitive Guide"Fourth Edition, O'reilly Media, 2015.
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

WEB LINKS:

1. https://www.scribd.com/document/631590350/Big-Data-Analytics-by-Seema-Acharya-pdf
2. https://www.periyaruniversity.ac.in/Documents/2021/syllabus/2021/Affiliated/ug1/bscds.pdf

COMPUTER NETWORKS

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS503PC

Prerequisites:
1. A course on "Programming for problem solving"
2. A course on "Data Structures"

Course Objectives:
1. To learn about the functionalities of layered models.
2. To gain knowledge about sliding window protocols and medium access sub layer.
3. To design a routing algorithm in a network.
4. To know the services of the transport layer.
5. To explore the knowledge of computer network applications.

Course Outcomes: After completion of this course, the students will be able to:
1. Enumerate the basic concepts of reference models.
2. Apply sliding window protocols and multiple access protocols.
3. Design the routing algorithms, congestion control techniques.
4. Analyze TCP and UDP protocols and services of the Transport Layer.
5. Implement different protocols at the application layer.

UNIT– I **[9 Lectures]**

Network Hardware, Network Software, OSI, TCP/IP Reference Models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission Media: Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission.

Data Link Layer: Design Issues, Framing, Error Detection and Correction.

UNIT– II **[10 Lectures]**

Elementary Data Link Protocols: Simplex Protocol, A Simplex Stop and Wait Protocol for An Error- Free Channel, A Simplex Stop and Wait Protocol for Noisy Channel.

Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back- N, A Protocol Using Selective Repeat, Example Data Link Protocols.

Medium Access Sub Layer: Channel Allocation Problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols. Wireless LANs, Data Link Layer Switching.

UNIT– III **[10 Lectures]**

Network Layer: Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Hierarchical Routing, Broadcast, Multicast, Distance Vector Routing, Link State Routing, Congestion Control Algorithms, Quality of Service, Internetworking, Network Layer in the Internet.

UNIT– IV **[8 Lectures]**

Transport Layer: Transport Services; Elements of Transport Protocols: Addressing, Connection Management, Error Control and Flow Control, Multiplexing; The Internet Transport Protocol: UDP, TCP, Performance Issues: Problems, Measurements, Host Design.

UNIT– V **[9 Lectures]**

Application Layer: Domain Name System-DNS Name Space, Domain Resource Records, Name Servers; Electronic Mail-Architecture, User Agent, Message Formats, Message Transfer; SNMP; The World Wide Web- Architecture, HTTP; Streaming audio and video – Digital audio, Digital video, Streaming Stored Media, Streaming Live Media, Real-Time Conference.

TEXT BOOKS:
1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5thEdition, Pearson Education/ PHI, 2011.
2. Behrouz A. Forouzan -Data Communications and Networking, 4th Edition, Tata McGraw Hill, 2006.

REFERENCEBOOKS:

1. S.Keshav,An Engineering Approach to Computer Networks, Addison Wesley, 1st edition, 2010.
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2010.
3. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw-Hill, 2004.

WEB LINKS:

1. https://nptel.ac.in/courses/106105183
2. https://www.coursera.org/learn/illinois-tech-computer-networking
3. https://www.udemy.com/course/computer-networks-fundamentals/
4. https://www.classcentral.com/course/youtube-computer-networks-complete-playlist-46807
5. https://www.geeksforgeeks.org/computer-network-tutorials/
6. https://freecomputerbooks.com/networkComputerBooks.html
7. https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-computer-networking
8. https://www.nesoacademy.org/ec/03-computer-networks

DATA WAREHOUSING AND BUSINESS INTELLIGENCE

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS511PE

Pre-Requisites:
1. A Course on "Database Management Systems".

Course Objectives:
1. To learn about fundamentals of data warehouse and perform OLAP operations.
2. To know the fundamental concepts of Business Intelligence.
3. To compare Business Intelligence Key Performance indicators.
4. To gain knowledge of using Advanced Business Intelligence Tools.
5. To learn about integrating Business Intelligence systems.

Course Outcomes: After the completion of the course the student can able to
1. Design a data warehouse and perform OLAP operations.
2. Enumerate the fundamental concepts of Business Intelligence.
3. Compare Business Intelligence Key Performance indicators.
4. Make use of Advanced Business Intelligence Tools.
5. Develop Integrated Business Intelligence systems.

UNIT – I **[12 Lectures]**

Data Warehousing: Definition, A Multi-Tier Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse, Extraction, Transformation and Loading, OLAP Operations.

Data Cube: A Multidimensional Data Model, Star, Snowflake and Fact Constellation: Schemas for Multidimensional Data Models, Data Cube Computation Methods, Measures of Similarity and Dissimilarity.

UNIT – II **[10 Lectures]**

Business Intelligence Introduction: Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle, Data for BI - Data Issues and Data Quality for BI.

UNIT – III **[10 Lectures]**

BI Implementation: Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-Vent-Driven Alerts, A Cyclic Process of Intelligence Creation. The Value of Business Intelligence-Value Driven and Information Use.

UNIT – IV **[9 Lectures]**

Advanced BI: Big Data and BI, Social Networks, Mobile BI, Emerging Trends, Description of Different BI-Tools, Types of BI Tools, Choose Appropriate BI Tool, Pentaho Reporting Tool, Features Of Pentaho, User Interfaces Available in Pentaho, Introduction to KNIME Tool, Features of KNIME.

UNIT – V **[9 Lectures]**

Business Intelligence and Integration Implementation: Connecting in BI Systems to Databases and Enterprise Systems, On-Demand BI, Benefits of On-Demand BI, Issues of Legality, Privacy and Ethics, Social Networking and BI, Types Of Integration, Functional Integration, Physical Integration, Need of Integration.

TEXT BOOKS:

1. JIAWEI HAN & MICHELINE KAMBER, Elsevier Data Mining – Concepts and Techniques Elsevier 4th Edition.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/difference-between-business-intelligence-and-data-warehouse/
2. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

ARTIFICIAL INTELLIGENCE (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS512PE

Pre-requisites:
1. A course on "Data Structures, Probability".

Course Objectives:
1. To learn the distinction between optimal reasoning vs. human like reasoning.
2. To know the concepts of state space representation, exhaustive search, heuristic search.
3. To search together with the time and space complexities.
4. To learn different knowledge representation techniques.
5. To know the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes: After completion of this course, the students will be able to:
1. Formulate an efficient problem space for a problem expressed in natural language.
2. Define search algorithm for a problem solving and estimate the performance analysis.
3. Apply knowledge using the appropriate technique for a given problem.
4. Build AI techniques to solve problems of game playing and machine learning.
5. Formulate uncertain problem-solving using probability.

UNIT – I **[10 Lectures]**

Introduction To AI, Intelligent Agents, Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-First Search, Uniform Cost Search, Depth-First Search, Iterative Deepening Depth-First Search, Bidirectional Search, Informed (Heuristic) Search Strategies: Greedy Best-First Search, A* Search, Heuristic Functions, Beyond Classical Search: Hill-Climbing Search, Simulated Annealing Search, Local Search in Continuous Spaces

UNIT – II **[10 Lectures]**

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPS, Local Search for CSPS, Structure of Problems.

Propositional Logic: Knowledge-Based Agents, Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and Proofs, Proof by Resolution, Horn Clauses and Definite Clauses, Forward and Backward Chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT – III **[8 Lectures]**

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT – IV **[8 Lectures]**

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

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, Other Classical Planning Approaches, Analysis of Planning Approaches.

UNIT – V **[10 Lectures]**

Uncertain Knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Bayes' Rule and Uses

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning, Dempster-Shafer Theory.

TEXT BOOK:

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

REFERENCE BOOKS:

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

WEBLINKS:

1. https://www.geeksforgeeks.org/difference-between-business-intelligence-and-data-warehouse/
2. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

WEB PROGRAMMING (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS513PE

Prerequisites:
1. A Course on "Object Oriented Programming through Java".

Course Objectives:
1. To learn the concepts of HTML, XML for creating web pages.
2. To learn about client-side scripting using JavaScript
3. To design webpages using AngularJS and ReactJS
4. To introduce server-side programming with servlets
5. To learn about server-side programming using JSP

Course Outcomes: After the completion of this course the student will able to:
1. Design web pages using HTML & XML.
2. Apply client-side scripting using JavaScript.
3. Design webpages using AngularJS and ReactJS.
4. Build server-side applications using servlets.
5. Apply server-side programming using JSP.

UNIT - I **[10 Lectures]**

Introduction to HTML: HTML Basic Tags- List, Tables, Images, Forms, Frames; Cascading Style Sheets; Reading Data from Web Form Controls Like Text Boxes, Radio Buttons and etc., Webpage Designing using HTML, CCS3, HTML5, HTML Canvas.

Introduction to XML: Defining XML Tags, Attributes and Values, Differences between HTML and XML, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data, DOM and SAX Parsers in Java.

UNIT - II **[8 Lectures]**

Client-Side Scripting: Introduction to JavaScript, JavaScript Language: Declaring Variables, Scope of Variables, Operators and Expressions, Functions. Event Handlers, Document Object Model, Form Validation.

UNIT - III **[8 Lectures]**

AngularJS: Angular MVC, AngularJS Expressions, Controllers, Tables, DOM, Forms, Validation, AJAX, AngularJS Animation.

ReactJS: Introduction, Features of React, React Installation, ReactJS Vs AngularJS, ReactJS and VueJS, React Forms, React Events, React Lists, React Tables, React CSS, React Animation.

UNIT - IV **[9 Lectures]**

Introduction to Servlets: Common Gateway Interface (CGI), Life Cycle of a Servlet, Deploying a Servlet, The Servlet API, Reading Servlet Parameters, Reading Initialization Parameters, Handling HTTP Request and Responses, Using Cookies and Sessions.

UNIT V **[8 Lectures]**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, Implicit Objects, Using Beans in JSP Pages, Using Cookies and Session for Session Tracking, Connecting to Database in JSP.

TEXT BOOKS:
1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How to Program 5th Edition.
2. Uttam K Roy, "Web Programming", Oxford University Press, 2nd Edition, 2010.

REFERENCE BOOKS:

1. John Pollock, JavaScript - A Beginners Guide, 3rd Edition –- Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.
3. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.

WEB LINKS:

1. https://www.geeksforgeeks.org/internet-and-web-programming/
2. https://www.visualpathedu.com/home/course/ui-development/9
3. https://www.visualpathedu.com/home/course/javascript-training/10
4. https://www.visualpathedu.com/home/course/ui-ux-design-training/199
5. https://www.coursera.org/learn/django-database-web-apps
6. https://extension.harvard.edu/academics/programs/web-technologies-certificate/#outcomes
7. https://www.coursera.org/learn/html-css-javascript-for-web-developers
8. https://www.coursera.org/specializations/web-design
9. https://www.coursera.org/learn/web-development
10. https://www.udemy.com/course/web-developer-course-on-creating-a-business-website

IMAGE PROCESSING (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS514PE

Prerequisites:
1. A course on "Mathematical and Statistical Foundations".

Course Objectives:
1. To learn the concepts of Digital Image Fundamentals.
2. To explore image enhancement techniques.
3. To know the image restoration and segmentation models.
4. To analyze image compression techniques.
5. To learn about pattern recognition in images

Course Outcomes: After completion of this course, the students will be able to:
1. Explore the basic concepts of Image processing fundamentals.
2. Articulate image enhancement techniques.
3. Apply image restoration and segmentation models.
4. Examine image compression Techniques
5. Analyze patterns recognized in images

UNIT – I **[10 Lectures]**

Digital Image Fundamentals: Light and Electromagnetic Spectrum, Components of Image Processing System, Image Formation and Digitization Concepts, Neighbors of Pixel Adjacency Connectivity, Regions and Boundaries, Distance Measures, Applications.

UNIT– II **[8 Lectures]**

Image Enhancements: Spatial Domain, Basic Gray Level Transformations, Histogram Processing, Using Arithmetic/Logic Operations, Smoothing Spatial Filters, Sharpening Spatial Filters.
Frequency Domain: Introduction to Fourier Transform, Frequency Domain Concepts, Smoothing Frequency, Domain Filters, Sharpening Frequency Domain Filters.

UNIT – III **[8 Lectures]**

Image Restoration: Noise Models, Mean Filters, Order Statistics, Adaptive Filters, Band Reject Filters, Band Pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener Filtering.
Segmentation: Edge Detection, Edge Linking and Boundary Detection, Region Based Segmentation, Morphological Processing, Erosion and Dilation.

UNIT – IV **[8 Lectures]**

Compression: Image Compression Redundancies, Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.
Representation and Descriptions: Introduction to Some Descriptors, Chain Codes, Signatures, Shape Numbers, Fourier Descriptors.

UNIT – V **[10 Lectures]**

Recognition: Patterns, Pattern Classes, Decision-Theoretic Methods, Introduction to Neural Networks, Neural Network Based Image Recognition.
Pattern Recognition: Overview of Pattern Recognition with Block Diagram.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.

3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

WEB LINKS:

1. https://archive.nptel.ac.in/courses/117/105/117105135/
2. https://www.coursera.org/specializations/image-processing
3. https://www.coursera.org/courses?query=image%20processing
4. https://www.udemy.com/topic/image-processing/
5. https://www.classcentral.com/course/computervision-imageprocessing-13567
6. https://www.v7labs.com/blog/image-processing-guide

COMPUTER GRAPHICS (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS515PE

Prerequisites:
1. A course on "Programming for Problem Solving".
2. A course on "Data Structures".

Course Objectives:
1. To study the Fundamental concepts of computer graphics.
2. To explore the knowledge of 2D geometrical transformations.
3. To learn about 3D Object representation.
4. To explore the concept of 3D geometrical transformations.
5. To gain knowledge of computer animation.

Course Outcomes: After the completion of the course the students will be able to:
1. Enumerate the applications of computer graphics.
2. Design 2D geometric transformations and 2D viewing functions.
3. Construct 3D object representation using surfaces
4. Apply the geometric projections for 3D objects.
5. Analyze animation sequence and visible surface detection methods.

UNIT – I **[10 Lectures]**

Introduction: Application Areas of Computer Graphics, Overview of Graphics Systems, Video-Display Devices, Raster-Scan Systems, Random-Scan Systems, Graphic Monitors, Work Stations and Input Devices.
Output Primitives: Points and Lines, Line Drawing Algorithms, DDA and Bresenham's Algorithms, Circle Generating Algorithms, Ellipse Generating Algorithms.
Polygon Filling: Scan Line Algorithm, Boundary-Fill and Flood-Fill Algorithms.

UNIT – II **[9 Lectures]**

2-D Geometric Transformations: Translation, Scaling, Rotation, Reflection and Shear Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transforms, Transformations Between Coordinate Systems
2-D Viewing: Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Clipping Operations, Point Clipping, Line Clipping: Cohen Sutherland Algorithms, Polygon Clipping: Sutherland Hodgeman Polygon Clipping Algorithms.

UNIT – III **[9 Lectures]**

3-D Object Representation: Polygon Surfaces, Quadric Surfaces, Spline Representation, Hermite Curve, Bezier Curve and B-Spline Curves, Bezier and B-Spline Surfaces, Polygon Rendering Methods, Color Models and Color Applications.

UNIT – IV **[8 Lectures]**

3-D Geometric Transformations: Translation, Rotation, Scaling, Reflection, Shear Transformations, Composite Transformations.
3-D Viewing: Viewing Pipeline, Viewing Coordinates, Projections, View Volume and General Projection Transforms and Clipping.

UNIT – V **[8 Lectures]**

Computer Animation: Design of Animation Sequence, General Computer Animation Functions, Raster Animations, Computer Animation Languages, Key Frame Systems, Motion Specifications.
Visible Surface Detection Methods: Classification, Back-Face Detection, Depth-Buffer Method, BSP- Tree Method, Area Sub-Division Method and Octree Method.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEBLINKS:

1. https://www.javatpoint.com/computer-graphics-tutorial
2. https://onlinecourses.nptel.ac.in/noc20_cs90/preview

SPATIAL AND MULTIMEDIA DATABASES (Professional Elective - II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS521PE

Course Objective:

1. To know the introduction to spatial databases and data models.
2. To learn about the indexing structures for spatial and multimedia data.
3. To understand the basic concepts of image databases.
4. To gain knowledge of audio, video, and multimedia databases.
5. To learn about the creation and presentation of distributed multimedia servers.

Course Outcomes: After completion of this course, the students will be able to:

1. Explore the basic concepts of spatial databases and data models.
2. Apply indexing structures for spatial and multimedia data.
3. Represent image database with R-tree.
4. Design multimedia databases.
5. Store and retrieve multimedia data.

UNIT – I **[10 Lectures]**

Introduction to Spatial Databases: Overview, Beneficiaries, GIA and SDBMS, Users, Space Taxonomy, Query Language, Query Processing, Query Optimization.

Spatial Concepts and Data Models: Models of Spatial Information, Three Step Database Design, Extending the ER Model with Spatial Concept, Object-Oriented Data Modeling, Spatial Query Languages.

UNIT – II **[8 Lectures]**

Spatial Storage and Indexing: Storage-Disks and Files, Spatial Indexing, TR*, Spatial Join Index. Query Processing and Optimization, Evaluation of Spatial Operations, Query Optimization, Analysis of Spatial Index Structures, Distributed and Parallel Spatial Database System.

Multidimensional Data Structures: K-D Trees, Point Quadtrees, MX-Quadtree, R-Trees, Comparison of Different Data Structures.

UNIT – III **[10 Lectures]**

Image Databases: Raw Images, Compressed Image Representations,

Image Processing: Segmentation, Similarity-Based Retrieval, Alternative Image DB Paradigms, Representing Image DBs with Relations, Representing Image DBs with R-Trees, Retrieving Images by Spatial Layout, Implementations.

Text/Document Databases: Precision and Recall, Stop Lists, Word Stems, Frequency Tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques.

UNIT – IV **[10 Lectures]**

Video Databases: Organizing Content of a Single Video, Querying Content of Video Libraries, Video Segmentation, Video Standards.

Audio Databases: A General Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data.

Multimedia Databases: Design and Architecture of a Multimedia Database, Organizing Multimedia Data Based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/Expansion.

UNIT – V **[8 Lectures]**

Creating Distributed Multimedia Presentations: Objects in Multimedia Presentations, Specifying Multimedia Documents with Temporal Constraints, Efficient Solution of Temporal Presentation Constraints, Spatial Constraints.

Distributed Media Servers: Distributed Multimedia Server Architecture, Distributed Retrieval Plans, Optimal Distributed Retrieval Plans.

TEXT BOOKS:

1. Shashi Shekhar, Sanjiv Chawla, Spatial Databases-A Tour, Pearson Education.
2. V.S. Subrahmanian, Principles of Multimedia Database Systems, Morgan Kauffman.

REFERENCE BOOK:

1. Multimedia Databases: An object relational approach, Lynne Dunckley, Pearson Education.
2. Multimedia Database Systems, Prabhakaran, Springer.

INFORMATION RETRIEVAL SYSTEMS (Professional Elective - II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS522PE

Prerequisites:
1. A course on "Data Structures".
2. A course on "Data Base Management Systems".

Course Objectives:
1. To learn the basic concepts of Information Retrieval Systems
2. To know about cataloging, indexing and Data Structures
3. To design document and term clustering algorithms.
4. To explore user search techniques and information visualization.
5. To learn about text search algorithms and multimedia information retrieval.

Course Outcomes: After the completion of this course, the students will be able to:
1. Apply Information Retrieval principles to locate relevant information from large collection of data.
2. Develop data models using statistical approaches.
3. Implement different document and term clustering algorithms.
4. Design an Information Retrieval System for web search tasks.
5. Apply visualization tools for multimedia information retrieval.

UNIT – I **[10 Lectures]**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

UNIT – II **[9 Lectures]**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction to Data Structures, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT – III **[10 Lectures]**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT – IV **[9 Lectures]**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT – V **[9 Lectures]**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.

WEBLINKS:

1. https://www.geeksforgeeks.org/what-is-information-retrieval/
2. https://onlinecourses.nptel.ac.in/noc24_ee47/preview

SOFTWARE PROJECT MANAGEMENT (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS523PE

Prerequisites: A course on "Software Engineering".

Course Objectives:

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development
3. To explore model-based software architectures.
4. To understand software economics, workflows and frameworks.
5. To learn about project control and process instrumentation.

Course Outcomes: After completion of this course, the students will be able to:

1. Understand the software economics to improve various phases of development.
2. Examine the life cycle phases, artifacts, workflows and checkpoints of a process.
3. Demonstrate the software project framework components.
4. Analyze the need for various software management disciplines.
5. Assess various software management metrics.

UNIT – I **[10 Lectures]**

Software Management Renaissance

Conventional Software Management: Waterfall Model, Conventional Software Management Performance. Evolution of 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.

UNIT – II **[9 Lectures]**

A Software Management Process Framework-I

The Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an Iterative Process; Life Cycle Phases: Engineering and Production Stages, Inception, Elaboration, Construction, Transition Phases; Artifacts of the Process: Artifact Sets, Management Artifacts, Engineering Artifacts, Programmatic Artifacts.

UNIT – III **[8 Lectures]**

A Software Management Process Framework-II

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 Milestones, Minor Milestones, Periodic Status Assessments.

UNIT – IV **[9 Lectures]**

Software Management Discipline-I

Iterative Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating, Iteration Planning Process, Pragmatic Planning; Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, Evolution of Organizations; Process Automation: Automation Building Blocks, Project Environment.

UNIT – V **[9 Lectures]**

Software Management Discipline-II

Project Control and Process Instrumentation: The Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations, Pragmatic Software Metrics, Metrics Automation; Tailoring the Process: Process Discriminates; Future Software Project Management: Modern Project Profiles, Next Generation Software Economics, Modern Process Transitions; Case Study: Command Center Processing and Display System-Replacement (CCPDS-R).

TEXT BOOK:

1. Software Project Management, Walker Royce, Addison-Wesley Pearson Education, 2005.

REFERENCE BOOKS:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education. 2005.

DEVOPS (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS523PE

Pre-Requisites:
1. A course on "Software Engineering".
2. A course on "Software Project Management"

Course Objectives:
1. To describe the agile relationship between development and IT operations.
2. To know the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. To explore project management tools.
4. To understand system integration.
5. To impart testing tools, automation, and deployment of the system.

Course Outcomes: After completion of this course, the students will be able to:
1. Explore various components of Devops environment.
2. Identify Software development models and architectures of DevOps.
3. Apply different project management models.
4. Investigate different DevOps Software development models, integration, Collaborate and adopt Devops in real-time projects.
5. Assess various Devops practices, testing and code deployment tools.

UNIT- I **[9 Lectures]**

Introduction to DevOps:

Introduction, Agile Development Model, DevOps and ITIL, DevOps Process and Continuous Delivery, Release Management, Scrum, Kanban, Delivery Pipeline, Identifying Bottlenecks.

UNIT- II **[9 Lectures]**

Software Development Models and DevOps:

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing; DevOps Influence on Architecture: Introducing Software Architecture, Monolithic Scenario, Architecture Rules of Thumb, Separation of Concerns, Handling Database Migrations, Micro Services and Data Tier, DevOps, Architecture, Resilience.

UNIT- III **[9 Lectures]**

Introduction to Project Management:

The Need for Source Code Control, The History of Source Code Management, Roles and Code, Source Code Management System and Migrations, Shared Authentication, Hosted Git Servers, Different Git Server Implementations, Docker Intermission, Gerrit, The Pull Request Model, GitLab.

UNIT- IV **[9 Lectures]**

Integrating the System:

Build Systems, Jenkins Build Server, Managing Build Dependencies, Jenkins Plugins, File System Layout, The Host Server, Build Slaves, Software on the Host, Triggers, Job Chaining and Build Pipelines, Build Servers and Infrastructure as Code, Building by Dependency Order, Build Phases, Alternative Build Servers, Collating Quality Measures.

UNIT- V **[10 Lectures]**

Testing Tools and Deployment:

Various Types of Testing, Automation of Testing Pros and Cons; Selenium: Introduction, Selenium Features, JavaScript Testing, Testing Backend Integration Points, Test-Driven Development, REPL-Driven Development; Deployment of the System: Deployment Systems, Virtualization Stacks, Code Execution at the Client, Puppet Master and Agents, Ansible; Deployment Tools: Chef, Salt Stack and Docker.

TEXT BOOK:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

REFERENCE BOOKS:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

WEB LINKS:

1. https://nptel.ac.in/courses/128106012
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/azure-devops-and-micro-services-azurekubernetes-deployment-models/
3. https://www.coursera.org/learn/intro-to-devops
4. https://www.udemy.com/course/devops-fundamentals-for-beginners/
5. https://dev.to/javinpaul/my-favorite-free-courses-to-learn-devops-in-2023-4h6m
6. https://www.udemy.com/topic/DevOps/?utm_source=adwords&utm_medium=udemyads&utm_campaign=Brand-Topic_la.EN_cc.INDIA&utm_content=deal4584&utm_term=
7. https://www.techtarget.com/whatis/feature/9-best-free-DevOps-certifications-and-training-courses

COMPUTER VISION AND ROBOTICS (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS524PE

Pre-Requisites:
1. A course on "Linear Algebra and Probability".

Course Objectives:
1. To know the Fundamental concepts related to sources, shadows and shading.
2. To learn about filters, edge detection and texture analysis.
3. To learn about segmentation by clustering.
4. To know about Geometric camera models and Geometric camera calibration.
5. To learn about common sensing techniques for reactive robots.

Course Outcomes: After the completion of this course the student can be able to:
1. Apply fundamental image processing techniques required for computer vision.
2. Examine Linear Filters, Edge Detection and Texture Analysis.
3. Apply segmentation by clustering.
4. Develop segmentation and Fitting using Probabilistic methods.
5. Enumerate common sensing techniques for reactive robots.

UNIT – I **[12 Lectures]**

CAMERAS: Pinhole Cameras
Radiometry Measuring Light: Light in Space, Light Surfaces, Important Special Cases Sources; Shadows and Shading: Qualitative Radiometry, Sources and Effects, Local Shading Models; Application: Photometric Stereo; Interreflections: Global Shading Models; Color: Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT – II **[10 Lectures]**

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.
Edge Detection: Noise, Estimating Derivatives, Detecting Edges.
Texture: Representing Texture, Analysis and Synthesis using Oriented Pyramids; Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT – III **[10 Lectures]**

Geometry of Multiple Views: Two Views.
Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras **Segmentation by Clustering**: Segmentation; Human Vision: Grouping and Getstalt; Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph Theoretic Clustering.

UNIT – IV **[9 Lectures]**

Segmentation by Fitting a Model: Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness.
Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and Perspective Projection, Affine Cameras and Affine Projection Equations.
Geometric Camera Calibration: Least Squares Parameter Estimation, Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry; Application: Mobile Robot Localization.

UNIT – V **[9 Lectures]**

Introduction to Robotics: Social Implications of Robotics, History of Robotics, Attributes of Hierarchical Paradigm, Closed World Assumption and Frame Problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential Fields and Perception.

Common Sensing Techniques for Reactive Robots: Logical Sensors, Behavioral Sensor Fusion, Proprioceptive Sensors, Proximity Sensors, Topological Planning and Metric Path Planning.

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

WEBLINKS:

1. https://www.javatpoint.com/computer-vision
2. https://onlinecourses.nptel.ac.in/noc24_ee38/preview

R PROGRAMMING LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS504PC

Pre-requisites: Any programming language.

Course Objectives:

1. Familiarize with R basic programming concepts, various data structures for handling datasets, various graph representations and Exploratory Data Analysis concepts

Course Outcomes:

1. Setup R programming environment.
2. Understand and use R – Data types and R – Data Structures.
3. Develop programming logic using R – Packages.
4. Analyze data sets using R – programming capabilities

LIST OF EXPERIMENTS:

1. Download and install R-Programming environment and install basic packages using install. packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write R command to
   i. Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
   ii. Enumerate multiplication and division operations between matrices and vectors in R console
4. Write R command to
   i. Illustrates the usage of Vector subsetting and Matrix subsetting
   ii. Write a program to create an array of 3×3 matrices with 3 rows and 3 columns.
5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file
6. Create a CSV file having Speed and Distance attributes with 1000 records. Write R program to draw i) Box plots
   i. Histogram
   ii. Line Graph
   iii. Multiple line graphs
   iv. Scatter plot

   to demonstrate the relation between the cars speed and the distance.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.
9. Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

REFERENCE BOOKS:

1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press

BIG DATA ANALYTICS LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS505PC

Course Objectives:

1. Provide knowledge of Big data Analytics principles and techniques.
2. Designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes: After completion of this course, the students will be able to:

1. Use Excel as an Analytical tool and visualization tool.
2. Ability to program using HADOOP and Map reduce
3. Ability to perform data analytics using ML in R.
4. Use MongoDB to perform data analytics.

List of Experiments:

1. Create a Hadoop cluster
2. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop).
3. Process big data in HBase
4. Store and retrieve data in Pig
5. Perform data analysis using MongoDB
6. Using Power Pivot (Excel) Perform the following on any dataset
    a. Big Data Analytics
    b. Big Data Charting

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

COMPUTER NETWORKS LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS506PC

Co-requisite: A Course on "Computer Networks".

Prerequisites:
1. A course on "Programming for problem solving."
2. A course on "Data Structures"

Course Objectives:
1. To understand the working principle of various communication protocols.
2. To analyze the traffic flow and the contents of protocol frames.
2. To interpret various routing algorithms.
3. To explore the concepts of data encryption and decryption.
4. To know congestion control and network and operating functionalities.

Course Outcomes: After completion of this course, the students will be able to:
1. Implement data link layer farming methods.
2. Analyze error detection and error correction codes.
3. Design and analyze routing and congestion issues in network design.
4. Develop Encoding and Decoding techniques used in presentation layer
5. Work with different network tools

List of Experiments
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRCCCIP
3. Develop a simple data link layer that performs flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. How to run N map scan.
11. Operating System Detection using N map.
12. Study of basic Network configuration commands and utilities to debug the network issues.

TEXT BOOK:
1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5th Edition, Pearson Education/PHI, 2011.
2. Behrouz A. Forouzan -Data Communications and Networking,4th Edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS:
1. S. Keshav, An Engineering Approach to Computer Networks, Addison Wesley, 1st edition, 2010.
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2010.
3. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw-Hill, 2004.

WEB LINKS:

1. https://www.bits-pilani.ac.in/computer-networks-network-programming-lab/
2. What Is a Computer Network? Definition, Objectives, Components, Types, and Best Practices - Spiceworks
3. What is Computer Networking? - Networking in Computers Explained - AWS (amazon.com)
4. What is Computer Networking? - GeeksforGeeks
5. Prof Soumya Kanti Ghosh & Prof Sandip Chakraborty (youtube.com)
6. Introduction to Computer Networks (youtube.com)

ETL-KAFKA/TALEND

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS507PC

Course Objectives:

1. Develop a comprehensive understanding of Extract, Transform, Load (ETL) processes using Apache Kafka and Talend.
2. Understand how to scale Kafka clusters seamlessly to handle growing data volumes, ensuring optimal performance for ETL operations.

Course Outcomes:

1. Learn to design and deploy fault-tolerant Kafka clusters, ensuring data integrity and availability in real-world scenarios.
2. Gain practical experience in cluster management, topic creation, and basic operations such as producing and consuming messages.

LIST OF EXPERIMENTS:

1. Install Apache Kafka on a single node.
2. Demonstrate setting up a single-node, single-broker Kafka cluster and show basic operations such as creating topics and producing/consuming messages.
3. Extend the cluster to multiple brokers on a single node.
4. Write a simple Java program to create a Kafka producer and Produce messages to a topic.
5. Implement sending messages both synchronously and asynchronously in the producer.
6. Develop a Java program to create a Kafka consumer and subscribe to a topic and consume messages.
7. Write a script to create a topic with specific partition and replication factor settings.
8. Simulate fault tolerance by shutting down one broker and observing the cluster behavior.
9. Implement operations such as listing topics, modifying configurations, and deleting topics.
10. Introduce Kafka Connect and demonstrate how to use connectors to integrate with external systems.
11. Implement a simple word count stream processing application using Kafka Stream
12. Implement Kafka integration with the Hadoop ecosystem.

TEXT BOOK:

1. Neha Narkhede, Gwen Shapira, Todd Palino, Kafka – The Definitive Guide: Real-time data and stream processing at scale, O′Reilly

INTELLECTUAL PROPERTY RIGHTS

B. Tech. V Semester

L	T	P	C
3	0	0	0

Subject Code: 22DS508MC

Course Objectives:

1. To explore intellectual property rights.
2. To outline the basics of trademarks.
3. To describe the copyrights and its laws.
4. To learn about the nature of trade secrets and unfair competition.
5. To define the new developments of intellectual property rights.

Course Outcomes: After completion of this course, the students will be able to:

1. Interpret intellectual property rights.
2. Identify different types of trademarks and related laws.
3. Examine copyrights and their laws.
4. Differentiate the trade secrets and unfair competition.
5. Enumerate the new developments of intellectual property.

UNIT– I **[7 Lectures]**

Introduction to Intellectual Property: Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.

UNIT– II **[7 Lectures]**

Trademarks: Purpose and Function of Trademarks, Acquisition of Trade Mark Rights, Protectable Matter, Selecting and Evaluating Trademark, Trademark Registration Processes.

UNIT– III **[10 Lectures]**

Law of Copy Rights: Fundamental of Copy Right Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copyright Registration, Notice of Copy Right, International Copy Right Law.

Law Of Patents: Foundation of Patent Law, Patent Searching Process, Ownership Rights and Transfer.

UNIT– IV **[8 Lectures]**

Trade Secrets: Trade Secrete Law, Determination of Trade Secrete Status, Liability for Misappropriation of Trade Secrets, Protection for Submission, Trade Secrete Litigation.

Unfair Competition: Misappropriation of Right of Publicity, False Advertising.

UNIT– V **[8 Lectures]**

New Development of Intellectual Property: New Developments in Trademark Law, Copy Right Law, Patent Law, Intellectual Property Audits, International Overview on Intellectual Property, International Trademark Law, Copyright Law, International Patent Law, International Development in Trade Secrets Law.

TEXT BOOKS:

1. Deborah E. Bouchoux, Intellectual Property: The Law Of Trademarks Copyrights Patents And Trade Secrets, 4Th Edn, Cengage India, 2015.
2. Prabuddha ganguli, Intellectual property right – Unleashing the knowledge economy, McGraw Hill Education, 1st edition, 2017.

REFERENCEBOOKS:

1. William M. Landes, Richard A. Posner, The Economic Structure of Intellectual Property Law, Belknap Press, Illustrated edition, 2003.
2. Rami M. Olwan, Intellectual Property and Development: Theory and Practice, Springer-Verlag Berlinand Heidelberg GmbH & Co. K, 2013th edition, 2015.
3. VK Ahuja, Law Relating to Intellectual Property Rights, Lexis Nexis, Thirdedition,2017.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc22_hs59/preview
2. https://www.coursera.org/learn/introduction-intellectual-property
3. https://www.udemy.com/topic/intellectual-property/
4. https://allea.org/intellectual-property-rights/
5. https://www.stopfakes.gov/Online-Intellectual-Property-Training-Module

MACHINE LEARNING

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS601PC

Prerequisites:
1. A course on "Mathematical and Statistical Foundations"
2. A course on "Programming with Python".
3. A course on "Data Structures"

Course Objectives:
1. To introduce the basic concepts of Machine Learning.
2. To learn about multi-layer perceptron and radial basis functions.
3. To know about decision trees and ensemble learning.
4. To learn about dimensionality reduction and evolutionary learning.
5. To know about Reinforcement learning and Markov chain monte carlo methods.

Course Outcomes: After completion of this course, the students will be able to:
1. Enumerate the basic concepts of machine learning.
2. Build classifiers using multi-layer perceptron and support vector machine.
3. Apply ensemble learning to increase the classification accuracy.
4. Make use of dimensionality reduction and evolutionary computing algorithms.
5. Apply Markov Chain Monte Carlo methods on real datasets.

UNIT – I **[12 Lectures]**

Introduction: Learning, Types of Machine Learning, Supervised Learning, The Brain and the Neuron, Design a Learning System, Perspectives and Issues in Machine Learning, Concept Learning Task, Concept Learning as Search, Finding a Maximally Specific Hypothesis, Version Spaces and Candidate Elimination Algorithm, Linear Discriminates, Perceptron, Linear Separability, Linear Regression.

UNIT – II **[10 Lectures]**

Multi-Layer Perceptron: Going Forwards, Going Backwards, Back Propagation Error, Multi-Layer Perceptron in Practice, Examples of using the MLP, Deriving Back-Propagation.
Radial Basis Functions and Splines: Concepts, RBF Network, Curse of Dimensionality, Interpolations and Basis Functions, Support Vector Machine.

UNIT – III **[10 Lectures]**

Learning with Trees: Decision Trees, Constructing Decision Trees, Classification and Regression Trees.
Ensemble Learning: Boosting, Bagging, Different ways to Combine Classifiers, Basic Statistics, Gaussian Mixture Models, Nearest Neighbour Methods.
Unsupervised Learning: K-Means Algorithm.

UNIT - IV **[9 Lectures]**

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis, Factor Analysis, Independent Component Analysis, Locally Linear Embedding, Isomap, Least Squares Optimization.
Evolutionary Learning: Genetic Algorithms, Genetic Offspring, Genetic Operators, Using Genetic Algorithms.

UNIT - V **[9 Lectures]**

Reinforcement Learning: Overview of Reinforcement Learning, Getting Lost Example.
Markov Chain Monte Carlo Methods: Sampling, Proposal Distribution, Markov Chain Monte Carlo.
Graphical Models: Bayesian Networks, Markov Random Fields, Hidden Markov Models, Tracking Methods.

TEXT BOOKS:
1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and all/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

WEBLINKS:

1. https://www.geeksforgeeks.org/machine-learning.
2. https://onlinecourses.nptel.ac.in/noc23_cs18/preview

ALGORITHM DESIGN AND ANALYSIS

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS602PC

Prerequisites:
1. A course on "Computer Programming and Data Structures".
2. A course on "Advanced Data Structures".

Course Objectives:
1. Introduces the notations for analysis of the performance of algorithms.
2. Describes major algorithmic techniques and mention problems for which each technique is appropriate;
3. Describes how to evaluate and compare different algorithms using worst, average, and best- case analysis.
4. To solve problems using algorithm design methods such as backtracking and branch and bound.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes: After completion of this course, the students will be able to:
1. Analyze the performance of algorithms
2. Design the algorithm using the divide and conquer greedy approach.
3. Implement dynamic programming strategy.
4. Apply the backtracking technique and branch and bound.
5. Construct the algorithm using the non-deterministic algorithm.

UNIT – I **[10 Lectures]**

Introduction: Algorithm, Performance Analysis: Space complexity, Time complexity; Asymptotic Notations: Big Oh Notation, Omega Notation, Theta Notation and Little Oh Notation.

Divide And Conquer: General Method, Applications: Binary Search, Quick Sort, Merge Sort, Strassen's Matrix Multiplication.

UNIT – II **[8 Lectures]**

Disjoint Sets: Disjoint Set Operations, Union and Find Algorithms, Priority Queue, Heaps, Heapsort.

Backtracking: General Method, Applications, N-Queen's Problem, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

UNIT – III **[8 Lectures]**

Dynamic Programming: General Method, Applications: Optimal Binary Search Tree, 0/1 Knapsack Problem, All Pairs Shortest Path Problem, Traveling Sales Person Problem, Reliability Design.

UNIT – IV **[8 Lectures]**

Greedy Method: General Method, Applications: Job Sequencing with Deadlines, Knapsack Problem, Minimum Cost Spanning Trees, Single Source Shortest Path Problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected Components, Biconnected Components.

UNIT – V **[10 Lectures]**

Branch and Bound: General Method, Applications: Travelling Sales Person Problem, 0/1 Knapsack Problem: LC Branch and Bound Solution, FIFO Branch and Bound Solution.

NP-Hard and NP-Complete Problems: Basic Concepts, Non-Deterministic Algorithms, NP-Hard and NP-Complete Classes, Cook's Theorem.

TEXT BOOK:

1. Ellis Horowitz, Sartaj Sahni and S. Raja sekharan, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2012.
2. P. H. Dave, H.B .Dave, Design and Analysis of Algorithms,2nd edition, Pearson Education, 2013.

REFERENCEBOOKS:

1. M.T. Good rich and R. Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John Wiley and sons, 2001.
2. S. Sridhar, Design and Analysis of Algorithms, Oxford Univ.Press,2014.
3. Aho, Ullman and Hop croft, Design and Analysis of algorithms, Pearson Education, 1st Edition, 2002.
4. R. Neapolitan and K.Naimipour, Foundations of Algorithms,4thedition,JonesAndBartlett India Private Limited, 2010.
5. T. H. Cormen, C. E.Leiserson, R. L. Rivest, and Stein, Introduction to Algorithms, 3rd Edition, PHI, 2010.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://www.coursera.org/learn/analysis-of-algorithms
3. https://www.udemy.com/course/design-and-analysis-of-algorithms/
4. https://www.classcentral.com/course/youtube-design-and-analysis-of-algorithms-daa-46806

.

AUTOMATA THEORY AND COMPILER DESIGN

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS603PC

Prerequisites: None

Course Objectives:

1. To introduce the fundamental concepts of formal languages, grammars and automata theory.
2. To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
3. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
4. Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation.
5. To understand run-time environment while executing the program.

Course Outcomes: After completion of this course, the students will be able to:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

UNIT - I **[12 Lectures]**

Introduction to Finite Automata: Structural Representations, Automata and Complexity, Central Concepts of Automata Theory: Alphabets, Strings, Languages, Problems. **Nondeterministic Finite Automata:** Formal Definition, Application, Text Search, Finite Automata with Epsilon-Transitions.
Deterministic Finite Automata: Definition, Processing Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions, Conversion of NFA to DFA.

UNIT - II **[10 Lectures]**

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.
Pumping Lemma for Regular Languages: Statement of the Pumping Lemma, Applications of Pumping Lemma.
Context-Free Grammars: Definition of Context-Free Grammars, Derivations using a Grammar, Leftmost and Rightmost Derivations, Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT - III **[10 Lectures]**

Push Down Automata: Definition of the Pushdown Automaton, Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by Final State.
Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous Description, Language of a Turing Machine.
Undecidability: Undecidability, A Language that is not Recursively Enumerable, An Undecidable Problem that is RE, Undecidable Problems about Turing Machines.

UNIT - IV **[10 Lectures]**

Introduction: The Structure of a Compiler.
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex.
Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing,
Introduction to LR Parsing: Simple LR, More Powerful LR Parsers.

UNIT - V **[10 Lectures]**

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's.
Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code.

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandra shekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry
2. D. Ullman, 2nd Edition, Pearson.
3. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
4. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
5. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
6. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

SOFTWARE TESTING METHODOLOGIES

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS631PE

Prerequisites: A course on "Software Engineering"

Course Objectives:

1. To introduce the concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To understand the transaction flow, data flow and domain testing techniques.
3. To explore the logic-based testing technique.
4. To describe the testing based on state graphs and transitions.
5. To know the software test automation and management using the latest tools.

Course Outcomes: After completion of this course, the students will be able to:

1. Compare and contrast the various testing strategies.
2. Impart skills to perform dataflow testing and domain testing strategies.
3. Detect anomalies and build decision tables and KV charts.
4. Apply the graph-based testing metrics to its application.
5. Implement test cases using any automated testing tools (Jmeter or WinRunner).

UNIT – I **[10 Lectures]**

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.
Flow Graphs and Path Testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT – II **[10 Lectures]**

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Data Flow Testing: Basics of Data Flow Testing, Strategies in Data Flow Testing, Application of Data Flow Testing.
Domain Testing: Domains and Paths, Nice and Ugly Domains, Domain Testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains And Testability.

UNIT – III **[9 Lectures]**

Paths, Path Products and Regular Expressions: Path Products and Path Expression, Reduction Procedure, Applications, Regular Expressions and Flow Anomaly Detection.
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

UNIT – IV **[9 Lectures]**

State, State Graphs and Transition Testing: State Graphs, Good and Bad State Graphs, State Testing, Testability Tips.

UNIT – V **[9 Lectures]**

Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools. (Student Should Be Given an Exposure to a Tool Like JMeter/Selenium/SoapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dream tech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dream tech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://www.coursera.org/courses?query=software%20testing
3. https://www.udemy.com/courses/development/software-testing/
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/software-testing-fundamentals1
5. https://smartbear.com/learn/automated-testing/software-testing-methodologies/

DATA VISUALIZATION TECHNIQUES (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS632PE

Prerequisites: None

Course Objective:

1. To understand various types of graphs for data visualization.
2. To learn data visualization through graph representation.
3. To explore multidimensional scaling techniques.
4. To learn data visualization via kernel machines.
5. To know about parallel coordinates, notations, and applications.

Course Outcomes: After completion of this course, the students will be able to:

1. Know the historical development and evolution of data visualization techniques.
2. Analyze and visualize high-dimensional datasets using appropriate techniques.
3. Visualize large multidimensional datasets using appropriate methods.
4. Create insightful visual representations for diverse types of data.
5. Visualizations promote collaboration and interdisciplinary communication by providing a shared understanding of data among team members.

UNIT – I **[10 Lectures]**

Introduction, A Brief History of Data Visualization, Pre-Historic Data Visualization, Different Types of Graphs for Data Visualization: Line Charts, Bar Charts, Scatter Plots, Pie Charts, Column Charts, Tree Map Charts, Heatmap Charts, Pareto Charts, Geo Charts, Waterfall Charts, Good Graphics, Static Graphics, Static Visualizations Vs Interactive Visualizations.

UNIT – II **[10 Lectures]**

Data Visualization Through Graph Representations: Data and Graphs, Graph Layout Techniques, Force-Directed Techniques, Multidimensional Scaling, Pulling Under Constraints Model, Graph-Theoretic Graphics; High-Dimensional Data Visualization: Univariate Analysis, Visualizing Data in One Dimension (1-D), Multivariate Analysis: Visualizing Data in Two Dimensions (2-D), Multivariate Data Glyphs: Principles and Practice, Linked Views for Visual Exploration, Linked Data Views, Visualizing Trees and Forests.

UNIT – III **[10 Lectures]**

Multidimensional Scaling: Multiple Line Graphs, Permutation Matrix, Survey Plot, Scatter Plot Matrix, Parallel Coordinates, Tree Maps, Principal Component Analysis (PCA), Sammon's Mapping, Self-Organizing Maps (SOM), Comparison of Visualization Techniques, Huge Multidimensional Data Visualization, Multivariate Visualization by Density Estimation, Structured Sets of Graphs, Structural Adaptive Smoothing by Propagation, Separation Methods, Smoothing Techniques for Visualization, Exponential Smoothing, Moving Average Smoothing, Double Exponential Smoothing, Holt-Winters Smoothing.

UNIT – IV **[8 Lectures]**

Data Visualization via Kernel Machines, Kernel Machines in the Frame Work of an RKHS, Kernel Principal Component Analysis: Computation of KPCA, Kernel Canonical Correlation Analysis, Kernel Cluster Analysis, Visualizing Cluster Analysis, Common Applications of Clustering; Visualization and Finite Mixture Models: Flexible Method of Modeling, A Brief History, Formulation of Mixture Distribution; Visualizing Contingency Tables: Mosaic Displays for N-Way Tables, Fourfold Display, Mosaic Plots and Variants.

UNIT – V **[10 Lectures]**

Parallel Coordinates: Scenarios, Components of a Parallel Coordinate Plot, Interpreting Parallel Coordinate Plots, Advantages of Parallel Coordinate Plots, Comparison with other Visualization Techniques, Visualization, Exploration and Classification of High-Dimensional Data, Notations, Data Matrix Preparation Heatmaps, Clustering, Comparing Clustering's with Rand Index, Properties, Applications, Matrix Visualization, Visualization in Bayesian Data Analysis.

TEXT BOOKS:

1. Handbook of Data Visualization by Chun-houh Chen, 2008.
2. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.

REFERENCE BOOKS:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

SCRIPTING LANGUAGES (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS633PE

Prerequisites:
1. A course on "Computer Programming and Data Structures"
2. A course on "Object-Oriented Programming Concepts"

Course Objectives:
1. To understand the web service architecture and applications.
2. To introducing Ruby scripting.
3. To understand the basics of PERL programming.
4. To illustrate the advanced programming in PERL.
5. To Learn TCL.

Course Outcomes: After completion of this course, the students will be able to:
1. Comprehend the SOAP architecture and web services.
2. Extend the Ruby scripting language.
3. Apply the basic Perl programming language.
4. Implement the advanced programming in PERL.
5. Develop TCL programming and select an appropriate language for solving a given problem.

UNIT – I **[12 Lectures]**

Introduction: Ruby, Rails, Structure and Execution of Ruby Programs, Package Management with Ruby Gems.
Ruby and Web: Writing CGI Scripts, Cookies, Choice of Web Servers, SOAP and Web Services.
Ruby Tk: Simple Tk Application, Widgets, Binding Events, Canvas, Scrolling.

UNIT – II **[8 Lectures]**

Extending Ruby: Ruby Objects in C, Jukebox Extension, Memory Allocation, Ruby Type System, Embedding Ruby to other Languages, Embedding a Ruby Interpreter.

UNIT – III **[10 Lectures]**

Introduction to Perl and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, Universe of Scripting Languages.
Perl: Names and Values, Variables, Scalar Expressions, Control Structures, Arrays, List, Hashes, Strings, Pattern and Regular Expressions, Subroutines.

UNIT – IV **[10 Lectures]**

Advanced Perl: Finer Points of Looping, Pack and Unpack, File System, Eval, Data Structures, Packages, Modules, Objects, Interfacing to the Operating System, Creating Internet Ware Applications, Dirty Hands Internet Programming, Security Issues.

UNIT - V **[12 Lectures]**

TCL: TCL Structure, Syntax, Variables and Data in TCL, Control Flow, Data Structures, Input/Output, Procedures, Strings, Patterns, Files.
Advanced TCL: Eval, Source, Exec and Uplevel Commands, Name Spaces, Trapping Errors, Event Driven Programs, Making Applications Internet Aware, Nuts and Bolts, Internet Programming, Security Issues, C Interface.
Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by Example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open-Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

WEB LINKS:

1. https://archive.nptel.ac.in/courses/117/106/117106113/
2. https://www.udemy.com/course/scripting-for-beginner/
3. https://freevideolectures.com/blog/free-courses-learn-scripting-language/
4. https://techenclave.com/threads/programming-and-scripting-links-and-resources.1325/
5. https://www.autoitscript.com/site/autoit/
6. https://www.tutorialspoint.com/ruby/ruby_overview.htm

MOBILE APPLICATION DEVELOPMENT (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS634PE

Prerequisites:
1. A Course on "JAVA programming"
2. A Course on "DBMS"

Course Objectives
1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To improve the skills of using Android software development tools.
3. To learn to broadcast and notifications on a mobile platform.
4. To explore persistent storage.
5. To understand database for mobile applications.

Course Outcomes: After completion of this course, the students will be able to:
1. Work on Android OS Practically.
2. Apply the concepts of mobile applications and user interfaces on Android.
3. Develop the broadcast and notifications on mobile applications.
4. Create persistent storage for Android Applications.
5. Design database for mobile Android Applications.

UNIT – I **[12 Lectures]**

Introduction to Android Operating System: Android OS Design and Features, Android Development Framework, SDK Features, Installing and Running Applications on Android Studio, Creating AVDs, Types of Android Applications, Best Practices in Android Programming, Android Tools.

Android Application Components: Android Manifest File, Externalizing Resources Like Values, Themes, Layouts, Menus etc., Resources for Different Devices and Languages, Runtime Configuration Changes.

Android Application Lifecycle: Activities, Activity Lifecycle, Activity States, Monitoring State Changes.

UNIT – II **[12 Lectures]**

Android User Interface: Measurements: Device and Pixel Density, Independent Measuring Units; Layouts: Linear, Relative, Grid and Table Layouts.

User Interface (UI) Components: Editable and Non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and Pickers.

Event Handling: Handling Clicks or Changes of Various UI Components.

Fragments: Creating Fragments, Lifecycle of Fragments, Fragment States, Adding Fragments to Activity, Adding, Removing and Replacing Fragments with Fragment Transactions, Interfacing Between Fragments and Activities, Multi-Screen Activities.

UNIT – III **[10 Lectures]**

Intents and Broadcasts: Intent: Using Intents to Launch Activities, Explicitly Starting New Activity, Implicit Intents, Passing Data to Intents, Getting Results from Activities, Native Actions, Using Intent to Dial a Number or to Send SMS.

Broadcast Receivers: Using Intent Filters to Service Implicit Intents, Resolving Intent Filters, Finding and Using Intents Received within an Activity.

Notifications: Creating and Displaying Notifications, Displaying Toasts.

UNIT – IV **[10 Lectures]**

Persistent Storage: Files: Using Application Specific Folders and Files, Creating Files, Reading Data from Files, Listing Contents of a Directory Shared Preferences, Creating Shared Preferences, Saving and Retrieving Data using Shared Preference, Introducing Structured Data Storage in Android, Storing Data using the Room Persistence Library, Accessing Files from other Applications using Storage Access Framework, Requesting Temporary Access to Files, Requesting Persistent Access to Files, Requesting Access to Directories.

UNIT – V **[10 Lectures]**

Database: Introduction to SQLite Database, Creating and Opening a Database, Creating Tables, Inserting, Retrieving and Etindelg Data, Registering Content Providers, Using Content Providers (Insert, Delete, Retrieve and Update).

Advanced Topics: Alarms: Creating and using Alarms; Using Internet Resources: Connecting to Internet Resource, Using Download Manager; Location Based Services: Finding Current Location and Showing Location on the Map, Updating Location.

TEXT BOOK:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

REFERENCE BOOKS:

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

WEB LINKS:

1. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
2. https://www.coursera.org/courses?query=mobile%20app%20development
3. https://www.udemy.com/topic/mobile-development/
4. https://www.mygreatlearning.com/mobile-app-development/free-courses
5. https://techreviewer.co/blog/best-free-open-source-app-development-software-solutions

CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS635PE

Prerequisites: A course on "Computer Networks"

Course Objectives:

1. To introduce various cryptographic algorithms and their characteristics.
2. To describe the private and public-key cryptosystems.
3. To know the key management scenarios.
4. To explore enhancements of Web security and Firewalls made to IPv4 by IPSec.
5. To understand PGP key pair and use the PGP package to send an encrypted e-mail message.

Course Outcomes: After completion of this course, the students will be able to:

1. Analyse the key concepts of cryptography and security.
2. Comprehend the private and public key cryptographic algorithms.
3. Define the key distribution and management methods.
4. Use of transporting data by Web security and Firewalls protocols.
5. Distribute the PGP to send a secured e-mail message.

UNIT – I **[10 Lectures]**

Security Concepts: Introduction, Need for Security, Security Approaches, Principles of Security, Types of Security Attacks, Security Services, Security Mechanisms, A Model for Network.

Security Cryptography Concepts and Techniques: Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

UNIT – II **[11 Lectures]**

Symmetric Key Ciphers: Block Cipher Principles, DES, AES, Blowfish, RC5, IDEA, Block Cipher Operation, Stream Ciphers, RC4.

Asymmetric Key Ciphers: Principles of Public Key Cryptosystems, RSA Algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III **[10 Lectures]**

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message Authentication Codes: Authentication Requirements, HMAC, CMAC, Digital Signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution using Symmetric and Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public Key Infrastructure.

UNIT – IV **[9 Lectures]**

Transport Level Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

UNIT – V **[8 Lectures]**

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

Case Studies on Cryptography and Security: Secure Multiparty Calculation, Virtual Elections, Single Sign On, Secure Inter-Branch Payment Transactions, Cross Site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc21_cs16/preview
2. https://www.coursera.org/courses?query=cryptography
3. https://www.udemy.com/topic/cryptography/
4. https://www.classcentral.com/course/swayam-cryptography-and-network-security-9896
5. https://www.nesoacademy.org/cs/11-cryptography-and-network-security

FUNDAMENTALS OF DATA SCIENCE (Open Elective – I)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS611OE

Prerequisites:

1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Data Structures."

Course Objectives:

1. To Learn concepts, techniques and tools deal with various facets of data science practice, including data collection and integration.
2. To understand the basic types of data and basic statistics.
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists.
4. To learn about iterative programming in R
5. To identify the importance of data visualization techniques

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

1. Discuss a flow process for data science problems.
2. Identify types of data and basic Statistical Description.
3. Create vectors, matrices and list using R
4. Develop R codes using iterative programming
5. Correlate results to the solution approach

UNIT - I **[10 Lectures]**

Introduction: Definition of Data Science, Big Data and Data Science Hype, Datafication, Current Landscape of Perspectives, Statistical Inference, Populations and Samples, Statistical Modeling, Probability Distributions, Fitting a Model, Over Fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II **[10 Lectures]**

Types of Data: Attribute, Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attributes, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete vs. Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency, Mean, Median, and Mode, Measuring the Dispersion of Data, Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III **[9 Lectures]**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Sub Setting.

Matrices: Creating and Naming Matrices, Matrix Sub Setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors, Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Sub Setting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List, Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

UNIT- IV **[9 Lectures]**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT- V **[7 Lectures]**

Charts and Graphs: Introduction, Pie Chart, Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

Regression: Linear Regression Analysis, Multiple Linear Regression.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/introduction-to-data-science/
2. https://onlinecourses.nptel.ac.in/noc24_cs54/preview

R PROGRAMMING (Open Elective – I)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS612OE

Course Objectives:

1. To understand basic programming concepts.
2. To learn about iterative programming in R.
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists.
4. To know how to generate dynamic documents.
5. To identify the importance of data visualization techniques.

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

1. Explore basic concepts of R programming language.
2. Work with iterative programming in R.
3. Create vectors, matrices and list using R.
4. Develop R codes using iterative programming.
5. Correlate results to the solution approach.

UNIT – I **[8 Lectures]**

Introduction: Overview of R, R Data Types and Objects, Reading and Writing Data, Sub Setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex Numbers in R, Rounding, Arithmetic, Modulo and Integer Quotients, Variable Names and Assignment, Operators, Integers, Factors, Logical Operations.

UNIT – II **[10 Lectures]**

Control Structures, Functions, Scoping Rules, Dates and Times, Introduction to Functions, Preview of some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Vectors, Generating Sequences, Vectors and Subscripts, Extracting Elements of a Vector using Subscripts, Working with Logical Subscripts, Scalars, Vectors, Arrays, Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors, Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.

UNIT – III **[8 Lectures]**

Lists: Creating Lists, General List Operations, List Indexing, Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance, Accessing List Components and Values, Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix Like Operations.

UNIT – IV **[8 Lectures]**

Factors And Tables: Factors and Levels, Common Functions used with Factors, Working with Tables, Matrix/Array Like Operations on Tables, Extracting a Sub Table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions.

UNIT – V **[8 Lectures]**

Graphics: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Customizing Graphs, Creating Three-Dimensional Plots.

Debugging: Fundamental Principles of Debugging, Using R Debugging Facilities, Moving Up in the World: More Convenient Debugging Tools, Ensuring Consistency in Debugging Simulation Code, Syntax and Runtime Errors, Running GDB on R.

TEXT BOOKS:

1. The Art of R Programming by Norman Matloff, Cengage Learning India.

REFERENCE BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
3. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press.

WEBLINKS:

1. https://www.w3schools.com/r/
2. https://www.geeksforgeeks.org/r-programming-language-introduction/
3. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
4. https://onlinecourses.nptel.ac.in/noc22_ma34/preview

MACHINE LEARNING LAB

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS604PC

Corequisites:

1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Programming with Python".
3. A Course on" Data Structure".

Course Objectives:

1. To learn about computing central tendency measures.
2. To gain the knowledge about SciPy, pandas, matplotlib libraries.
3. To learn about simple and multiple linear regression algorithms
4. To develop machine learning model using decision tree, KNN algorithms.
5. To apply logistic regression, K-Means algorithms for a problem.

Course Outcomes: After the completion of this course, the students will be able to:

1. Develop program for computing central tendency measures.
2. Make use of SciPy, pandas, matplotlib libraries to machine learning applications.
3. Develop simple and multiple linear regression algorithms
4. Build machine learning model using decision tree, KNN algorithms.
5. Apply logistic regression, K-Means algorithms for a problem.

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Write a python program to demonstrate the use of statistics, math, NumPy and SciPy libraries
3. Write a python program to demonstrate a Machine Learning application using pandas, matplot lab libraries
4. Write a python program to apply simple linear regression algorithm for a regression problem
5. Write a python program to apply multiple linear regression algorithm for house price prediction using SK-learn library.
6. Write a python program to apply decision tree algorithm for a classification problem and perform parameter tuning for better results
7. Write a python program to apply KNN algorithm for a classification problem using SK-learn library
8. Write a python program to apply Logistic regression algorithm for a classification problem using SK-learn library
9. Write a python program to apply k-means algorithm for a clustering problem
10. Mini Project by including performance analysis of any three classification algorithms on a specific dataset

TEXT BOOK:

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

REFERENCE BOOK:

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

WEBLINKS:

1. https://mllab.csa.iisc.ac.in.
2. https://studyglance.in/labprograms/mllabprograms.php

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22EN605HS

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language
   – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e- mails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system

- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

WEB LINKS:

1. https://nptel.ac.in/courses/109104031
2. https://www.udemy.com/topic/english-conversation/?p=3
3. https://www.coursera.org/specializations/business-english
4. (99+) ADVANCED ENGLISH COMMUNICATION SKILLS LAB: Syllabus ADVANCED ENGLISH COMMUNICATION SKILLS LAB | Rock Rishi - Academia.edu

SOFTWARE TESTING METHODOLOGIES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS631PL

Prerequisites: A course on "Java programming" or "C Programming".

Corequisite: A course on "Software Testing Methodologies".

Course Objectives:

1. To demonstrate use of testing tool-WinRunner in applications.
2. To introduce skills in software test automation and management.
3. To learn the recording of tests in analog and context sensitive modes.
4. To know GUI, Bitmap and Database checkpoints for an application.
5. To understand the test cases for windows application and batch testing.

Course Outcome: After the completion of the course the student can able to:

1. Work with WinRunner user interface and describe the benefits of automated testing.
2. Design and develop the best test strategies in accordance with the development model.
3. Record the test in analog and context sensitive modes.
4. Create various checkpoints like GUI, Bitmap and Database for an application.
5. Perform the batch testing with and without parameter passing.

List of Experiments:

1. Recording in context sensitive mode and analog mode.
2. GUI checkpoint for single property.
3. GUI checkpoint for single object/window.
4. GUI checkpoint for multiple objects.
5. a) Bitmap checkpoint for object/window.
   b) Bitmap checkpoint for screen area.
6. Database checkpoint for Default check.
7. Database checkpoint for custom check.
8. Database checkpoint for runtime record check.
9. a) Data driven test for dynamic test data submission.
   b) Data driven test through flat files.
   c) Data driven test through front grids.
   d) Data driven test through excel test.
10. a) Batch testing without parameter passing.
    b) Batch testing with parameter passing.
11. Data driven batch.
12. Silent mode test execution without any interruption.
13. Test case for calculator in windows application.

TEXT BOOKS:

1. K.V.K.K. Prasad, Software Testing Tools: Covering WinRunner, SilkTest, LoadRunner, JMeter, TestDirector and QTP with Case Studies, Dreamtech Press, 1st edition, 2007.
2. Mark Harbin, Thomas Messerschmidt, WinRunner 7 In A Hurry! Software Test Automation with WinRunner, Riverside Pr Intl, 2001.

REFERENCE BOOKS:

1. Nageshwar Rao Pusuluri, SOFTWARE TESTING CONCEPTS AND TOOLS, Dreamtech Press, 2006.
2. Naresh Chauhan, Software Testing: principles and practices, Oxford University Press, Second edition, 2016.

WEB LINKS:

1. https://support.microfocus.com/kb/kmdoc.php?id=KM0247&fileName=hp_man_WinRunner-version5.01-WR_TUT_pdf.pdf
2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview
3. https://www.udemy.com/course/software-manual-testing-course/
4. https://www.scribd.com/document/418157684/stm-lab
5. https://itqcr.com/

DATA VISUALIZATION TECHNIQUES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS632PL

Prerequisites: None.

Course Objectives:

1. Understand the various types of data, apply and evaluate the principles of data visualization.
2. Acquire skills to apply visualization techniques to a problem and its associated dataset.

Course Outcomes: After the completion of the course the student can able to:

1. Identify the different data types, visualization types to bring out the insight.
2. Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on a large dataset.
3. Demonstrate the analysis of a large dataset using various visualization techniques and tools.
4. Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data.
5. Ability to create and interpret plots using R/Python.

List of Experiments:

1. Acquiring and plotting data.
2. Statistical Analysis – such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance.
3. Financial analysis using Clustering, Histogram and Heat Map.
4. Time-series analysis – stock market.
5. Visualization of various massive dataset - Finance - Healthcare - Census – Geospatial.
6. Visualization on Streaming dataset (Stock market dataset, weather forecasting).
7. Market-Basket Data analysis-visualization.
8. Text visualization using web analytics.

TEXT BOOKS:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.

REFERENCE BOOKS:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2 nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

SCRIPTING LANGUAGES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS633PL

Prerequisites: Any High-level programming language (C, C++).

Corequisite: A course on "Scripting Languages".

Course Objectives:

1. To understand scripting languages for developing web-based projects.
2. To explore Ruby scripting language.
3. To introduce TCL scripting language.
4. To know Perl Scripting language.
5. To learn web-based applications using scripting languages.

Course Outcomes: After the completion of the course the student can able to:

1. Differentiate between Scripting languages and programming languages.
2. Gain some fluency programming in Ruby, Perl, TCL.
3. Analyze the differences between Scripting languages and programming languages.
4. Create software systems using scripting languages such as Ruby, Perl, TCL.
5. Develop web-based projects using scripting languages.

List of Experiments:

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non- negative integer.
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them.
4. Write a Ruby script to accept a filename from the user print the extension of that.
5. Write a Ruby script to find the greatest of three numbers.
6. Write a Ruby script to print odd numbers from 10 to 1.
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum.
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100.
9. Write a Ruby script to print the elements of a given array.
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash.
11. Write a TCL script to find the factorial of a number.
12. Write a TCL script that multiplies the numbers from 1 to 10.
13. Write a TCL script for Sorting a list using a comparison function.
14. Write a TCL script to (i) Create a list (ii) Append elements to the list (iii) Traverse the list (iv) Concatenate the list.
15. Write a TCL script for comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shift b) Unshift c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

TEXT BOOKS:

1. David Barron, The World of Scripting Languages, Wiley Publications, 2009.
2. David Flanagan and Yukihiro Matsumoto, Ruby Programming language, O'Reilly, 1st edition, 2008.
3. Dave Thomas, Chad Fowler, Andy Hunt, Programming Ruby: The Pragmatic Programmers' Guide, Pragmatic Bookshelf, 2nd edition, 2004.
4. Brent B. Welch, Practical Programming in Tcl and Tk, Prentice Hall, 3rd edition, 1999.
5. David Till, Teach Yourself Perl 5 in 21 Days, Sams, 2nd edition, 1996.

REFERENCE BOOKS:

1. J.Lee and B. Ware, Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, (Addison Wesley) Pearson Education, 1st edition, 2002.
2. E. Quigley, Perl by Example, Pearson Education, 5th edition, 2014.
3. Larry Wall, T. Christiansen and J. Orwant, Programming Perl, O'Reilly, SPD, 3rd edition, 2000.
4. Boris Paskhaver, Learn to Code with Ruby, Packt, 2022.
5. John K. Ousterhout, Tcl and the Tk Toolkit, Addison Wesley, 1994.
6. J. P. Flynt, Perl Power, Cengage Learning, 1st edition, 2006.
7. Tom Christiansen, brian foy, Larry Wall, Jon Orwant, Programming Perl: Unmatched power for text processing and scripting, O'Reilly Media, 4th edition, 2012.

WEB LINKS:

1. https://www.ni.com/en/shop/labview/scripting-languages-and-ni-labview.html
2. https://extendedstudies.ucsd.edu/courses-and-programs/programming-and-scripting-languages
3. https://guides.lib.wayne.edu/information_science_tools/scr

MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS634PL

Corequisite: A course on "Mobile Application Development".

Course Objectives:

1. To learn how to develop Applications in an android environment.
2. To introduce Layout Management and Multi layout definition techniques to create adaptable User Interface.
3. To know user interface for mobile Application using widgets with event handling.
4. To describe push notifications for incoming messages.
5. To explore applications to the Android marketplace for distribution.

Course Outcomes: After the completion of the course the student can able to:

1. Work with Android operating system practically.
2. Configure Android environment and use development tools.
3. Develop rich user Interfaces by using layouts and controls.
4. Implement User Interface components for android application development.
5. Create Android applications using a database and publish it.

List of Experiments:

1. a) Create an Android application that shows Hello + name of the user and run it on an emulator.
   (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

TEXT BOOKS:

1. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
2. James C Sheusi, Android Application Development for Java Programmers, Cengage, 2013.
3. Pradeep Kothari, Kogent Learning Solutions Inc., Android Application Development (With Kitkat Support), Black Book, Dreamtech Press, 2014.
4. Ashok Kumar R, Baskaran p, Mobile Application Development Laboratory, 2017.

REFERENCE BOOK:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2013.
2. Michael Burton, Android App Development for Dummies, Wiley, Third edition, 2015.
3. Priyadharshini Ashokkumar, VTU-Mobile Application Development Lab Manual-18CSMP68: MAD Lab Manual(18CSMP68), 2021.

WEB LINKS:

1. https://www.udemy.com/course/mobile-application-development-using-android/
2. https://github.com/shubhaam13/Mobile-Application-Development
3. https://www.studocu.com/row/document/university-of-agriculture-faisalabad/mobile-application/mobile-application-development-lab/22189066
4. https://www.codingconnect.net/mobile-application-development-lab/
5. https://www.tutorialspoint.com/android
6. https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf
7. https://developer.android.com

CRYPTOGRAPHY AND NETWORK SECURITY LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS635PL

Corequisite: A Course on "Cryptography and Network Security".

Prerequisites:
1. A Course on "C Programming".
2. A Course on "Java Programming".

Course Objectives:
1. To learn different cipher techniques.
2. To introduce the algorithms DES, RSA, MD5, SHA-1.
3. To know network security tools and vulnerability assessment tools.
4. To explore key exchange concepts.
5. To understand block ciphers implementation.

Course Outcomes: After the completion of the course the student can able to:
1. Develop code for classical Encryption Techniques to solve the problems.
2. Build cryptosystems by applying symmetric and public key encryption algorithms.
3. Construct code for authentication algorithms.
4. Design key exchange mechanisms for secure communication.
5. Implement the network security system using open-source tools.

List of Experiments:
1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or/and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
   a) Ceaser cipher b) Substitution cipher c) Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
7. Write a Java program to implement RSA algorithm.
8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
9. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
10. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOKS:
1. Michael Gregg, Build Your Own Security Lab: A Field Guide For Network Testing, Wiley India, 2012.
2. Gohel Hardik, Introduction to Network & Cyber Security, LAP Lambert Academic Publishing, 2015.

REFERENCE BOOKS:
1. Neal Krawetz, Introduction to Network Security, CENGAGE Learning, 2007.
2. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning, 1st Edition, 2010.

WEB LINKS:
1. https://cse29-iiith.vlabs.ac.in/
2. https://www.udemy.com/course/building-a-computer-network-test-lab/
3. https://github.com/topics/cns-lab
4. https://github.com/sobolevn/awesome-cryptography

UI DESIGN - FLUTTER

B. Tech. VI Semester

L	T	P	C
0	0	4	2

Subject Code: 22DS606PC

Course Objectives:

1. To learn about how to setup the environment for user interface design.
2. To know how to develop responsive user interfaces using flutter.
3. To apply stateful and stateless widgets to user interface.
4. To create custom widgets for specific UI elements.
5. To learn about designing a form various input field, along with validation.

Course Outcomes: After completion of this course, the students will be able to:

1. Build the environment for user interface design using flutter SDK
2. Develop responsive user interfaces using flutter.
3. Apply stateful and stateless widgets to user interface.
4. Create custom widgets for specific UI elements.
5. Design a form with various input fields, along with validation and error handling.

List of Experiments: Students need to implement the following experiments

1. a) Installation of Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.
5. a) Demonstrate stateful and stateless widgets.
   b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
   b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
    b) Demonstrate the use of Flutter's debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview
2. https://www.coursera.org/projects/googlecloud-getting-started-with-flutter-development-guo1q
3. https://www.udemy.com/course/the-complete-flutter-ui-course-build-amazing-mobile-ui/
4. https://iqonic.design/blog/8-best-flutter-ui-kits-free-ui-kits-and-templates/

ENVIRONMENTAL SCIENCE

B. Tech. VI Semester

L	T	P	C
3	0	0	0

Subject Code: 22CH607MC

Course Objectives:

1. To recognize the importance of environment, self-sustain eco systems.
2. To understand various natural resources – their importance, over exploitation, effects, and mitigation measures.
3. To create basic knowledge about different biotic resources and their need for conservation.
4. To be aware of the impacts of developmental activities and mitigation measures.
5. To know various environmental policies, legislation, and regulations.

Course Outcomes: After completion of this course, the students will be able to:

1. Explore harmonious co-existence of nature and human beings.
2. Recognize conservation of natural resources particularly alternate sources of energy.
3. Evaluate and develop technologies for conservation of biodiversity in a sustainable manner.
4. Generate ideas and implement technologies to solve environmental problems associated with air, water, and soil.
5. Develop technologies based on ecological principles and environmental regulations which helps in sustainable developments.

UNIT – I **[12 Lectures]**

Ecosystems: Definition, Scope and Importance of Ecosystem. Classification, Structure and Function of an Ecosystem, Food Chains, Food Webs, Ecological Pyramids. Flow of Energy, Biogeochemical Cycles, Bioaccumulation, Biomagnification, Ecosystem Value, Services and Carrying Capacity, Field Visits.

UNIT – II **[10 Lectures]**

Natural Resources: Classification of Resources: Living and Non-Living Resources, Water Resources: Use and Over Utilization of Surface and Ground Water, Floods and Droughts, Dams: Benefits and Problems. Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources; Land Resources, Forest Resources, Energy Resources: Growing Energy Needs, Renewable and Non-Renewable Energy Sources, Use of Alternate Energy Source, Case Studies.

UNIT – III **[10 Lectures]**

Biodiversity and Biotic Resources: Introduction, Definition, Genetic, Species and Ecosystem Diversity, Value of Biodiversity; Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Optional Values, India as a Mega Diversity Nation, Hot Spots of Biodiversity, Field Visit; Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man Wildlife Conflicts; Conservation of Biodiversity: In-Situ and Ex-Situ Conservation, National Biodiversity Act.

UNIT – IV **[9 Lectures]**

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of Pollution; Air Pollution: Primary and Secondary Pollutants, Automobile and Industrial Pollution, Ambient Air Quality Standards; Water Pollution: Sources and Types of Pollution, Drinking Water Quality Standards; Soil Pollution: Sources and Types, Impacts of Modern Agriculture, Degradation of Soil; Noise Pollution: Sources and Health Hazards, Standards; Solid Waste: Municipal Solid Waste Management, Composition and Characteristics of E-Waste and Its Management.

Pollution Control Technologies: Wastewater Treatment Methods: Primary, Secondary and Tertiary. Overview of Air Pollution Control Technologies, Concepts of Bioremediation; Global Environmental Problems and Global Efforts: Climate Change and Impacts on Human Environment, Ozone Depletion and Ozone Depleting Substances (ODS). Deforestation and Desertification. International Conventions/Protocols: Earth Summit, Kyoto Protocol, and Montréal Protocol.

UNIT – V **[9 Lectures]**

Environmental Policy, Legislation and EIA: Environmental Protection Act, Legal Aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal Solid Waste Management and Handling Rules, Biomedical Waste Management and Handling Rules, Hazardous Waste Management and Handling Rules; EIA: EIA Structure, Methods of Baseline Data Acquisition; Overview on Impacts of Air, Water, Biological and Socio-Economical

Aspects. Strategies for Risk Assessment, Concepts of Environmental Management Plan (EMP).
Towards Sustainable Future: Concept of Sustainable Development, Population and Its Explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human Health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle Assessment (LCA), Low Carbon Life Style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.coursera.org/courses?query=environmental%20science
3. https://www.udemy.com/topic/environmental-science/
4. https://www.classcentral.com/subject/environmental-science
5. https://www.sciencedaily.com/news/earth_climate/environmental_science/

INTRODUCTION TO DATA SCIENCE

B. Tech. V Semester

L	T	P	C
3	1	0	4

Subject Code: 22DS501PC

Prerequisites:
1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Data Structures."

Course Objectives:
1. To Learn concepts, techniques and tools deal with various facets of data science practice, including data collection and integration
2. To understand the basic types of data and basic statistics
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists
4. To learn about iterative programming in R
5. To identify the importance of data visualization techniques

Course Outcomes: After the completion of the course the student will able to:
1. Discuss a flow process for data science problems.
2. Identify types of data and basic Statistical Description.
3. Create vectors, matrices and list using R
4. Develop R codes using iterative programming
5. Correlate results to the solution approach

UNIT - I **[10 Lectures]**

Introduction: Definition of Data Science, Big Data and Data Science hype, Datafication, Current Landscape of Perspectives, Statistical Inference, Populations and Samples, Statistical Modeling, Probability Distributions, Fitting a Model, Over Fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II **[10 Lectures]**

Types of Data: Attribute, Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attributes, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete vs. Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency, Mean, Median, and Mode, Measuring the Dispersion of Data, Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III **[9 Lectures]**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Sub Setting.

Matrices: Creating and Naming Matrices, Matrix Sub Setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors, Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Sub Setting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List, Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

UNIT- IV **[9 Lectures]**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.
Iterative Programming in R: Introduction, While Loop, For Loop, Looping over List.
Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT- V **[9 Lectures]**

Plotting and Visualization: A Brief Matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in Pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.
Regression: Linear Regression Analysis, Multiple Linear Regression.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch,Pearson Eduation.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/introduction-to-data-science/
2. https://onlinecourses.nptel.ac.in/noc24_cs54/preview

BIG DATA ANALYTICS

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS502PC

Pre-requisites: A Course on "Data Analytics".

Course Objectives:

1. To provide the knowledge of principles and techniques for Big data Analytics.
2. To know Hadoop environment and the concepts of HDFS.
3. To learn the concepts of MapReduce programming and NoSQL.
4. To understand the fundamental concepts of MongoDB.
5. To explore the concepts of Pig, Hive, Spark and HBase.

Course Outcomes: After completion of this course, the students will be able to:

1. Learn the importance of big data analytics and its types
2. Perform analytics on big data
3. Proficiency in big data storage and processing in Hadoop
4. Data analytics through MongoDB
5. Explore various frameworks of Big Data.

UNIT – I **[10 Lectures]**

Types of Digital Data: Classification of Digital Data,
Introduction to Big Data: Evolution of Big Data, Definition of Big Data, Traditional Business Intelligence vs Big Data, Coexistence of Big Data and Data Warehouse.
Big Data Analytics: Introduction to Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Big Data Analytics Importance, Data Science, Terminologies used in Big Data Environments.

UNIT – II **[10 Lectures]**

Hadoop: Features of Hadoop, Key Advantages of Hadoop, Versions of Hadoop, Overview of Hadoop Ecosystem, Hadoop Distributions. Need of Hadoop, Hadoop vs. SQL, Integrated Hadoop Systems Offered by Leading Market Vendors, Cloud-Based Hadoop Solutions, RDBMS vs. Hadoop, Distribution Computing Challenges, Hadoop Overview.
HDFS: HDFS Daemons, Anatomy of File Read, Anatomy of File Write, Replica Placement Strategy, Working with HDFS Commands, Special Features of HDFS.

UNIT – III **[8 Lectures]**

Processing Data with Hadoop, Introduction to MapReduce Programming, MapReduce Example, Mapper, Reducer, Combiner, Partitioner.
NoSQL: Types of NoSQL Databases, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs. NoSQL, NewSQL, Comparison of SQL, NoSQL and NewSQL.

UNIT – IV **[8 Lectures]**

Introduction to MongoDB, Necessity of MongoDB, Terms used in MongoDB and RDBMS, Datatypes in MongoDB, MongoDB Query Language. Introduction to Cassandra, Features of Cassandra, CQL Datatypes, CQLSH, Key Spaces, CRUD Operations, Collections, TTL, Alter Commands, Import and Export, Querying System Tables.

UNIT – V **[8 Lectures]**

Hive: Installing Hive, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data.

Spark: Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run.

HBase: HBasics, Installation, Clients, Building an Online Query Application.

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

REFERENCE BOOKS:

1. Chandramouli Subramanian, Asha A Geroge, C R Rene Robin, big data analytics, University press.
2. Tom White, "Hadoop: The Definitive Guide"Fourth Edition, O'reilly Media, 2015.
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

WEB LINKS:

1. https://www.scribd.com/document/631590350/Big-Data-Analytics-by-Seema-Acharya-pdf
2. https://www.periyaruniversity.ac.in/Documents/2021/syllabus/2021/Affiliated/ug1/bscds.pdf

COMPUTER NETWORKS

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS503PC

Prerequisites:
1. A course on "Programming for problem solving"
2. A course on "Data Structures"

Course Objectives:
1. To learn about the functionalities of layered models.
2. To gain knowledge about sliding window protocols and medium access sub layer.
3. To design a routing algorithm in a network.
4. To know the services of the transport layer.
5. To explore the knowledge of computer network applications.

Course Outcomes: After completion of this course, the students will be able to:
1. Enumerate the basic concepts of reference models.
2. Apply sliding window protocols and multiple access protocols.
3. Design the routing algorithms, congestion control techniques.
4. Analyze TCP and UDP protocols and services of the Transport Layer.
5. Implement different protocols at the application layer.

UNIT– I **[9 Lectures]**

Network Hardware, Network Software, OSI, TCP/IP Reference Models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission Media: Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission.

Data Link Layer: Design Issues, Framing, Error Detection and Correction.

UNIT– II **[10 Lectures]**

Elementary Data Link Protocols: Simplex Protocol, A Simplex Stop and Wait Protocol for An Error- Free Channel, A Simplex Stop and Wait Protocol for Noisy Channel.

Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol Using Selective Repeat, Example Data Link Protocols.

Medium Access Sub Layer: Channel Allocation Problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols. Wireless LANs, Data Link Layer Switching.

UNIT– III **[10 Lectures]**

Network Layer: Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Hierarchical Routing, Broadcast, Multicast, Distance Vector Routing, Link State Routing, Congestion Control Algorithms, Quality of Service, Internetworking, Network Layer in the Internet.

UNIT– IV **[8 Lectures]**

Transport Layer: Transport Services; Elements of Transport Protocols: Addressing, Connection Management, Error Control and Flow Control, Multiplexing; The Internet Transport Protocol: UDP, TCP, Performance Issues: Problems, Measurements, Host Design.

UNIT– V **[9 Lectures]**

Application Layer: Domain Name System-DNS Name Space, Domain Resource Records, Name Servers; Electronic Mail-Architecture, User Agent, Message Formats, Message Transfer; SNMP; The World Wide Web- Architecture, HTTP; Streaming audio and video – Digital audio, Digital video, Streaming Stored Media, Streaming Live Media, Real-Time Conference.

TEXT BOOKS:

1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5thEdition, Pearson Education/ PHI, 2011.
2. Behrouz A. Forouzan -Data Communications and Networking, 4th Edition, Tata McGraw Hill, 2006.

REFERENCEBOOKS:

1. S.Keshav,An Engineering Approach to Computer Networks, Addison Wesley, 1st edition, 2010.
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2010.
3. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw-Hill, 2004.

WEB LINKS:

1. https://nptel.ac.in/courses/106105183
2. https://www.coursera.org/learn/illinois-tech-computer-networking
3. https://www.udemy.com/course/computer-networks-fundamentals/
4. https://www.classcentral.com/course/youtube-computer-networks-complete-playlist-46807
5. https://www.geeksforgeeks.org/computer-network-tutorials/
6. https://freecomputerbooks.com/networkComputerBooks.html
7. https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-computer-networking
8. https://www.nesoacademy.org/ec/03-computer-networks

DATA WAREHOUSING AND BUSINESS INTELLIGENCE

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS511PE

Pre-Requisites:
1. A Course on "Database Management Systems".

Course Objectives:
1. To learn about fundamentals of data warehouse and perform OLAP operations.
2. To know the fundamental concepts of Business Intelligence.
3. To compare Business Intelligence Key Performance indicators.
4. To gain knowledge of using Advanced Business Intelligence Tools.
5. To learn about integrating Business Intelligence systems.

Course Outcomes: After the completion of the course the student can able to
1. Design a data warehouse and perform OLAP operations.
2. Enumerate the fundamental concepts of Business Intelligence.
3. Compare Business Intelligence Key Performance indicators.
4. Make use of Advanced Business Intelligence Tools.
5. Develop Integrated Business Intelligence systems.

UNIT – I **[12 Lectures]**

Data Warehousing: Definition, A Multi-Tier Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse, Extraction, Transformation and Loading, OLAP Operations.

Data Cube: A Multidimensional Data Model, Star, Snowflake and Fact Constellation: Schemas for Multidimensional Data Models, Data Cube Computation Methods, Measures of Similarity and Dissimilarity.

UNIT – II **[10 Lectures]**

Business Intelligence Introduction: Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle, Data for BI - Data Issues and Data Quality for BI.

UNIT – III **[10 Lectures]**

BI Implementation: Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-Vent-Driven Alerts, A Cyclic Process of Intelligence Creation. The Value of Business Intelligence-Value Driven and Information Use.

UNIT – IV **[9 Lectures]**

Advanced BI: Big Data and BI, Social Networks, Mobile BI, Emerging Trends, Description of Different BI-Tools, Types of BI Tools, Choose Appropriate BI Tool, Pentaho Reporting Tool, Features Of Pentaho, User Interfaces Available in Pentaho, Introduction to KNIME Tool, Features of KNIME.

UNIT – V **[9 Lectures]**

Business Intelligence and Integration Implementation: Connecting in BI Systems to Databases and Enterprise Systems, On-Demand BI, Benefits of On-Demand BI, Issues of Legality, Privacy and Ethics, Social Networking and BI, Types Of Integration, Functional Integration, Physical Integration, Need of Integration.

TEXT BOOKS:

1. JIAWEI HAN & MICHELINE KAMBER, Elsevier Data Mining – Concepts and Techniques Elsevier 4th Edition.
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/difference-between-business-intelligence-and-data-warehouse/
2. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

ARTIFICIAL INTELLIGENCE (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS512PE

Pre-requisites:

1. A course on "Data Structures, Probability".

Course Objectives:

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

Course Outcomes: After completion of this course, the students will be able to:

1. Formulate an efficient problem space for a problem expressed in natural language.
2. Define search algorithm for a problem solving and estimate the performance analysis.
3. Apply knowledge using the appropriate technique for a given problem.
4. Build AI techniques to solve problems of game playing and machine learning.
5. Formulate uncertain problem-solving using probability.

UNIT – I **[10 Lectures]**

Introduction To AI, Intelligent Agents, Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-First Search, Uniform Cost Search, Depth-First Search, Iterative Deepening Depth-First Search, Bidirectional Search, Informed (Heuristic) Search Strategies: Greedy Best-First Search, A* Search, Heuristic Functions, Beyond Classical Search: Hill-Climbing Search, Simulated Annealing Search, Local Search in Continuous Spaces

UNIT – II **[10 Lectures]**

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPS, Local Search for CSPS, Structure of Problems.

Propositional Logic: Knowledge-Based Agents, Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and Proofs, Proof by Resolution, Horn Clauses and Definite Clauses, Forward and Backward Chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT – III **[8 Lectures]**

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT – IV [8 Lectures]

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

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, Other Classical Planning Approaches, Analysis of Planning Approaches.

UNIT – V [10 Lectures]

Uncertain Knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Bayes' Rule and Uses **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning, Dempster-Shafer Theory.

TEXT BOOK:

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

REFERENCE BOOKS:

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

WEBLINKS:

1. https://www.geeksforgeeks.org/difference-between-business-intelligence-and-data-warehouse/
2. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

WEB PROGRAMMING (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS513PE

Prerequisites:

1. A Course on "Object Oriented Programming through Java".

Course Objectives:

1. To learn the concepts of HTML, XML for creating web pages.
2. To learn about client-side scripting using JavaScript
3. To design webpages using AngularJS and ReactJS
4. To introduce server-side programming with servlets
5. To learn about server-side programming using JSP

Course Outcomes: After the completion of this course the student will able to:

1. Design web pages using HTML & XML.
2. Apply client-side scripting using JavaScript.
3. Design webpages using AngularJS and ReactJS.
4. Build server-side applications using servlets.
5. Apply server-side programming using JSP.

UNIT - I **[10 Lectures]**

Introduction to HTML: HTML Basic Tags- List, Tables, Images, Forms, Frames; Cascading Style Sheets; Reading Data from Web Form Controls Like Text Boxes, Radio Buttons and etc., Webpage Designing using HTML, CSS3, HTML5, HTML Canvas.

Introduction to XML: Defining XML Tags, Attributes and Values, Differences between HTML and XML, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data, DOM and SAX Parsers in Java.

UNIT - II **[8 Lectures]**

Client-Side Scripting: Introduction to JavaScript, JavaScript Language: Declaring Variables, Scope of Variables, Operators and Expressions, Functions. Event Handlers, Document Object Model, Form Validation.

UNIT - III **[8 Lectures]**

AngularJS: Angular MVC, AngularJS Expressions, Controllers, Tables, DOM, Forms, Validation, AJAX, AngularJS Animation.

ReactJS: Introduction, Features of React, React Installation, ReactJS Vs AngularJS, ReactJS and VueJS, React Forms, React Events, React Lists, React Tables, React CSS, React Animation.

UNIT - IV **[9 Lectures]**

Introduction to Servlets: Common Gateway Interface (CGI), Life Cycle of a Servlet, Deploying a Servlet, The Servlet API, Reading Servlet Parameters, Reading Initialization Parameters, Handling HTTP Request and Responses, Using Cookies and Sessions.

UNIT V **[8 Lectures]**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, Implicit Objects, Using Beans in JSP Pages, Using Cookies and Session for Session Tracking, Connecting to Database in JSP.

TEXT BOOKS:

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How to Program 5th Edition.
2. Uttam K Roy, "Web Programming", Oxford University Press, 2nd Edition, 2010.

REFERENCE BOOKS:

1. John Pollock, JavaScript - A Beginners Guide, 3rd Edition –- Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.
3. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.

WEB LINKS:

1. https://www.geeksforgeeks.org/internet-and-web-programming/
2. https://www.visualpathedu.com/home/course/ui-development/9
3. https://www.visualpathedu.com/home/course/javascript-training/10
4. https://www.visualpathedu.com/home/course/ui-ux-design-training/199
5. https://www.coursera.org/learn/django-database-web-apps
6. https://extension.harvard.edu/academics/programs/web-technologies-certificate/#outcomes
7. https://www.coursera.org/learn/html-css-javascript-for-web-developers
8. https://www.coursera.org/specializations/web-design
9. https://www.coursera.org/learn/web-development
10. https://www.udemy.com/course/web-developer-course-on-creating-a-business-website

IMAGE PROCESSING (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS514PE

Prerequisites:

1. A course on "Mathematical and Statistical Foundations".

Course Objectives:

1. To learn the concepts of Digital Image Fundamentals.
2. To explore image enhancement techniques.
3. To know the image restoration and segmentation models.
4. To analyze image compression techniques.
5. To learn about pattern recognition in images

Course Outcomes: After completion of this course, the students will be able to:

1. Explore the basic concepts of Image processing fundamentals.
2. Articulate image enhancement techniques.
3. Apply image restoration and segmentation models.
4. Examine image compression Techniques
5. Analyze patterns recognized in images

UNIT – I **[10 Lectures]**

Digital Image Fundamentals: Light and Electromagnetic Spectrum, Components of Image Processing System, Image Formation and Digitization Concepts, Neighbors of Pixel Adjacency Connectivity, Regions and Boundaries, Distance Measures, Applications.

UNIT– II **[8 Lectures]**

Image Enhancements: Spatial Domain, Basic Gray Level Transformations, Histogram Processing, Using Arithmetic/Logic Operations, Smoothing Spatial Filters, Sharpening Spatial Filters.

Frequency Domain: Introduction to Fourier Transform, Frequency Domain Concepts, Smoothing Frequency, Domain Filters, Sharpening Frequency Domain Filters.

UNIT – III **[8 Lectures]**

Image Restoration: Noise Models, Mean Filters, Order Statistics, Adaptive Filters, Band Reject Filters, Band Pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener Filtering.

Segmentation: Edge Detection, Edge Linking and Boundary Detection, Region Based Segmentation, Morphological Processing, Erosion and Dilation.

UNIT – IV **[8 Lectures]**

Compression: Image Compression Redundancies, Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

Representation and Descriptions: Introduction to Some Descriptors, Chain Codes, Signatures, Shape Numbers, Fourier Descriptors.

UNIT – V **[10 Lectures]**

Recognition: Patterns, Pattern Classes, Decision-Theoretic Methods, Introduction to Neural Networks, Neural Network Based Image Recognition.

Pattern Recognition: Overview of Pattern Recognition with Block Diagram.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

WEB LINKS:

1. https://archive.nptel.ac.in/courses/117/105/117105135/
2. https://www.coursera.org/specializations/image-processing
3. https://www.coursera.org/courses?query=image%20processing
4. https://www.udemy.com/topic/image-processing/
5. https://www.classcentral.com/course/computervision-imageprocessing-13567
6. https://www.v7labs.com/blog/image-processing-guide

COMPUTER GRAPHICS (Professional Elective – I)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS515PE

Prerequisites:
1. A course on "Programming for Problem Solving".
2. A course on "Data Structures".

Course Objectives:
1. To study the Fundamental concepts of computer graphics.
2. To explore the knowledge of 2D geometrical transformations.
3. To learn about 3D Object representation.
4. To explore the concept of 3D geometrical transformations.
5. To gain knowledge of computer animation.

Course Outcomes: After the completion of the course the students will be able to:
1. Enumerate the applications of computer graphics.
2. Design 2D geometric transformations and 2D viewing functions.
3. Construct 3D object representation using surfaces
4. Apply the geometric projections for 3D objects.
5. Analyze animation sequence and visible surface detection methods.

UNIT – I **[10 Lectures]**

Introduction: Application Areas of Computer Graphics, Overview of Graphics Systems, Video-Display Devices, Raster-Scan Systems, Random-Scan Systems, Graphic Monitors, Work Stations and Input Devices.

Output Primitives: Points and Lines, Line Drawing Algorithms, DDA and Bresenham's Algorithms, Circle Generating Algorithms, Ellipse Generating Algorithms.

Polygon Filling: Scan Line Algorithm, Boundary-Fill and Flood-Fill Algorithms.

UNIT – II **[9 Lectures]**

2-D Geometric Transformations: Translation, Scaling, Rotation, Reflection and Shear Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transforms, Transformations Between Coordinate Systems

2-D Viewing: Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Clipping Operations, Point Clipping, Line Clipping: Cohen Sutherland Algorithms, Polygon Clipping: Sutherland Hodgeman Polygon Clipping Algorithms.

UNIT – III **[9 Lectures]**

3-D Object Representation: Polygon Surfaces, Quadric Surfaces, Spline Representation, Hermite Curve, Bezier Curve and B-Spline Curves, Bezier and B-Spline Surfaces, Polygon Rendering Methods, Color Models and Color Applications.

UNIT – IV **[8 Lectures]**

3-D Geometric Transformations: Translation, Rotation, Scaling, Reflection, Shear Transformations, Composite Transformations.

3-D Viewing: Viewing Pipeline, Viewing Coordinates, Projections, View Volume and General Projection Transforms and Clipping.

UNIT – V **[8 Lectures]**

Computer Animation: Design of Animation Sequence, General Computer Animation Functions, Raster Animations, Computer Animation Languages, Key Frame Systems, Motion Specifications.

Visible Surface Detection Methods: Classification, Back-Face Detection, Depth-Buffer Method, BSP- Tree Method, Area Sub-Division Method and Octree Method.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEBLINKS:

1. https://www.javatpoint.com/computer-graphics-tutorial
2. https://onlinecourses.nptel.ac.in/noc20_cs90/preview

SPATIAL AND MULTIMEDIA DATABASES (Professional Elective - II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS521PE

Course Objective:

1. To know the introduction to spatial databases and data models.
2. To learn about the indexing structures for spatial and multimedia data.
3. To understand the basic concepts of image databases.
4. To gain knowledge of audio, video, and multimedia databases.
5. To learn about the creation and presentation of distributed multimedia servers.

Course Outcomes: After completion of this course, the students will be able to:

1. Explore the basic concepts of spatial databases and data models.
2. Apply indexing structures for spatial and multimedia data.
3. Represent image database with R-tree.
4. Design multimedia databases.
5. Store and retrieve multimedia data.

UNIT – I **[10 Lectures]**

Introduction to Spatial Databases: Overview, Beneficiaries, GIA and SDBMS, Users, Space Taxonomy, Query Language, Query Processing, Query Optimization.

Spatial Concepts and Data Models: Models of Spatial Information, Three Step Database Design, Extending the ER Model with Spatial Concept, Object-Oriented Data Modeling, Spatial Query Languages.

UNIT – II **[8 Lectures]**

Spatial Storage and Indexing: Storage-Disks and Files, Spatial Indexing, TR*, Spatial Join Index. Query Processing and Optimization, Evaluation of Spatial Operations, Query Optimization, Analysis of Spatial Index Structures, Distributed and Parallel Spatial Database System.

Multidimensional Data Structures: K-D Trees, Point Quadtrees, MX-Quadtree, R-Trees, Comparison of Different Data Structures.

UNIT – III **[10 Lectures]**

Image Databases: Raw Images, Compressed Image Representations,

Image Processing: Segmentation, Similarity-Based Retrieval, Alternative Image DB Paradigms, Representing Image DBs with Relations, Representing Image DBs with R-Trees, Retrieving Images by Spatial Layout, Implementations.

Text/Document Databases: Precision and Recall, Stop Lists, Word Stems, Frequency Tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques.

UNIT – IV **[10 Lectures]**

Video Databases: Organizing Content of a Single Video, Querying Content of Video Libraries, Video Segmentation, Video Standards.

Audio Databases: A General Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data.

Multimedia Databases: Design and Architecture of a Multimedia Database, Organizing Multimedia Data Based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/Expansion.

UNIT – V [8 Lectures]

Creating Distributed Multimedia Presentations: Objects in Multimedia Presentations, Specifying Multimedia Documents with Temporal Constraints, Efficient Solution of Temporal Presentation Constraints, Spatial Constraints.

Distributed Media Servers: Distributed Multimedia Server Architecture, Distributed Retrieval Plans, Optimal Distributed Retrieval Plans.

TEXT BOOKS:

1. Shashi Shekhar, Sanjiv Chawla, Spatial Databases-A Tour, Pearson Education.
2. V.S. Subrahmanian, Principles of Multimedia Database Systems, Morgan Kauffman.

REFERENCE BOOK:

1. Multimedia Databases: An object relational approach, Lynne Dunckley, Pearson Education.
2. Multimedia Database Systems, Prabhakaran, Springer.

INFORMATION RETRIEVAL SYSTEMS (Professional Elective - II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS522PE

Prerequisites:

1. A course on "Data Structures".
2. A course on "Data Base Management Systems".

Course Objectives:

1. To learn the basic concepts of Information Retrieval Systems
2. To know about cataloging, indexing and Data Structures
3. To design document and term clustering algorithms.
4. To explore user search techniques and information visualization.
5. To learn about text search algorithms and multimedia information retrieval.

Course Outcomes: After the completion of this course, the students will be able to:

1. Apply Information Retrieval principles to locate relevant information from large collection of data.
2. Develop data models using statistical approaches.
3. Implement different document and term clustering algorithms.
4. Design an Information Retrieval System for web search tasks.
5. Apply visualization tools for multimedia information retrieval.

UNIT – I **[10 Lectures]**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

UNIT – II **[9 Lectures]**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction to Data Structures, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT – III **[10 Lectures]**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT – IV **[9 Lectures]**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT – V **[9 Lectures]**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.

WEBLINKS:

1. https://www.geeksforgeeks.org/what-is-information-retrieval/
2. https://onlinecourses.nptel.ac.in/noc24_ee47/preview

SOFTWARE PROJECT MANAGEMENT (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS523PE

Prerequisites: A course on "Software Engineering".

Course Objectives:

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development
3. To explore model-based software architectures.
4. To understand software economics, workflows and frameworks.
5. To learn about project control and process instrumentation.

Course Outcomes: After completion of this course, the students will be able to:

1. Understand the software economics to improve various phases of development.
2. Examine the life cycle phases, artifacts, workflows and checkpoints of a process.
3. Demonstrate the software project framework components.
4. Analyze the need for various software management disciplines.
5. Assess various software management metrics.

UNIT – I **[10 Lectures]**

Software Management Renaissance

Conventional Software Management: Waterfall Model, Conventional Software Management Performance. Evolution of 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.

UNIT – II **[9 Lectures]**

A Software Management Process Framework-I

The Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an Iterative Process; Life Cycle Phases: Engineering and Production Stages, Inception, Elaboration, Construction, Transition Phases; Artifacts of the Process: Artifact Sets, Management Artifacts, Engineering Artifacts, Programmatic Artifacts.

UNIT – III **[8 Lectures]**

A Software Management Process Framework-II

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 Milestones, Minor Milestones, Periodic Status Assessments.

UNIT – IV **[9 Lectures]**

Software Management Discipline-I

Iterative Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating, Iteration Planning Process, Pragmatic Planning; Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, Evolution of Organizations; Process Automation: Automation Building Blocks, Project Environment.

UNIT – V [9 Lectures]

Software Management Discipline-II

Project Control and Process Instrumentation: The Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations, Pragmatic Software Metrics, Metrics Automation; Tailoring the Process: Process Discriminates; Future Software Project Management: Modern Project Profiles, Next Generation Software Economics, Modern Process Transitions; Case Study: Command Center Processing and Display System-Replacement (CCPDS-R).

TEXT BOOK:

1. Software Project Management, Walker Royce, Addison-Wesley Pearson Education, 2005.

REFERENCE BOOKS:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education. 2005.

DEVOPS (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS523PE

Pre-Requisites:
1. A course on "Software Engineering".
2. A course on "Software Project Management"

Course Objectives:
1. To describe the agile relationship between development and IT operations.
2. To know the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. To explore project management tools.
4. To understand system integration.
5. To impart testing tools, automation, and deployment of the system.

Course Outcomes: After completion of this course, the students will be able to:
1. Explore various components of Devops environment.
2. Identify Software development models and architectures of DevOps.
3. Apply different project management models.
4. Investigate different DevOps Software development models, integration, Collaborate and adopt Devops in real-time projects.
5. Assess various Devops practices, testing and code deployment tools.

UNIT- I **[9 Lectures]**

Introduction to DevOps:

Introduction, Agile Development Model, DevOps and ITIL, DevOps Process and Continuous Delivery, Release Management, Scrum, Kanban, Delivery Pipeline, Identifying Bottlenecks.

UNIT- II **[9 Lectures]**

Software Development Models and DevOps:

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing; DevOps Influence on Architecture: Introducing Software Architecture, Monolithic Scenario, Architecture Rules of Thumb, Separation of Concerns, Handling Database Migrations, Micro Services and Data Tier, DevOps, Architecture, Resilience.

UNIT- III **[9 Lectures]**

Introduction to Project Management:

The Need for Source Code Control, The History of Source Code Management, Roles and Code, Source Code Management System and Migrations, Shared Authentication, Hosted Git Servers, Different Git Server Implementations, Docker Intermission, Gerrit, The Pull Request Model, GitLab.

UNIT- IV **[9 Lectures]**

Integrating the System:

Build Systems, Jenkins Build Server, Managing Build Dependencies, Jenkins Plugins, File System Layout, The Host Server, Build Slaves, Software on the Host, Triggers, Job Chaining and Build Pipelines, Build Servers and Infrastructure as Code, Building by Dependency Order, Build Phases, Alternative Build Servers, Collating Quality Measures.

UNIT- V **[10 Lectures]**

Testing Tools and Deployment:

Various Types of Testing, Automation of Testing Pros and Cons; Selenium: Introduction, Selenium Features, JavaScript Testing, Testing Backend Integration Points, Test-Driven Development, REPL-Driven Development; Deployment of the System: Deployment Systems, Virtualization Stacks, Code Execution at the Client, Puppet Master and Agents, Ansible; Deployment Tools: Chef, Salt Stack and Docker.

TEXT BOOK:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

REFERENCE BOOKS:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

WEB LINKS:

1. https://nptel.ac.in/courses/128106012
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/azure-devops-and-micro-services-azurekubernetes-deployment-models/
3. https://www.coursera.org/learn/intro-to-devops
4. https://www.udemy.com/course/devops-fundamentals-for-beginners/
5. https://dev.to/javinpaul/my-favorite-free-courses-to-learn-devops-in-2023-4h6m
6. https://www.udemy.com/topic/DevOps/?utm_source=adwords&utm_medium=udemyads&utm_campaign=Brand-Topic_la.EN_cc.INDIA&utm_content=deal4584&utm_term=
7. https://www.techtarget.com/whatis/feature/9-best-free-DevOps-certifications-and-training-courses

COMPUTER VISION AND ROBOTICS (Professional Elective – II)

B. Tech. V Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS524PE

Pre-Requisites:

1. A course on "Linear Algebra and Probability".

Course Objectives:

1. To know the Fundamental concepts related to sources, shadows and shading.
2. To learn about filters, edge detection and texture analysis.
3. To learn about segmentation by clustering.
4. To know about Geometric camera models and Geometric camera calibration.
5. To learn about common sensing techniques for reactive robots.

Course Outcomes: After the completion of this course the student can be able to:

1. Apply fundamental image processing techniques required for computer vision.
2. Examine Linear Filters, Edge Detection and Texture Analysis.
3. Apply segmentation by clustering.
4. Develop segmentation and Fitting using Probabilistic methods.
5. Enumerate common sensing techniques for reactive robots.

UNIT – I **[12 Lectures]**

CAMERAS: Pinhole Cameras

Radiometry Measuring Light: Light in Space, Light Surfaces, Important Special Cases Sources; Shadows and Shading: Qualitative Radiometry, Sources and Effects, Local Shading Models; Application: Photometric Stereo; Interreflections: Global Shading Models; Color: Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT – II **[10 Lectures]**

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.

Edge Detection: Noise, Estimating Derivatives, Detecting Edges.

Texture: Representing Texture, Analysis and Synthesis using Oriented Pyramids; Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT – III **[10 Lectures]**

Geometry of Multiple Views: Two Views.

Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras

Segmentation by Clustering: Segmentation; Human Vision: Grouping and Getstalt; Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph Theoretic Clustering.

UNIT – IV **[9 Lectures]**

Segmentation by Fitting a Model: Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness.

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and Perspective Projection, Affine Cameras and Affine Projection Equations.

Geometric Camera Calibration: Least Squares Parameter Estimation, Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry; Application: Mobile Robot Localization.

UNIT – V **[9 Lectures]**

Introduction to Robotics: Social Implications of Robotics, History of Robotics, Attributes of Hierarchical Paradigm, Closed World Assumption and Frame Problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential Fields and Perception.

Common Sensing Techniques for Reactive Robots: Logical Sensors, Behavioral Sensor Fusion, Proprioceptive Sensors, Proximity Sensors, Topological Planning and Metric Path Planning.

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

WEBLINKS:

1. https://www.javatpoint.com/computer-vision
2. https://onlinecourses.nptel.ac.in/noc24_ee38/preview

R PROGRAMMING LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS504PC

Pre-requisites: Any programming language.

Course Objectives:

1. Familiarize with R basic programming concepts, various data structures for handling datasets, various graph representations and Exploratory Data Analysis concepts

Course Outcomes:

1. Setup R programming environment.
2. Understand and use R – Data types and R – Data Structures.
3. Develop programming logic using R – Packages.
4. Analyze data sets using R – programming capabilities

LIST OF EXPERIMENTS:

1. Download and install R-Programming environment and install basic packages using install. packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write R command to
   i) Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
   ii) Enumerate multiplication and division operations between matrices and vectors in R console
4. Write R command to
   i) Illustrates the usage of Vector subsetting and Matrix subsetting
   ii) Write a program to create an array of 3×3 matrices with 3 rows and 3 columns.
5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file
6. Create a CSV file having Speed and Distance attributes with 1000 records. Write R program to draw i) Box plots
   ii) Histogram
   iii) Line Graph
   iv) Multiple line graphs
   v) Scatter plot
   to demonstrate the relation between the cars speed and the distance.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.
9. Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

REFERENCE BOOKS:

1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press

BIG DATA ANALYTICS LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS505PC

Course Objectives:

1. Provide knowledge of Big data Analytics principles and techniques.
2. Designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes: After completion of this course, the students will be able to:

1. Use Excel as an Analytical tool and visualization tool.
2. Ability to program using HADOOP and Map reduce
3. Ability to perform data analytics using ML in R.
4. Use MongoDB to perform data analytics.

List of Experiments:

1. Create a Hadoop cluster
2. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop).
3. Process big data in HBase
4. Store and retrieve data in Pig
5. Perform data analysis using MongoDB
6. Using Power Pivot (Excel) Perform the following on any dataset
    a. Big Data Analytics
    b. Big Data Charting

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

COMPUTER NETWORKS LAB

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS506PC

Co-requisite: A Course on "Computer Networks".

Prerequisites:
1. A course on "Programming for problem solving."
2. A course on "Data Structures"

Course Objectives:
1. To understand the working principle of various communication protocols.
2. To analyze the traffic flow and the contents of protocol frames.
2. To interpret various routing algorithms.
3. To explore the concepts of data encryption and decryption.
4. To know congestion control and network and operating functionalities.

Course Outcomes: After completion of this course, the students will be able to:
1. Implement data link layer farming methods.
2. Analyze error detection and error correction codes.
3. Design and analyze routing and congestion issues in network design.
4. Develop Encoding and Decoding techniques used in presentation layer
5. Work with different network tools

List of Experiments
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRCCCIP
3. Develop a simple data link layer that performs flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. How to run N map scan.
11. Operating System Detection using N map.
12. Study of basic Network configuration commands and utilities to debug the network issues.

TEXT BOOK:

1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5th Edition, Pearson Education/PHI, 2011.
2. Behrouz A. Forouzan -Data Communications and Networking,4th Edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. S. Keshav, An Engineering Approach to Computer Networks, Addison Wesley, 1st edition, 2010.
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2010.
3. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw-Hill, 2004.

WEB LINKS:

1. https://www.bits-pilani.ac.in/computer-networks-network-programming-lab/
2. What Is a Computer Network? Definition, Objectives, Components, Types, and Best Practices - Spiceworks
3. What is Computer Networking? - Networking in Computers Explained - AWS (amazon.com)
4. What is Computer Networking? - GeeksforGeeks
5. Prof Soumya Kanti Ghosh & Prof Sandip Chakraborty (youtube.com)
6. Introduction to Computer Networks (youtube.com)

ETL-KAFKA/TALEND

B. Tech. V Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS507PC

Course Objectives:

1. Develop a comprehensive understanding of Extract, Transform, Load (ETL) processes using Apache Kafka and Talend.
2. Understand how to scale Kafka clusters seamlessly to handle growing data volumes, ensuring optimal performance for ETL operations.

Course Outcomes:

1. Learn to design and deploy fault-tolerant Kafka clusters, ensuring data integrity and availability in real-world scenarios.
2. Gain practical experience in cluster management, topic creation, and basic operations such as producing and consuming messages.

LIST OF EXPERIMENTS:

1. Install Apache Kafka on a single node.
2. Demonstrate setting up a single-node, single-broker Kafka cluster and show basic operations such as creating topics and producing/consuming messages.
3. Extend the cluster to multiple brokers on a single node.
4. Write a simple Java program to create a Kafka producer and Produce messages to a topic.
5. Implement sending messages both synchronously and asynchronously in the producer.
6. Develop a Java program to create a Kafka consumer and subscribe to a topic and consume messages.
7. Write a script to create a topic with specific partition and replication factor settings.
8. Simulate fault tolerance by shutting down one broker and observing the cluster behavior.
9. Implement operations such as listing topics, modifying configurations, and deleting topics.
10. Introduce Kafka Connect and demonstrate how to use connectors to integrate with external systems.
11. Implement a simple word count stream processing application using Kafka Stream
12. Implement Kafka integration with the Hadoop ecosystem.

TEXT BOOK:

1. Neha Narkhede, Gwen Shapira, Todd Palino, Kafka – The Definitive Guide: Real-time data and stream processing at scale, O′Reilly

INTELLECTUAL PROPERTY RIGHTS

B. Tech. V Semester

L	T	P	C
3	0	0	0

Subject Code: 22DS508MC

Course Objectives:

1. To explore intellectual property rights.
2. To outline the basics of trademarks.
3. To describe the copyrights and its laws.
4. To learn about the nature of trade secrets and unfair competition.
5. To define the new developments of intellectual property rights.

Course Outcomes: After completion of this course, the students will be able to:

1. Interpret intellectual property rights.
2. Identify different types of trademarks and related laws.
3. Examine copyrights and their laws.
4. Differentiate the trade secrets and unfair competition.
5. Enumerate the new developments of intellectual property.

UNIT– I **[7 Lectures]**

Introduction to Intellectual Property: Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.

UNIT– II **[7 Lectures]**

Trademarks: Purpose and Function of Trademarks, Acquisition of Trade Mark Rights, Protectable Matter, Selecting and Evaluating Trademark, Trademark Registration Processes.

UNIT– III **[10 Lectures]**

Law of Copy Rights: Fundamental of Copy Right Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copyright Registration, Notice of Copy Right, International Copy Right Law.

Law Of Patents: Foundation of Patent Law, Patent Searching Process, Ownership Rights and Transfer.

UNIT– IV **[8 Lectures]**

Trade Secrets: Trade Secrete Law, Determination of Trade Secrete Status, Liability for Misappropriation of Trade Secrets, Protection for Submission, Trade Secrete Litigation.

Unfair Competition: Misappropriation of Right of Publicity, False Advertising.

UNIT– V **[8 Lectures]**

New Development of Intellectual Property: New Developments in Trademark Law, Copy Right Law, Patent Law, Intellectual Property Audits, International Overview on Intellectual Property, International Trademark Law, Copyright Law, International Patent Law, International Development in Trade Secrets Law.

TEXT BOOKS:

1. Deborah E. Bouchoux, Intellectual Property: The Law Of Trademarks Copyrights Patents And Trade Secrets, 4Th Edn, Cengage India, 2015.
2. Prabuddha ganguli, Intellectual property right – Unleashing the knowledge economy, McGraw Hill Education, 1st edition, 2017.

REFERENCEBOOKS:

1. William M. Landes, Richard A. Posner, The Economic Structure of Intellectual Property Law, Belknap Press, Illustrated edition, 2003.
2. Rami M. Olwan, Intellectual Property and Development: Theory and Practice, Springer-Verlag Berlinand Heidelberg GmbH & Co. K, 2013th edition, 2015.
3. VK Ahuja, Law Relating to Intellectual Property Rights, Lexis Nexis, Thirdedition,2017.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc22_hs59/preview
2. https://www.coursera.org/learn/introduction-intellectual-property
3. https://www.udemy.com/topic/intellectual-property/
4. https://allea.org/intellectual-property-rights/
5. https://www.stopfakes.gov/Online-Intellectual-Property-Training-Module

MACHINE LEARNING

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS601PC

Prerequisites:
1. A course on "Mathematical and Statistical Foundations"
2. A course on "Programming with Python".
3. A course on "Data Structures"

Course Objectives:
1. To introduce the basic concepts of Machine Learning.
2. To learn about multi-layer perceptron and radial basis functions.
3. To know about decision trees and ensemble learning.
4. To learn about dimensionality reduction and evolutionary learning.
5. To know about Reinforcement learning and Markov chain monte carlo methods.

Course Outcomes: After completion of this course, the students will be able to:
1. Enumerate the basic concepts of machine learning.
2. Build classifiers using multi-layer perceptron and support vector machine.
3. Apply ensemble learning to increase the classification accuracy.
4. Make use of dimensionality reduction and evolutionary computing algorithms.
5. Apply Markov Chain Monte Carlo methods on real datasets.

UNIT – I **[12 Lectures]**

Introduction: Learning, Types of Machine Learning, Supervised Learning, The Brain and the Neuron, Design a Learning System, Perspectives and Issues in Machine Learning, Concept Learning Task, Concept Learning as Search, Finding a Maximally Specific Hypothesis, Version Spaces and Candidate Elimination Algorithm, Linear Discriminates, Perceptron, Linear Separability, Linear Regression.

UNIT – II **[10 Lectures]**

Multi-Layer Perceptron: Going Forwards, Going Backwards, Back Propagation Error, Multi-Layer Perceptron in Practice, Examples of using the MLP, Deriving Back-Propagation.

Radial Basis Functions and Splines: Concepts, RBF Network, Curse of Dimensionality, Interpolations and Basis Functions, Support Vector Machine.

UNIT – III **[10 Lectures]**

Learning with Trees: Decision Trees, Constructing Decision Trees, Classification and Regression Trees.

Ensemble Learning: Boosting, Bagging, Different ways to Combine Classifiers, Basic Statistics, Gaussian Mixture Models, Nearest Neighbour Methods.

Unsupervised Learning: K-Means Algorithm.

UNIT - IV **[9 Lectures]**

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis, Factor Analysis, Independent Component Analysis, Locally Linear Embedding, Isomap, Least Squares Optimization.

Evolutionary Learning: Genetic Algorithms, Genetic Offspring, Genetic Operators, Using Genetic Algorithms.

UNIT - V **[9 Lectures]**

Reinforcement Learning: Overview of Reinforcement Learning, Getting Lost Example.

Markov Chain Monte Carlo Methods: Sampling, Proposal Distribution, Markov Chain Monte Carlo.

Graphical Models: Bayesian Networks, Markov Random Fields, Hidden Markov Models, Tracking Methods.

TEXT BOOKS:

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and all/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

WEBLINKS:

1. https://www.geeksforgeeks.org/machine-learning.
2. https://onlinecourses.nptel.ac.in/noc23_cs18/preview

ALGORITHM DESIGN AND ANALYSIS

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS602PC

Prerequisites:
1. A course on "Computer Programming and Data Structures".
2. A course on "Advanced Data Structures".

Course Objectives:
1. Introduces the notations for analysis of the performance of algorithms.
2. Describes major algorithmic techniques and mention problems for which each technique is appropriate;
3. Describes how to evaluate and compare different algorithms using worst, average, and best- case analysis.
4. To solve problems using algorithm design methods such as backtracking and branch and bound.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes: After completion of this course, the students will be able to:
1. Analyze the performance of algorithms
2. Design the algorithm using the divide and conquer greedy approach.
3. Implement dynamic programming strategy.
4. Apply the backtracking technique and branch and bound.
5. Construct the algorithm using the non-deterministic algorithm.

UNIT – I **[10 Lectures]**

Introduction: Algorithm, Performance Analysis: Space complexity, Time complexity; Asymptotic Notations: Big Oh Notation, Omega Notation, Theta Notation and Little Oh Notation.

Divide And Conquer: General Method, Applications: Binary Search, Quick Sort, Merge Sort, Strassen's Matrix Multiplication.

UNIT – II **[8 Lectures]**

Disjoint Sets: Disjoint Set Operations, Union and Find Algorithms, Priority Queue, Heaps, Heapsort.

Backtracking: General Method, Applications, N-Queen's Problem, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

UNIT – III **[8 Lectures]**

Dynamic Programming: General Method, Applications: Optimal Binary Search Tree, 0/1 Knapsack Problem, All Pairs Shortest Path Problem, Traveling Sales Person Problem, Reliability Design.

UNIT – IV **[8 Lectures]**

Greedy Method: General Method, Applications: Job Sequencing with Deadlines, Knapsack Problem, Minimum Cost Spanning Trees, Single Source Shortest Path Problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected Components, Biconnected Components.

UNIT – V **[10 Lectures]**

Branch and Bound: General Method, Applications: Travelling Sales Person Problem, 0/1 Knapsack Problem: LC Branch and Bound Solution, FIFO Branch and Bound Solution.

NP-Hard and NP-Complete Problems: Basic Concepts, Non-Deterministic Algorithms, NP-Hard and NP-Complete Classes, Cook's Theorem.

TEXT BOOK:

1. Ellis Horowitz, Sartaj Sahni and S. Raja sekharan, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2012.
2. P. H. Dave, H.B .Dave, Design and Analysis of Algorithms,2nd edition, Pearson Education, 2013.

REFERENCEBOOKS:

1. M.T. Good rich and R. Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John Wiley and sons, 2001.
2. S. Sridhar, Design and Analysis of Algorithms, Oxford Univ.Press,2014.
3. Aho, Ullman and Hop croft, Design and Analysis of algorithms, Pearson Education, 1st Edition, 2002.
4. R. Neapolitan and K.Naimipour, Foundations of Algorithms,4thedition,JonesAndBartlett India Private Limited, 2010.
5. T. H. Cormen, C. E.Leiserson, R. L. Rivest, and Stein, Introduction to Algorithms, 3rd Edition, PHI, 2010.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://www.coursera.org/learn/analysis-of-algorithms
3. https://www.udemy.com/course/design-and-analysis-of-algorithms/
4. https://www.classcentral.com/course/youtube-design-and-analysis-of-algorithms-daa-46806

AUTOMATA THEORY AND COMPILER DESIGN

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS603PC

Prerequisites: None

Course Objectives:

1. To introduce the fundamental concepts of formal languages, grammars and automata theory.
2. To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
3. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
4. Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation.
5. To understand run-time environment while executing the program.

Course Outcomes: After completion of this course, the students will be able to:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

UNIT - I **[12 Lectures]**

Introduction to Finite Automata: Structural Representations, Automata and Complexity, Central Concepts of Automata Theory: Alphabets, Strings, Languages, Problems. **Nondeterministic Finite Automata:** Formal Definition, Application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition, Processing Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions, Conversion of NFA to DFA.

UNIT - II **[10 Lectures]**

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

Pumping Lemma for Regular Languages: Statement of the Pumping Lemma, Applications of Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations using a Grammar, Leftmost and Rightmost Derivations, Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT - III **[10 Lectures]**

Push Down Automata: Definition of the Pushdown Automaton, Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by Final State.

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous Description, Language of a Turing Machine.

Undecidability: Undecidability, A Language that is not Recursively Enumerable, An Undecidable Problem that is RE, Undecidable Problems about Turing Machines.

UNIT - IV **[10 Lectures]**

Introduction: The Structure of a Compiler.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex.

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing,

Introduction to LR Parsing: Simple LR, More Powerful LR Parsers.

UNIT - V **[10 Lectures]**

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code.

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandra shekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry
2. D. Ullman, 2nd Edition, Pearson.
3. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
4. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
5. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
6. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

SOFTWARE TESTING METHODOLOGIES

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS631PE

Prerequisites: A course on "Software Engineering"

Course Objectives:

1. To introduce the concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To understand the transaction flow, data flow and domain testing techniques.
3. To explore the logic-based testing technique.
4. To describe the testing based on state graphs and transitions.
5. To know the software test automation and management using the latest tools.

Course Outcomes: After completion of this course, the students will be able to:

1. Compare and contrast the various testing strategies.
2. Impart skills to perform dataflow testing and domain testing strategies.
3. Detect anomalies and build decision tables and KV charts.
4. Apply the graph-based testing metrics to its application.
5. Implement test cases using any automated testing tools (Jmeter or WinRunner).

UNIT – I **[10 Lectures]**

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

Flow Graphs and Path Testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT – II **[10 Lectures]**

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.

Data Flow Testing: Basics of Data Flow Testing, Strategies in Data Flow Testing, Application of Data Flow Testing.

Domain Testing: Domains and Paths, Nice and Ugly Domains, Domain Testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains And Testability.

UNIT – III **[9 Lectures]**

Paths, Path Products and Regular Expressions: Path Products and Path Expression, Reduction Procedure, Applications, Regular Expressions and Flow Anomaly Detection.

Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

UNIT – IV **[9 Lectures]**

State, State Graphs and Transition Testing: State Graphs, Good and Bad State Graphs, State Testing, Testability Tips.

UNIT – V **[9 Lectures]**

Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools. (Student Should Be Given an Exposure to a Tool Like JMeter/Selenium/SoapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dream tech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dream tech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://www.coursera.org/courses?query=software%20testing
3. https://www.udemy.com/courses/development/software-testing/
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/software-testing-fundamentals1
5. https://smartbear.com/learn/automated-testing/software-testing-methodologies/

DATA VISUALIZATION TECHNIQUES (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS632PE

Prerequisites: None

Course Objective:

1. To understand various types of graphs for data visualization.
2. To learn data visualization through graph representation.
3. To explore multidimensional scaling techniques.
4. To learn data visualization via kernel machines.
5. To know about parallel coordinates, notations, and applications.

Course Outcomes: After completion of this course, the students will be able to:

1. Know the historical development and evolution of data visualization techniques.
2. Analyze and visualize high-dimensional datasets using appropriate techniques.
3. Visualize large multidimensional datasets using appropriate methods.
4. Create insightful visual representations for diverse types of data.
5. Visualizations promote collaboration and interdisciplinary communication by providing a shared understanding of data among team members.

UNIT – I **[10 Lectures]**

Introduction, A Brief History of Data Visualization, Pre-Historic Data Visualization, Different Types of Graphs for Data Visualization: Line Charts, Bar Charts, Scatter Plots, Pie Charts, Column Charts, Tree Map Charts, Heatmap Charts, Pareto Charts, Geo Charts, Waterfall Charts, Good Graphics, Static Graphics, Static Visualizations Vs Interactive Visualizations.

UNIT – II **[10 Lectures]**

Data Visualization Through Graph Representations: Data and Graphs, Graph Layout Techniques, Force-Directed Techniques, Multidimensional Scaling, Pulling Under Constraints Model, Graph-Theoretic Graphics; High-Dimensional Data Visualization: Univariate Analysis, Visualizing Data in One Dimension (1-D), Multivariate Analysis: Visualizing Data in Two Dimensions (2-D), Multivariate Data Glyphs: Principles and Practice, Linked Views for Visual Exploration, Linked Data Views, Visualizing Trees and Forests.

UNIT – III **[10 Lectures]**

Multidimensional Scaling: Multiple Line Graphs, Permutation Matrix, Survey Plot, Scatter Plot Matrix, Parallel Coordinates, Tree Maps, Principal Component Analysis (PCA), Sammon's Mapping, Self-Organizing Maps (SOM), Comparison of Visualization Techniques, Huge Multidimensional Data Visualization, Multivariate Visualization by Density Estimation, Structured Sets of Graphs, Structural Adaptive Smoothing by Propagation, Separation Methods, Smoothing Techniques for Visualization, Exponential Smoothing, Moving Average Smoothing, Double Exponential Smoothing, Holt-Winters Smoothing.

UNIT – IV [8 Lectures]

Data Visualization via Kernel Machines, Kernel Machines in the Frame Work of an RKHS, Kernel Principal Component Analysis: Computation of KPCA, Kernel Canonical Correlation Analysis, Kernel Cluster Analysis, Visualizing Cluster Analysis, Common Applications of Clustering; Visualization and Finite Mixture Models: Flexible Method of Modeling, A Brief History, Formulation of Mixture Distribution; Visualizing Contingency Tables: Mosaic Displays for N-Way Tables, Fourfold Display, Mosaic Plots and Variants.

UNIT – V [10 Lectures]

Parallel Coordinates: Scenarios, Components of a Parallel Coordinate Plot, Interpreting Parallel Coordinate Plots, Advantages of Parallel Coordinate Plots, Comparison with other Visualization Techniques, Visualization, Exploration and Classification of High-Dimensional Data, Notations, Data Matrix Preparation Heatmaps, Clustering, Comparing Clustering's with Rand Index, Properties, Applications, Matrix Visualization, Visualization in Bayesian Data Analysis.

TEXT BOOKS:

1. Handbook of Data Visualization by Chun-houh Chen, 2008.
2. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.

REFERENCE BOOKS:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

SCRIPTING LANGUAGES (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS633PE

Prerequisites:
1. A course on "Computer Programming and Data Structures"
2. A course on "Object-Oriented Programming Concepts"

Course Objectives:
1. To understand the web service architecture and applications.
2. To introducing Ruby scripting.
3. To understand the basics of PERL programming.
4. To illustrate the advanced programming in PERL.
5. To Learn TCL.

Course Outcomes: After completion of this course, the students will be able to:
1. Comprehend the SOAP architecture and web services.
2. Extend the Ruby scripting language.
3. Apply the basic Perl programming language.
4. Implement the advanced programming in PERL.
5. Develop TCL programming and select an appropriate language for solving a given problem.

UNIT – I **[12 Lectures]**

Introduction: Ruby, Rails, Structure and Execution of Ruby Programs, Package Management with Ruby Gems.

Ruby and Web: Writing CGI Scripts, Cookies, Choice of Web Servers, SOAP and Web Services.

Ruby Tk: Simple Tk Application, Widgets, Binding Events, Canvas, Scrolling.

UNIT – II **[8 Lectures]**

Extending Ruby: Ruby Objects in C, Jukebox Extension, Memory Allocation, Ruby Type System, Embedding Ruby to other Languages, Embedding a Ruby Interpreter.

UNIT – III **[10 Lectures]**

Introduction to Perl and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, Universe of Scripting Languages.

Perl: Names and Values, Variables, Scalar Expressions, Control Structures, Arrays, List, Hashes, Strings, Pattern and Regular Expressions, Subroutines.

UNIT – IV **[10 Lectures]**

Advanced Perl: Finer Points of Looping, Pack and Unpack, File System, Eval, Data Structures, Packages, Modules, Objects, Interfacing to the Operating System, Creating Internet Ware Applications, Dirty Hands Internet Programming, Security Issues.

UNIT - V **[12 Lectures]**

TCL: TCL Structure, Syntax, Variables and Data in TCL, Control Flow, Data Structures, Input/Output, Procedures, Strings, Patterns, Files.

Advanced TCL: Eval, Source, Exec and Uplevel Commands, Name Spaces, Trapping Errors, Event Driven Programs, Making Applications Internet Aware, Nuts and Bolts, Internet Programming, Security Issues, C Interface.

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by Example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open-Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

WEB LINKS:

1. https://archive.nptel.ac.in/courses/117/106/117106113/
2. https://www.udemy.com/course/scripting-for-beginner/
3. https://freevideolectures.com/blog/free-courses-learn-scripting-language/
4. https://techenclave.com/threads/programming-and-scripting-links-and-resources.1325/
5. https://www.autoitscript.com/site/autoit/
6. https://www.tutorialspoint.com/ruby/ruby_overview.htm

MOBILE APPLICATION DEVELOPMENT (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS634PE

Prerequisites:
1. A Course on "JAVA programming"
2. A Course on "DBMS"

Course Objectives
1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To improve the skills of using Android software development tools.
3. To learn to broadcast and notifications on a mobile platform.
4. To explore persistent storage.
5. To understand database for mobile applications.

Course Outcomes: After completion of this course, the students will be able to:
1. Work on Android OS Practically.
2. Apply the concepts of mobile applications and user interfaces on Android.
3. Develop the broadcast and notifications on mobile applications.
4. Create persistent storage for Android Applications.
5. Design database for mobile Android Applications.

UNIT – I **[12 Lectures]**

Introduction to Android Operating System: Android OS Design and Features, Android Development Framework, SDK Features, Installing and Running Applications on Android Studio, Creating AVDs, Types of Android Applications, Best Practices in Android Programming, Android Tools.

Android Application Components: Android Manifest File, Externalizing Resources Like Values, Themes, Layouts, Menus etc., Resources for Different Devices and Languages, Runtime Configuration Changes.

Android Application Lifecycle: Activities, Activity Lifecycle, Activity States, Monitoring State Changes.

UNIT – II **[12 Lectures]**

Android User Interface: Measurements: Device and Pixel Density, Independent Measuring Units; Layouts: Linear, Relative, Grid and Table Layouts.

User Interface (UI) Components: Editable and Non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and Pickers.

Event Handling: Handling Clicks or Changes of Various UI Components.

Fragments: Creating Fragments, Lifecycle of Fragments, Fragment States, Adding Fragments to Activity, Adding, Removing and Replacing Fragments with Fragment Transactions, Interfacing Between Fragments and Activities, Multi-Screen Activities.

UNIT – III **[10 Lectures]**

Intents and Broadcasts: Intent: Using Intents to Launch Activities, Explicitly Starting New Activity, Implicit Intents, Passing Data to Intents, Getting Results from Activities, Native Actions, Using Intent to Dial a Number or to Send SMS.

Broadcast Receivers: Using Intent Filters to Service Implicit Intents, Resolving Intent Filters, Finding and Using Intents Received within an Activity.

Notifications: Creating and Displaying Notifications, Displaying Toasts.

UNIT – IV **[10 Lectures]**

Persistent Storage: Files: Using Application Specific Folders and Files, Creating Files, Reading Data from Files, Listing Contents of a Directory Shared Preferences, Creating Shared Preferences, Saving and Retrieving Data using Shared Preference, Introducing Structured Data Storage in Android, Storing Data using the Room Persistence Library, Accessing Files from other Applications using Storage Access Framework, Requesting Temporary Access to Files, Requesting Persistent Access to Files, Requesting Access to Directories.

UNIT – V **[10 Lectures]**

Database: Introduction to SQLite Database, Creating and Opening a Database, Creating Tables, Inserting, Retrieving and Etindelg Data, Registering Content Providers, Using Content Providers (Insert, Delete, Retrieve and Update).

Advanced Topics: Alarms: Creating and using Alarms; Using Internet Resources: Connecting to Internet Resource, Using Download Manager; Location Based Services: Finding Current Location and Showing Location on the Map, Updating Location.

TEXT BOOK:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

REFERENCE BOOKS:

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

WEB LINKS:

1. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
2. https://www.coursera.org/courses?query=mobile%20app%20development
3. https://www.udemy.com/topic/mobile-development/
4. https://www.mygreatlearning.com/mobile-app-development/free-courses
5. https://techreviewer.co/blog/best-free-open-source-app-development-software-solutions

CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS635PE

Prerequisites: A course on "Computer Networks"

Course Objectives:

1. To introduce various cryptographic algorithms and their characteristics.
2. To describe the private and public-key cryptosystems.
3. To know the key management scenarios.
4. To explore enhancements of Web security and Firewalls made to IPv4 by IPSec.
5. To understand PGP key pair and use the PGP package to send an encrypted e-mail message.

Course Outcomes: After completion of this course, the students will be able to:

1. Analyse the key concepts of cryptography and security.
2. Comprehend the private and public key cryptographic algorithms.
3. Define the key distribution and management methods.
4. Use of transporting data by Web security and Firewalls protocols.
5. Distribute the PGP to send a secured e-mail message.

UNIT – I **[10 Lectures]**

Security Concepts: Introduction, Need for Security, Security Approaches, Principles of Security, Types of Security Attacks, Security Services, Security Mechanisms, A Model for Network.

Security Cryptography Concepts and Techniques: Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

UNIT – II **[11 Lectures]**

Symmetric Key Ciphers: Block Cipher Principles, DES, AES, Blowfish, RC5, IDEA, Block Cipher Operation, Stream Ciphers, RC4.

Asymmetric Key Ciphers: Principles of Public Key Cryptosystems, RSA Algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III **[10 Lectures]**

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message Authentication Codes: Authentication Requirements, HMAC, CMAC, Digital Signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution using Symmetric and Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public Key Infrastructure.

UNIT – IV **[9 Lectures]**

Transport Level Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

UNIT – V **[8 Lectures]**

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

Case Studies on Cryptography and Security: Secure Multiparty Calculation, Virtual Elections, Single Sign On, Secure Inter-Branch Payment Transactions, Cross Site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc21_cs16/preview
2. https://www.coursera.org/courses?query=cryptography
3. https://www.udemy.com/topic/cryptography/
4. https://www.classcentral.com/course/swayam-cryptography-and-network-security-9896
5. https://www.nesoacademy.org/cs/11-cryptography-and-network-security

FUNDAMENTALS OF DATA SCIENCE (Open Elective – I)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS611OE

Prerequisites:
1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Data Structures."

Course Objectives:
1. To Learn concepts, techniques and tools deal with various facets of data science practice, including data collection and integration.
2. To understand the basic types of data and basic statistics.
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists.
4. To learn about iterative programming in R
5. To identify the importance of data visualization techniques

Course Outcomes: After the completion of the course the student will able to:
1. Discuss a flow process for data science problems.
2. Identify types of data and basic Statistical Description.
3. Create vectors, matrices and list using R
4. Develop R codes using iterative programming
5. Correlate results to the solution approach

UNIT - I **[10 Lectures]**

Introduction: Definition of Data Science, Big Data and Data Science Hype, Datafication, Current Landscape of Perspectives, Statistical Inference, Populations and Samples, Statistical Modeling, Probability Distributions, Fitting a Model, Over Fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II **[10 Lectures]**

Types of Data: Attribute, Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attributes, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete vs. Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency, Mean, Median, and Mode, Measuring the Dispersion of Data, Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III **[9 Lectures]**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Sub Setting.

Matrices: Creating and Naming Matrices, Matrix Sub Setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors, Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Sub Setting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List, Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

UNIT- IV **[9 Lectures]**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.
Iterative Programming in R: Introduction, While Loop, For Loop, Looping over List.
Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT- V **[7 Lectures]**

Charts and Graphs: Introduction, Pie Chart, Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.
Regression: Linear Regression Analysis, Multiple Linear Regression.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

WEBLINKS:

1. https://www.geeksforgeeks.org/introduction-to-data-science/
2. https://onlinecourses.nptel.ac.in/noc24_cs54/preview

R PROGRAMMING (Open Elective – I)

B. Tech. VI Semester

L	T	P	C
3	0	0	3

Subject Code: 22DS612OE

Course Objectives:

1. To understand basic programming concepts.
2. To learn about iterative programming in R.
3. To demonstrate the use of vectors, matrices, factors, Data frames and Lists.
4. To know how to generate dynamic documents.
5. To identify the importance of data visualization techniques.

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

1. Explore basic concepts of R programming language.
2. Work with iterative programming in R.
3. Create vectors, matrices and list using R.
4. Develop R codes using iterative programming.
5. Correlate results to the solution approach.

UNIT – I **[8 Lectures]**

Introduction: Overview of R, R Data Types and Objects, Reading and Writing Data, Sub Setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex Numbers in R, Rounding, Arithmetic, Modulo and Integer Quotients, Variable Names and Assignment, Operators, Integers, Factors, Logical Operations.

UNIT – II **[10 Lectures]**

Control Structures, Functions, Scoping Rules, Dates and Times, Introduction to Functions, Preview of some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Vectors, Generating Sequences, Vectors and Subscripts, Extracting Elements of a Vector using Subscripts, Working with Logical Subscripts, Scalars, Vectors, Arrays, Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors, Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.

UNIT – III **[8 Lectures]**

Lists: Creating Lists, General List Operations, List Indexing, Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance, Accessing List Components and Values, Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix Like Operations.

UNIT – IV **[8 Lectures]**

Factors And Tables: Factors and Levels, Common Functions used with Factors, Working with Tables, Matrix/Array Like Operations on Tables, Extracting a Sub Table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions.

UNIT – V **[8 Lectures]**

Graphics: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Customizing Graphs, Creating Three-Dimensional Plots.

Debugging: Fundamental Principles of Debugging, Using R Debugging Facilities, Moving Up in the World: More Convenient Debugging Tools, Ensuring Consistency in Debugging Simulation Code, Syntax and Runtime Errors, Running GDB on R.

TEXT BOOKS:

1. The Art of R Programming by Norman Matloff, Cengage Learning India.

REFERENCE BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
3. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press.

WEBLINKS:

1. https://www.w3schools.com/r/
2. https://www.geeksforgeeks.org/r-programming-language-introduction/
3. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
4. https://onlinecourses.nptel.ac.in/noc22_ma34/preview

MACHINE LEARNING LAB

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS604PC

Corequisites:

1. A Course on "Mathematical and Statistical Foundations".
2. A Course on "Programming with Python".
3. A Course on" Data Structure".

Course Objectives:

1. To learn about computing central tendency measures.
2. To gain the knowledge about SciPy, pandas, matplotlib libraries.
3. To learn about simple and multiple linear regression algorithms
4. To develop machine learning model using decision tree, KNN algorithms.
5. To apply logistic regression, K-Means algorithms for a problem.

Course Outcomes: After the completion of this course, the students will be able to:

1. Develop program for computing central tendency measures.
2. Make use of SciPy, pandas, matplotlib libraries to machine learning applications.
3. Develop simple and multiple linear regression algorithms
4. Build machine learning model using decision tree, KNN algorithms.
5. Apply logistic regression, K-Means algorithms for a problem.

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Write a python program to demonstrate the use of statistics, math, NumPy and SciPy libraries
3. Write a python program to demonstrate a Machine Learning application using pandas, matplot lab libraries
4. Write a python program to apply simple linear regression algorithm for a regression problem
5. Write a python program to apply multiple linear regression algorithm for house price prediction using SK-learn library.
6. Write a python program to apply decision tree algorithm for a classification problem and perform parameter tuning for better results
7. Write a python program to apply KNN algorithm for a classification problem using SK-learn library
8. Write a python program to apply Logistic regression algorithm for a classification problem using SK-learn library
9. Write a python program to apply k-means algorithm for a clustering problem
10. Mini Project by including performance analysis of any three classification algorithms on a specific dataset

TEXT BOOK:

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

REFERENCE BOOK:

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

WEBLINKS:

1. https://mllab.csa.iisc.ac.in.
2. https://studyglance.in/labprograms/mllabprograms.php

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22EN605HS

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language

   – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.

3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

SOFTWARE TESTING METHODOLOGIES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS631PL

Prerequisites: A course on "Java programming" or "C Programming".

Corequisite: A course on "Software Testing Methodologies".

Course Objectives:

1. To demonstrate use of testing tool-WinRunner in applications.
2. To introduce skills in software test automation and management.
3. To learn the recording of tests in analog and context sensitive modes.
4. To know GUI, Bitmap and Database checkpoints for an application.
5. To understand the test cases for windows application and batch testing.

Course Outcome: After the completion of the course the student can able to:

1. Work with WinRunner user interface and describe the benefits of automated testing.
2. Design and develop the best test strategies in accordance with the development model.
3. Record the test in analog and context sensitive modes.
4. Create various checkpoints like GUI, Bitmap and Database for an application.
5. Perform the batch testing with and without parameter passing.

List of Experiments:

1. Recording in context sensitive mode and analog mode.
2. GUI checkpoint for single property.
3. GUI checkpoint for single object/window.
4. GUI checkpoint for multiple objects.
5. a) Bitmap checkpoint for object/window.
   b) Bitmap checkpoint for screen area.
6. Database checkpoint for Default check.
7. Database checkpoint for custom check.
8. Database checkpoint for runtime record check.
9. a) Data driven test for dynamic test data submission.
   b) Data driven test through flat files.
   c) Data driven test through front grids.
   d) Data driven test through excel test.
10. a) Batch testing without parameter passing.
    b) Batch testing with parameter passing.
11. Data driven batch.
12. Silent mode test execution without any interruption.
13. Test case for calculator in windows application.

TEXT BOOKS:

1. K.V.K.K. Prasad, Software Testing Tools: Covering WinRunner, SilkTest, LoadRunner, JMeter, TestDirector and QTP with Case Studies, Dreamtech Press, 1st edition, 2007.
2. Mark Harbin, Thomas Messerschmidt, WinRunner 7 In A Hurry! Software Test Automation with WinRunner, Riverside Pr Intl, 2001.

REFERENCE BOOKS:

1. Nageshwar Rao Pusuluri, SOFTWARE TESTING CONCEPTS AND TOOLS, Dreamtech Press, 2006.
2. Naresh Chauhan, Software Testing: principles and practices, Oxford University Press, Second edition, 2016.

WEB LINKS:

1. https://support.microfocus.com/kb/kmdoc.php?id=KM0247&fileName=hp_man_WinRunner-version5.01-WR_TUT_pdf.pdf
2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview
3. https://www.udemy.com/course/software-manual-testing-course/
4. https://www.scribd.com/document/418157684/stm-lab
5. https://itqcr.com/

DATA VISUALIZATION TECHNIQUES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS632PL

Prerequisites: None.

Course Objectives:

1. Understand the various types of data, apply and evaluate the principles of data visualization.
2. Acquire skills to apply visualization techniques to a problem and its associated dataset.

Course Outcomes: After the completion of the course the student can able to:

1. Identify the different data types, visualization types to bring out the insight.
2. Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on a large dataset.
3. Demonstrate the analysis of a large dataset using various visualization techniques and tools.
4. Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data.
5. Ability to create and interpret plots using R/Python.

List of Experiments:

1. Acquiring and plotting data.
2. Statistical Analysis – such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance.
3. Financial analysis using Clustering, Histogram and Heat Map.
4. Time-series analysis – stock market.
5. Visualization of various massive dataset - Finance - Healthcare - Census – Geospatial.
6. Visualization on Streaming dataset (Stock market dataset, weather forecasting).
7. Market-Basket Data analysis-visualization.
8. Text visualization using web analytics.

TEXT BOOKS:

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010.
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Margon Kaufmann Publishers, 2004.

REFERENCE BOOKS:

1. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007.
2. Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd, 2008.

SCRIPTING LANGUAGES LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS633PL

Prerequisites: Any High-level programming language (C, C++).

Corequisite: A course on "Scripting Languages".

Course Objectives:

1. To understand scripting languages for developing web-based projects.
2. To explore Ruby scripting language.
3. To introduce TCL scripting language.
4. To know Perl Scripting language.
5. To learn web-based applications using scripting languages.

Course Outcomes: After the completion of the course the student can able to:

1. Differentiate between Scripting languages and programming languages.
2. Gain some fluency programming in Ruby, Perl, TCL.
3. Analyze the differences between Scripting languages and programming languages.
4. Create software systems using scripting languages such as Ruby, Perl, TCL.
5. Develop web-based projects using scripting languages.

List of Experiments:

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non- negative integer.
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them.
4. Write a Ruby script to accept a filename from the user print the extension of that.
5. Write a Ruby script to find the greatest of three numbers.
6. Write a Ruby script to print odd numbers from 10 to 1.
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum.
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100.
9. Write a Ruby script to print the elements of a given array.
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash.
11. Write a TCL script to find the factorial of a number.
12. Write a TCL script that multiplies the numbers from 1 to 10.
13. Write a TCL script for Sorting a list using a comparison function.
14. Write a TCL script to (i) Create a list (ii) Append elements to the list (iii) Traverse the list (iv) Concatenate the list.

15. Write a TCL script for comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shift b) Unshift c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

TEXT BOOKS:

1. David Barron, The World of Scripting Languages, Wiley Publications, 2009.
2. David Flanagan and Yukihiro Matsumoto, Ruby Programming language, O'Reilly, 1st edition, 2008.
3. Dave Thomas, Chad Fowler, Andy Hunt, Programming Ruby: The Pragmatic Programmers' Guide, Pragmatic Bookshelf, 2nd edition, 2004.
4. Brent B. Welch, Practical Programming in Tcl and Tk, Prentice Hall, 3rd edition, 1999.
5. David Till, Teach Yourself Perl 5 in 21 Days, Sams, 2nd edition, 1996.

REFERENCE BOOKS:

1. J.Lee and B. Ware, Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, (Addison Wesley) Pearson Education, 1st edition, 2002.
2. E. Quigley, Perl by Example, Pearson Education, 5th edition, 2014.
3. Larry Wall, T. Christiansen and J. Orwant, Programming Perl, O'Reilly, SPD, 3rd edition, 2000.
4. Boris Paskhaver, Learn to Code with Ruby, Packt, 2022.
5. John K. Ousterhout, Tcl and the Tk Toolkit, Addison Wesley, 1994.
6. J. P. Flynt, Perl Power, Cengage Learning, 1st edition, 2006.
7. Tom Christiansen, brian foy, Larry Wall, Jon Orwant, Programming Perl: Unmatched power for text processing and scripting, O'Reilly Media, 4th edition, 2012.

WEB LINKS:

1. https://www.ni.com/en/shop/labview/scripting-languages-and-ni-labview.html
2. https://extendedstudies.ucsd.edu/courses-and-programs/programming-and-scripting-languages
3. https://guides.lib.wayne.edu/information_science_tools/scr

MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS634PL

Corequisite: A course on "Mobile Application Development".

Course Objectives:

1. To learn how to develop Applications in an android environment.
2. To introduce Layout Management and Multi layout definition techniques to create adaptable User Interface.
3. To know user interface for mobile Application using widgets with event handling.
4. To describe push notifications for incoming messages.
5. To explore applications to the Android marketplace for distribution.

Course Outcomes: After the completion of the course the student can able to:

1. Work with Android operating system practically.
2. Configure Android environment and use development tools.
3. Develop rich user Interfaces by using layouts and controls.
4. Implement User Interface components for android application development.
5. Create Android applications using a database and publish it.

List of Experiments:

1. a) Create an Android application that shows Hello + name of the user and run it on an emulator.
   (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

TEXT BOOKS:

1. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
2. James C Sheusi, Android Application Development for Java Programmers, Cengage, 2013.
3. Pradeep Kothari, Kogent Learning Solutions Inc., Android Application Development (With Kitkat Support), Black Book, Dreamtech Press, 2014.
4. Ashok Kumar R, Baskaran p, Mobile Application Development Laboratory, 2017.

REFERENCE BOOK:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2013.
2. Michael Burton, Android App Development for Dummies, Wiley, Third edition, 2015.
3. Priyadharshini Ashokkumar, VTU-Mobile Application Development Lab Manual-18CSMP68: MAD Lab Manual(18CSMP68), 2021.

WEB LINKS:

1. https://www.udemy.com/course/mobile-application-development-using-android/
2. https://github.com/shubhaam13/Mobile-Application-Development
3. https://www.studocu.com/row/document/university-of-agriculture-faisalabad/mobile-application/mobile-application-development-lab/22189066
4. https://www.codingconnect.net/mobile-application-development-lab/
5. https://www.tutorialspoint.com/android
6. https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf
7. https://developer.android.com

CRYPTOGRAPHY AND NETWORK SECURITY LAB (Professional Elective – III)

B. Tech. VI Semester

L	T	P	C
0	0	2	1

Subject Code: 22DS635PL

Corequisite: A Course on "Cryptography and Network Security".

Prerequisites:

1. A Course on "C Programming".
2. A Course on "Java Programming".

Course Objectives:

1. To learn different cipher techniques.
2. To introduce the algorithms DES, RSA, MD5, SHA-1.
3. To know network security tools and vulnerability assessment tools.
4. To explore key exchange concepts.
5. To understand block ciphers implementation.

Course Outcomes: After the completion of the course the student can able to:

1. Develop code for classical Encryption Techniques to solve the problems.
2. Build cryptosystems by applying symmetric and public key encryption algorithms.
3. Construct code for authentication algorithms.
4. Design key exchange mechanisms for secure communication.
5. Implement the network security system using open-source tools.

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or/and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
   a) Ceaser cipher b) Substitution cipher c) Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
7. Write a Java program to implement RSA algorithm.
8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
9. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
10. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOKS:

1. Michael Gregg, Build Your Own Security Lab: A Field Guide For Network Testing, Wiley India, 2012.
2. Gohel Hardik, Introduction to Network & Cyber Security, LAP Lambert Academic Publishing, 2015.

REFERENCE BOOKS:

1. Neal Krawetz, Introduction to Network Security, CENGAGE Learning, 2007.
2. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning, 1st Edition, 2010.

WEB LINKS:

1. https://cse29-iiith.vlabs.ac.in/
2. https://www.udemy.com/course/building-a-computer-network-test-lab/
3. https://github.com/topics/cns-lab
4. https://github.com/sobolevn/awesome-cryptography

UI DESIGN - FLUTTER

B. Tech. VI Semester

L	T	P	C
0	0	4	2

Subject Code: 22DS606PC

Course Objectives:

1. To learn about how to setup the environment for user interface design.
2. To know how to develop responsive user interfaces using flutter.
3. To apply stateful and stateless widgets to user interface.
4. To create custom widgets for specific UI elements.
5. To learn about designing a form various input field, along with validation.

Course Outcomes: After completion of this course, the students will be able to:

1. Build the environment for user interface design using flutter SDK
2. Develop responsive user interfaces using flutter.
3. Apply stateful and stateless widgets to user interface.
4. Create custom widgets for specific UI elements.
5. Design a form with various input fields, along with validation and error handling.

List of Experiments: Students need to implement the following experiments

1. a) Installation of Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.
5. a) Demonstrate stateful and stateless widgets.
   b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
   b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
    b) Demonstrate the use of Flutter’s debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview
2. https://www.coursera.org/projects/googlecloud-getting-started-with-flutter-development-guo1q
3. https://www.udemy.com/course/the-complete-flutter-ui-course-build-amazing-mobile-ui/
4. https://iqonic.design/blog/8-best-flutter-ui-kits-free-ui-kits-and-templates/

ENVIRONMENTAL SCIENCE

B. Tech. VI Semester

L	T	P	C
3	0	0	0

Subject Code: 22CH607MC

Course Objectives:

1. To recognize the importance of environment, self-sustain eco systems.
2. To understand various natural resources – their importance, over exploitation, effects, and mitigation measures.
3. To create basic knowledge about different biotic resources and their need for conservation.
4. To be aware of the impacts of developmental activities and mitigation measures.
5. To know various environmental policies, legislation, and regulations.

Course Outcomes: After completion of this course, the students will be able to:

1. Explore harmonious co-existence of nature and human beings.
2. Recognize conservation of natural resources particularly alternate sources of energy.
3. Evaluate and develop technologies for conservation of biodiversity in a sustainable manner.
4. Generate ideas and implement technologies to solve environmental problems associated with air, water, and soil.
5. Develop technologies based on ecological principles and environmental regulations which helps in sustainable developments.

UNIT – I **[12 Lectures]**

Ecosystems: Definition, Scope and Importance of Ecosystem. Classification, Structure and Function of an Ecosystem, Food Chains, Food Webs, Ecological Pyramids. Flow of Energy, Biogeochemical Cycles, Bioaccumulation, Biomagnification, Ecosystem Value, Services and Carrying Capacity, Field Visits.

UNIT – II **[10 Lectures]**

Natural Resources: Classification of Resources: Living and Non-Living Resources, Water Resources: Use and Over Utilization of Surface and Ground Water, Floods and Droughts, Dams: Benefits and Problems. Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources; Land Resources, Forest Resources, Energy Resources: Growing Energy Needs, Renewable and Non-Renewable Energy Sources, Use of Alternate Energy Source, Case Studies.

UNIT – III **[10 Lectures]**

Biodiversity and Biotic Resources: Introduction, Definition, Genetic, Species and Ecosystem Diversity, Value of Biodiversity; Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Optional Values, India as a Mega Diversity Nation, Hot Spots of Biodiversity, Field Visit; Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man Wildlife Conflicts; Conservation of Biodiversity: In-Situ and Ex-Situ Conservation, National Biodiversity Act.

UNIT – IV [9 Lectures]

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of Pollution; Air Pollution: Primary and Secondary Pollutants, Automobile and Industrial Pollution, Ambient Air Quality Standards; Water Pollution: Sources and Types of Pollution, Drinking Water Quality Standards; Soil Pollution: Sources and Types, Impacts of Modern Agriculture, Degradation of Soil; Noise Pollution: Sources and Health Hazards, Standards; Solid Waste: Municipal Solid Waste Management, Composition and Characteristics of E-Waste and Its Management.

Pollution Control Technologies: Wastewater Treatment Methods: Primary, Secondary and Tertiary. Overview of Air Pollution Control Technologies, Concepts of Bioremediation; Global Environmental Problems and Global Efforts: Climate Change and Impacts on Human Environment, Ozone Depletion and Ozone Depleting Substances (ODS). Deforestation and Desertification. International Conventions/Protocols: Earth Summit, Kyoto Protocol, and Montréal Protocol.

UNIT – V [9 Lectures]

Environmental Policy, Legislation and EIA: Environmental Protection Act, Legal Aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal Solid Waste Management and Handling Rules, Biomedical Waste Management and Handling Rules, Hazardous Waste Management and Handling Rules; EIA: EIA Structure, Methods of Baseline Data Acquisition; Overview on Impacts of Air, Water, Biological and Socio-Economical Aspects. Strategies for Risk Assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development, Population and Its Explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human Health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle Assessment (LCA), Low Carbon Life Style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

WEB LINKS:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.coursera.org/courses?query=environmental%20science
3. https://www.udemy.com/topic/environmental-science/
4. https://www.classcentral.com/subject/environmental-science
5. https://www.sciencedaily.com/news/earth_climate/environmental_science