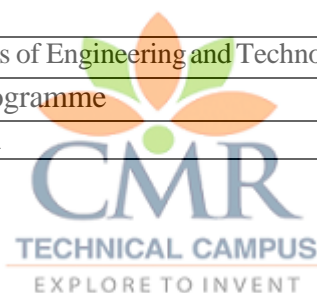


**CMR TECHNICAL CAMPUS**  
**UGC AUTONOMOUS**  
**B. Tech. I Year Syllabus**

**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				
<b>Total</b>			<b>12</b>	<b>2</b>	<b>12</b>	<b>20</b>



**II SEMESTER**

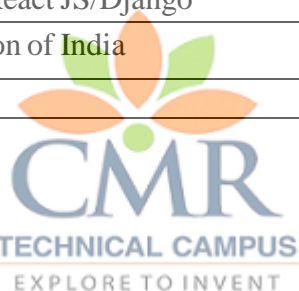
S.No.	Course Code	Course Title	L	T	P	Credits
1	22MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	22CH202BS	Engineering Chemistry	3	1	0	4
3	22CS203ES	Data Structures	3	0	0	3
4	22EC204ES	Basic Electrical and Electronics Engineering	3	1	0	4
5	22ME205ES	Computer Aided Engineering Graphics	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
<b>Total</b>			<b>16</b>	<b>3</b>	<b>8</b>	<b>20</b>

**CMRTECHNICAL CAMPUS**  
UGC AUTONOMOUS  
B. Tech. II Year Syllabus

**ARTIFICIAL INTELLEGEENCE AND MACHINE LEARNING**

**III SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	22AM301PC	Discrete Mathematics	3	0	0	3
2	22AM302PC	Software Engineering	3	0	0	3
3	22AM303PC	Programming with Python	3	0	0	3
4	22AM304PC	Computer Organization and Architecture	3	0	0	3
5	22AM305PC	Operating Systems	3	0	0	3
6	22AM306PC	Python Lab	0	0	3	1.5
7	22AM307PC	Software Engineering Lab	0	0	2	1
8	22AM308PC	Operating Systems Lab	0	0	3	1.5
9	22AM309PC	Node JS/ React JS/Django	0	0	2	1
10	22EN310MC	Constitution of India	3	0	0	0
<b>Total</b>			<b>18</b>	<b>0</b>	<b>10</b>	<b>20</b>



**IV SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	22AM401PC	Automata Theory and Compiler Design	3	0	0	3
2	22AM402PC	Database Management Systems	3	0	0	3
3	22MA403BS	Mathematical and Statistical Foundations	3	0	0	3
4	22AM404PC	Introduction to Artificial Intelligence	3	0	0	3
5	22AM405PC	Object Oriented Programming through Java	3	0	0	3
6	22AM406PC	Database Management Systems Lab	0	0	2	1
7	22AM407PC	Java Programming Lab	0	0	2	1
8	22EN408MC	Gender Sensitization Lab	0	0	2	0
9	22AM409PC	Prolog/ Lisp/ Pyswip	0	0	2	1
10	22AM410PC	Real-time Research Project/Field-Based Research Project	0	0	4	2
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>20</b>

**CMR TECHNICAL CAMPUS**  
**UGC AUTONOMOUS**  
**B. Tech. III Year Syllabus**

**V SEMESER**

S.No	Course Code	Course Title	L	T	P	Credits
1	22AM501PC	Design and Analysis of Algorithms	3	1	0	4
2	22AM502PC	Machine Learning	3	0	0	3
3	22AM503PC	Computer Networks	3	0	0	3
4	22MB504HS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective-I	3	0	0	3
6	22AM505PC	Machine Learning Lab	0	0	3	1.5
7	22AM506PC	Computer Networks Lab	0	0	3	1.5
8	22AM507PC	UI design-Flutter	0	0	2	1
9	22AM508MC	Intellectual Property Rights	3	0	0	0
		<b>Total</b>	<b>18</b>	<b>1</b>	<b>8</b>	<b>20</b>

**VI SEMESTER**

S.No.	Course Code	Course Title	L	T	P	Credits
1	22AM601PC	Knowledge Representation and Reasoning	3	0	0	3
2	22AM602PC	Data Analytics	3	0	0	3
3	22AM603PC	Natural Language Processing	3	0	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective-I	3	0	0	3
6	22AM604PC	Data Analytics Lab	0	0	2	1
7	22EN605HS	Advanced English Communication Skill lab	0	0	2	1
8	22AM606PC	Natural Language Processing Lab	0	0	2	1
9	22CH607MC	Environmental Science*	3	0	0	0
10	22AM608PC	Industrial Oriented Mini Project/ Internship/ SkillDevelopment Course(DevOps)	0	0	4	2
		<b>Total</b>	<b>18</b>	<b>0</b>	<b>10</b>	<b>20</b>

**\*Environmental Science III Yr. II Sem should be Registered by Lateral Entry Students Only.**

**CMR TECHNICAL CAMPUS**  
**UGC AUTONOMOUS**  
**B. Tech. IV Year Syllabus**

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**V SEMESTER**

S.No	Course Code	Course Title	L	T	P	Credits
1	22MB701HS	Professional Practice, Law & Ethics	3	0	0	3
2	22AM702PC	Deep Learning	3	0	0	3
3		Professional Elective-III	3	0	0	3
4		Professional Elective-IV	3	0	0	3
5		Open Elective-II	3	0	0	3
6	22AM703PC	Deep Learning lab	0	0	2	1
7		Professional Elective-III Lab	0	0	2	1
8	22AM704PC	Project Stage-I	0	0	6	3
		<b>Total</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>20</b>

**VI SEMESTER**

S.No	Course Code	Course Title	L	T	P	Credits
1		Professional Elective-V	3	0	0	3
2		Professional Elective-VI	3	0	0	3
3		Open Elective-III	3	0	0	3
4	22AM801PC	Project Stage-II including Seminar	0	0	22	11
		<b>Total</b>	<b>9</b>	<b>0</b>	<b>22</b>	<b>20</b>

\*MC-pass/fail

#SkillCourse-1 credit with 2 Practical Hours

**Professional Elective-I**

22AM511PE	Graph Theory
22AM512PE	Introduction to Data Science
22AM513PE	Web Programming
22AM514PE	Image Processing
22AM515PE	Computer Graphics

**Professional Elective-II**

22AM621PE	Software Testing Methodologies
22AM622PE	Information Retrieval Systems
22AM623PE	Pattern Recognition
22AM624PE	Computer Vision and Robotics
22AM625PE	Data Warehousing and Business Intelligence

**Professional Elective-III**

22AM731PE	Internet of Things
22AM732PE	Data Mining
22AM733PE	Scripting Languages
22AM734PE	Mobile Application Development
22AM735PE	Cloud Computing

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

**Professional Elective-III Lab**

22AM731PL	Internet of Things Lab
22AM732PL	Data Mining Lab
22AM733PL	Scripting Languages Lab
22AM734PL	Mobile Application Development Lab
22AM735PL	Cloud Computing Lab

**Professional Elective-IV**

22AM741PE	Quantum Computing
22AM742PE	Expert Systems
22AM743PE	Semantic Web
22AM744PE	Nature Inspired Computing
22AM745PE	Mobile Computing

**Professional Elective-V**

22AM851PE	Social Network Analysis
22AM852PE	Federated Machine Learning
22AM853PE	Augmented Reality & Virtual Reality
22AM854PE	Web Security
22AM855PE	Ad-hoc & Sensor Networks

**Professional Elective-VI**

22AM861PE	Speech and Video Processing
22AM862PE	Robotic Process Automation
22AM863PE	Randomized Algorithms
22AM864PE	Cognitive Computing
22AM865PE	Conversational AI

The following Open Electives are offered by CSE(AI&ML) department

**Open Elective -I**

22AM611OE	Fundamentals of AI
22AM612OE	Machine Learning Basics

**Open Elective -II**

22AM711OE	Introduction to Natural Language Processing
22AM712OE	AI applications

**Open Elective -III**

22AM811OE	Chat bots
22AM812OE	Evolutionary Computing



## Matrices and Calculus

**B. Tech. I Semester**

**L T P C**

**Subject Code: 22MA101BS**

**3 1 0 4**

**Pre-requisites:** Mathematical Knowledge at pre-university level

**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. Apply the extreme values of functions of two variables with/ without constraints.
5. Compute multiple integrals and apply the 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 by double integrals.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Erwin kreyzig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, 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 quantum physics and band theory of solids.
2. Summarize the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric and magnetic materials.
4. Identify the importance of nanoscale, quantum confinement 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. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental 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, 11<sup>th</sup> 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, 4<sup>th</sup> Edition, 2021.
4. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning, 2<sup>nd</sup> Edition, 2022.
5. Narasimha Reddy Katta, Essentials of Nanoscience & Nanotechnology, Typical Creatives NANO DIGEST, 1<sup>st</sup> Edition, 2021.

**REFERENCE BOOKS:**

1. H.C.Verma, Quantum Physics, TBS Publication, 2<sup>nd</sup> Edition 2012.
2. Halliday, Resnick and Walker, John Wiley & Sons, Fundamentals of Physics 11<sup>th</sup> Edition, 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. Bhandhopadhyaya – Nano Materials, New Age International, 1<sup>st</sup> Edition, 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, ifndef  
 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, 3<sup>rd</sup> edition, 2006.
2. Jeri R. Hanly and 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 by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

#### Web Links:

1. <https://nptel.ac.in/courses/106104074>
2. [https://onlinecourses.nptel.ac.in/noc21\\_cs01/preview](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:

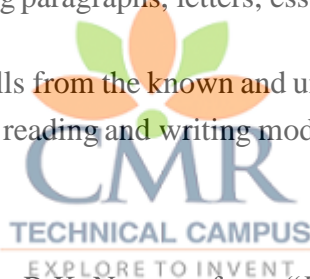
**This course will enable the students to:**

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering 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 vocabulary and 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*’ by R.K. Narayan from “*English: Language, Context and Culture*” published by Orient Black Swan, 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 Black Swan, 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- Essay Writing-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 Vocabulary and 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 are covered 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](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

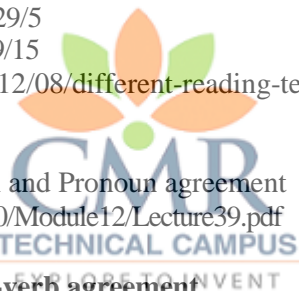
WL11:<https://nptel.ac.in/courses/109104030/Module12/Lecture39.pdf>**common errors and Rules of Subject-verb agreement**WL12:<https://nptel.ac.in/courses/109106094/8><https://www.grammarbook.com/grammar/subjectVerbAgree.asp>**Techniques for improving comprehension skills**WL13:<https://nptel.ac.in/courses/109106129/5>WL14:<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](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/>**Writing formal 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\\_m212.pdf](https://nptel.ac.in/courses/117105083/pdf/ssg_m212.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.english.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 training lab course to get training on PC Hardware, Internet & Worldwide Web and Productivity tools for documentation, Spreadsheet computations and Presentation.
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 introduce the usage of Productivity tools in crafting professional 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. Apply knowledge for PC hardware and computer parts.
2. Apply knowledge for computer assembling and software installation.
3. Ability how to solve the trouble shooting problems.
4. Apply the tools for preparation of project certificate, Creating a Newsletter.
5. Apply the 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 CPU and 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 boot due to improper assembly or defective peripherals. They should identify the problem and fix it 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. Finally students 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 how to 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 HTML consisting of his/her photo, name, address and education details as a table and his/her skill set as a list. Productivity tools: 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, IITL Education Solutions limited, Pearson Education. LaTeX Companion – Leslie Lamport, PHI/Pearson.
2. Comdex Information Technology course 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 study the 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 identify the 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 OF EXPERIMENTS:**

1. Determination of work function and Planck's constant using photoelectric effect.
2. To study the resonant frequency, bandwidth and quality factor of series and parallel LCR circuits.
3. To study the V-I characteristics of a p-n junction diode.
4. a. To study the V-I characteristics of solar cell.  
b. To study the V-I characteristics of light emitting diode (LED).
5. Determination of energy gap of a semiconductor.
6. a. Determination of the V-I characteristics 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. Study B-H curve of a magnetic material.
9. Determination of the resistivity of semiconductor by two probe method.
10. Determination of Hall coefficient 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.*

**REFERENCE BOOK:**

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 by understanding 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. Apply the 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) Write a simple program that converts one given data type to another using auto conversion and 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:

$$5 \times 1 = 5$$

$$5 \times 2 = 10$$

$$5 \times 3 = 15$$

- e) Write a C program for 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) Transpose of a matrix with memory dynamically allocated for the new matrix as row and column 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 display the 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 of Integers 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 array of integers using insertion sort in ascending order

**TEXT BOOKS:**

1. Jeri R. Hanly and 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 fluency of 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 clarity and 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 they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training 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
  - Describing objects/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 – V****CALL 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 Fidelity Headphones

**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 University Press

**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 Easy by Darling Kindersley.
- Punctuation Made Easy by 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\\_WT0BIs](https://www.youtube.com/watch?v=JIKU_WT0BIs)

**NPTEL on role-play and conversation skills**

WL2:<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24j4KOkQCOElxcDQrs>

**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](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](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 be able to learn various 3D printing technologies.
- Knowledge towards Assembling and testing of robots.
- Understanding functionality of 3D printers and their application.
- Developing team 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.

**Module III: 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.

**Module IV: Software and 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 have 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. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme.– CISCO Press, Pearson Education.
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, 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-university level

**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 ordinary differential 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. Identify whether 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  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , 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, Khanna Publishers, 36<sup>th</sup> Edition, 2021
2. R.K.JAIN, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 4<sup>th</sup> 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, John Wiley & Sons, 9<sup>th</sup> Edition 2006.
2. G.B.Thomas and R.L.Finney, Calculus and Analytic geometry, 9<sup>th</sup> 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 Publications, 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**

Prerequisites: Engineering chemistry knowledge in school and college level.

### Course Objectives:

To bring adaptability to 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 battery chemistry, 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 and Lubricants.

### Course Outcomes:

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

1. Identify the basic properties of water and its usage in domestic and industrial purposes.
2. Learn the fundamentals and general properties of polymers and other engineering materials. Apply in day to day life.
3. Make use of basic knowledge of electrochemical procedures related to corrosion and its control.
4. Interpret the concepts of petroleum products and cement, Smart materials.
5. Find potential applications of chemistry and practical utility in order to become good 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<sup>-</sup> 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, and Thiokol rubber.

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

**Conducting polymers:** Characteristics and Classification with examples - mechanism of conduction in trans - 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 Electroplating

**UNIT - IV: Energy Sources:****[8 Lectures]**

Introduction, Classification- Calorific value of fuel – HCV, LCV- Dulong's 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, Poly vinyl 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:

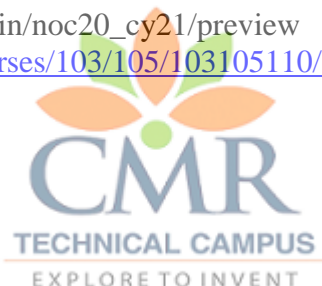
1. P.C. Jain and M. Jain, Engineering Chemistry by Dhanpatrai Publishing Company, 2010.
2. Rama Devi, Venkata Ramana Reddy and Rath, Engineering Chemistry by Cengage learning, 2016.
3. Jaya Shree Anireddy, Textbook of Engineering Chemistry by Wiley Publications.
4. M. Thirumala Chary, E. Laxminarayana 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](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 variety of 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 variety of data structures including binary search trees, heaps trees and AVL-trees.
4. Design programs on sorting and graphs.
5. Apply different 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:**

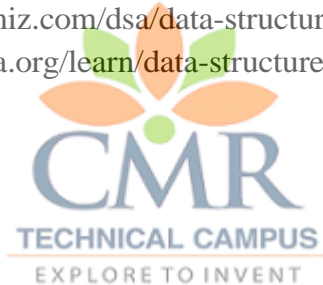
1. E. Horowitz, S. Sahni and Susan Anderson Freed, *Universities Press*. Fundamentals of Data Structures in C, 2nd Edition, 2008.
2. A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education. Data Structures using C, 2004.

**REFERENCE BOOKS:**

1. R. F. Gilberg and B.A. Forouzan, Cengage Learning. Data Structures: A Pseudocode Approach with C, 2<sup>nd</sup> 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 study and understand the different types of DC, AC single & three phase circuits.
3. To study and 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. Identify the basic DC electrical circuits.
2. Evaluate the basic single phase and three phase AC circuits.
3. Analyze the working principles of Electrical Machines.
4. Classify the 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  $\alpha$  and  $\beta$ , Comparison of CE, CB and CC configurations. SCR Construction, Operation and V-I characteristics.

### TEXTBOOKS:

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](https://www.youtube.com/watch?v=vh_aCAHThTQ)
2. [www.electriceasy.com/2014/03/electrical-transformer-basic.html](http://www.electriceasy.com/2014/03/electrical-transformer-basic.html)
3. [www.youtube.com/watch?v=Unh99Qn7CmI](https://www.youtube.com/watch?v=Unh99Qn7CmI)
4. [www.youtube.com/watch?v=d\\_LOXUEFA-o](https://www.youtube.com/watch?v=d_LOXUEFA-o)
5. [www.electriceasy.com/2022/09/construction-and-working-of-dc-generator.html](http://www.electriceasy.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 ability of 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. Apply computer aided drafting tools to sketch the conventions and the methods of drawings, engineering curves and scales
2. Identify and 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 · Genre January 2019.
2. T. Jeyapovan, Vikas: Engineering Drawing and graphics Using AutoCAD Third Edition S. Chand and company Ltd. January 2010.
3. N. S. Parthasarathy and Vela Murali/ Engineering Drawing/Oxford publications. 12<sup>th</sup> 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 CM Agrawal, Engineering Drawing, Third Edition McGraw Hil. 2019
4. K Balaveera Reddy et 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=ga1ud9yQ14I>
4. <http://www.digimat.in/nptel/courses/video/105104148/L04.html>
5. <https://engineeringvidelectures.com/course/758>

## Engineering Chemistry Laboratory

**B. Tech. II Semester**

**L T P C**

**Subject Code: 22CH206BS**

**0 0 2 1**

**Pre-requisites :** To bring adaptability to new developments in engineering chemistry lab and acquire the knowledge in practical skills

**Course Objectives:**

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

1. Estimation of hardness of water to check its suitability for 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. Apply the 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 Complexometry method.
- II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
- III. **Potentiometry:** Estimation of the concentration of an acid by Potentiometry Estimation of the amount of  $\text{Fe}^{2+}$  by Potentiometry.

**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 presence and 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](http://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 trees and graphs.
3. It provides an understanding of linear and binary search algorithms.
4. It provides an understanding of sorting algorithms.

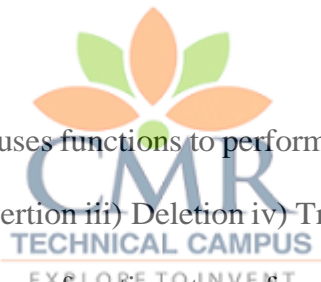
**Course Outcomes:**

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. Ability to 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.

**REFERENCE BOOKS:**

1. R. F. Gilberg and B.A. Forouzan, Cengage Learning. Data Structures: A Pseudocode Approach with C, 2<sup>nd</sup> 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**  
**Subject Code 22EC208ES**

**L T P C**  
**0 0 2 1**

**Prerequisites:** Mathematics

**Corequisites:** Basic Electrical and Electronics Engineering

**Course Objectives:**

1. To Analyze a given network by applying 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. Verify the 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 KCL and 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. Study and 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 Characteristics A) 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 Chakrabarthy, 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\\_O93B&index=2](https://www.youtube.com/watch?v=Ki60DB0I3W4&list=PLwymdQ84KI-x0T05PcG6D_2rhbWV_O93B&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: None**

**Course Objectives:**

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the 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 at least 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 philosophy of science, concepts and scope.
4. Evaluate consequences of human exposure to pollution and its impacts to environmental quality.
5. Comprehending the statutory and regulatory mechanisms 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: 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**

**[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 Montréal Protocol. 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, 2<sup>nd</sup> edition , 1 January 2015.
2. R. Rajagopalan, Environmental Studies , Oxford University Press, 3<sup>rd</sup> 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. Anji Reddy, 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 0 0 3**

**Subject Code: 22AM301PC**

**Prerequisites:** A course on **Logic design**

**Course Objectives:**

1. To Introduce elementary discrete mathematics for computer science and engineering.
2. To include formal logic notation, methods of proof.
3. To study permutations and combinations.

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

1. Construct precise mathematical proofs
2. Demonstrate the logic and set theory to formulate precise statements
3. Solve counting problems on finite and discrete structures
4. Make use of Elementary Combinatorics
5. Apply graph theory concepts in solving computing problems

**UNIT – I**

**[8Lectures]**

**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**

**[8Lectures]**

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

**UNIT - III**

**[8Lectures]**

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

**UNIT - IV**

**[8Lectures]**

**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**

**[8Lectures]**

**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. J.P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science: McGraw-Hill, 1<sup>st</sup> ed., 1997
2. Joe I. Mott, Abraham Kandel, Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians: Prentis Hall of India, 2<sup>nd</sup> ed. 2008

**REFERENCE BOOKS:**

1. Ralph.P. Grimald, Pearson Education. Discrete and Combinatorial Mathematics - an applied introduction, , 5<sup>th</sup> edition. 2016
2. J. P. Tremblay, R. Manohar, **Discrete Mathematical Structures** with Applications to Computer Science, **Tata McGraw Hill**, India, 1st Edition, 1997.

Web Link- 1) [https://onlinecourses.nptel.ac.in/noc20\\_cs82/preview](https://onlinecourses.nptel.ac.in/noc20_cs82/preview)  
2) <https://www.javatpoint.com/discrete-mathematics-lattices>



## Software Engineering

**B. Tech. III Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM302PC**

**Prerequisites:** A course on Programming for Problem Solving.

### Course Objectives

1. To understand the working knowledge of techniques of large software development projects.
2. To study software requirements and testing strategies.
3. To study about Risk and quality management.
4. To study about Unified Markup Language.

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

1. Define the end-user requirements into the system.
2. Translate and apply the process model based on software requirements.
3. Build the design of a systematic models.
4. Categories the testing strategies and generate a report.
5. Formulate the metrics for process and plan

### 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

**[8 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, sequencediagrams, collaboration diagrams, use case diagrams, component diagrams.

### UNIT – IV

**[8 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

**[6 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, McGraw Hill International Edition, 6th edition, 2016.
2. Sommerville, Software Engineering, Pearson Education, 7th edition, 2008.

**REFERENCE BOOKS:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson ,The unified modeling language user guide,Pearson Education,2004.
2. James F. Peters, Witold Pedrycz, John Wiley, Software Engineering, an Engineering approach,2000.
3. Waman S Jawadekar, Software Engineering principles and practice- The McGraw-HillCompanies,2004.
4. Meiler page-Jones ,Fundamentals of object-oriented design using UML: Pearson Education,2007.



## Programming with Python

**B. Tech. III Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Subject Code: 22AM303PC**

**Prerequisites:** A course on Data Structure using C

**Course Objectives:**

1. To Learn Syntax and Semantics in Python.
2. To Handle Strings and Files in Python.
3. To Understand core data structure concepts in Python.
4. To Implement Object Oriented Programming concepts in Python.

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

1. Define syntax and semantics in Python.
2. Demonstrate proficiency in handling Strings and Arrays.
3. Develop Python Programs using core data structures.
4. Conduct experiments on file handling, exception handling and modules.
5. Apply the concepts of Object-Oriented Programming in Python.

**UNIT-I**

**[10 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 in to Dictionary, Converting Strings in to Dictionary, Passing Dictionaries to Functions.

**UNIT-IV**

**[8 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, Re

**Python Multithreaded Programming:** Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

#### TEXT BOOKS

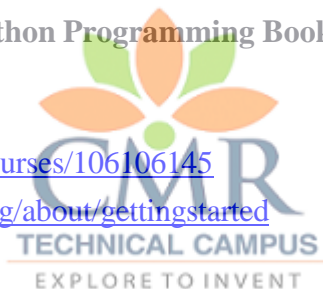
1. WesleyJ. Chun, Core Python Programming, Pearson ,Second Edition,2006.
2. R.Nageswara Rao, Core Python Programming, Dream Tech Press,2016.

#### REFERENCE BOOKS:

1. John M Zelle , Mark Lutz, Python Programming Books for Beginner & Advanced Coders, 5th edition,2014.

**WEB LINK-** 1) <https://nptel.ac.in/courses/106106145>

2) <https://www.python.org/about/gettingstarted>



## Computer Organization and Architecture

**B.Tech. III Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM304PC**

**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 specify various computer operations.
4. Describing memory organization and I/O systems.
5. Introduce pipelining and vector processing.

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

1. Identity of 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.

EXPLORE TO INVENT

[8 Lectures]

### UNIT-II

**Basic Computer Organization and Design:** Instruction codes, Computer Registers Computer instructions, Timing and Control, Instructions, Input – Output and Interrupt. Instruction cycle, Memory Reference

**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.**TEXTBOOKS:**

1. M.MorisMano,Computer System Architecture, ThirdEdition, Pearson/PHI,2016.
2. William Stallings, Computer OrganizationandArchitecture,6thed,Pearson/PHI, 2010.

**REFERENCEBOOKS:**

1. Car Hamacher, ZvonksVranesic, SafeaZaky, Computer Organization, Vth Edition, McGraw Hill, 2002.
2. Andrew S.Tanenbaum, Structured Computer Organization, 4 th Edition, PHI/Pearson, 2003.
- 3.B.Ram,ComputerFundamentalsArchitectureandOrganization,5thed.,NewAge International Publications, 2000.

**WEBLINKS:**

1. <https://nptel.ac.in/courses/106105163>
2. [https://onlinecourses.nptel.ac.in/noc20\\_cs64/preview](https://onlinecourses.nptel.ac.in/noc20_cs64/preview)
3. <https://www.udemy.com/topic/computer-architecture/>



## Operating System

**B.Tech. III Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM305PC**

**Prerequisites:** A course on Data structures using C

**Course Objectives:**

1. To study the concepts of Operating system.
2. To Introduce the issues in design and development of operating system.
3. To study basic Unix commands system call.

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

1. Define the operating system concepts.
2. Compare different CPU Scheduling Algorithms.
3. Analyze process management and synchronization mechanisms.
4. Determine different memory management techniques.
3. Examine file system interface and operations.

**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**

**[8 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 Recovery from Deadlock

**UNIT – III**

**[8 Lectures]**

**Process Management and Synchronization** - The Critical Section Problem,

Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical

Regions, Monitors **Interprocess Communication Mechanisms:** IPC between processes on

a single computer system, IPC between processes on different systems, using pipes, FIFOs,

message queues, shared memory.

**UNIT – IV**

**[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**

**[8 Lectures]**

**File System Interface and Operations** - Access methods, Directory Structure, Protection, File

System Structure, Allocation methods, Free-space Management. Usage of open, create, read,

write, close, lseek, stat, ioctl system calls.



**TEXT BOOKS:**

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne ,”Operating System Principles”, John Wiley ,7th Edition,2007.
2. W.R. Stevens ,Advanced programming in the UNIX environment, Pearson education,2014.

**REFERENCE BOOKS:**

1. William Stallings, Operating Systems- Internals and Design Principles, Pearson Education/PHI, f i f th Edition–2005,
2. Crowley,Operating System A Design Approach, TMH,1996.
3. Andrew S. Tanenbaum ,Modern Operating Systems, Pearson/PHI, 2nd edition,2014.
4. Kernighan and Pike ,UNIX programming environment, PHI/ Pearson Education,2015.

Web Link: 1) <https://nptel.ac.in/courses/106102132>  
2) <https://www.javatpoint.com/operating-system>



## Python Lab

**B.Tech. III Semester**

**L T P C**  
**0 0 3 1.5**

**Subject Code: 22AM306PC**

**Prerequisites:** A course on Data Structure using C

**Co-requisites:** A course on Python Programming

**Course Objectives:**

1. To install and run the Python interpreter
2. To learn control structures.
3. To Understand Lists and Dictionaries in python.
4. To Handle Strings and Files in Python

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

1. Define python syntax, semantics and flow control.
2. Demonstrate proficiency in handling strings, list tuples and arrays.
3. Develop python programs using core data structures.
4. Conduct experiments on file handling, exception handling and modules.
5. Design the application specific codes using python.

Note: The lab experiments will be like the following experiment examples

**Week -1:**

1. i) Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
- ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
  - i) Write a program to calculate compound interest when principal, rate and number of periods are given.
  - ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

**Week - 2:**

1. Print the below triangle using for loop.
 

```

5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

**Week - 3:**

1. i) Write a program to convert a list and tuple into arrays.  
ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

**Week - 4:**

1. Write a function called is\_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has\_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
  - i). Write a function called remove\_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
  - ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
  - iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'  
ii) Remove the given word in all the places in a string?  
iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Write a recursive function that generates all binary strings of n-bit length

**Week - 5:**

1. i) Write a python program that defines a matrix and prints  
ii) Write a python program to perform addition of two square matrices  
iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

**Week-6:**

1. a. Write a function called draw\_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.  
b. Add an attribute named color to your Rectangle objects and modify draw\_rectangle so that it uses the color attribute as the fill color.  
c. Write a function called draw\_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.  
d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw\_circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

**Week- 7**

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blankspaces, lower case letters and uppercase letters.

**Week - 8:**

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOKS:**

1. Supercharged Python: Take your code to the next level, Overland 4<sup>th</sup> Edition, 2019.
2. Mark Lutz, O'reilly, Learning Python. 5<sup>th</sup> Edition, 2015.

**REFERENCE BOOKS:**

1. Vamsi Kurama, Python Programming: A Modern Approach, Pearson, 2017.
2. Sheetal Taneja, Naveen Kumar, Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Pearson, 2017.
3. Michael Dawson, Cengage Learning, Programming with Python, A User's Book, India Edition. 5<sup>th</sup> Edition 2013
4. W. Chun, Core Python Programming, Pearson. 2<sup>nd</sup> Edition, 2006.
5. Kenneth A. Lambert, Introduction to Python, Cengage 2<sup>nd</sup> Edition, 2017.

**Web Link:** 1) [https://onlinecourses.nptel.ac.in/noc22\\_cs26/preview](https://onlinecourses.nptel.ac.in/noc22_cs26/preview)  
2) <https://www.python.org/about/gettingstarted/>

## Software Engineering Lab

**B.Tech. III Semester.**

**L T P C**  
**0 0 2 1**

**Subject Code: 22AM307PC**

**Prerequisites:** A course on Programming for Problem Solving.

**Co-requisite: A course on Software Engineering.**

**Course Objectives:**

1. To provide hands on experience in developing a software project.

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

1. Translate end-user requirements into system and software requirements.
2. Design the Software Configuration Management and Risk Management
3. Measure the high-level design of the system from the software requirements
4. Develop awareness of testing problems with testing report
5. Demonstrate the sample project.

**List of Experiments**

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

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

**Sample Projects:**

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

**TEXT BOOKS:**

1. Roger S. Pressman, Software Engineering, A practitioner's Approach-, McGraw Hill International Edition 6th edition.2007
2. Sommerville, Software Engineering, Pearson Education, 7th edition.2008
3. Grady Booch, James Rumbaugh, Ivar Jacobson, The unified modeling language user guide, Pearson Education.1999

**REFERENCE BOOKS:**

1. James F. Peters, Witold Pedrycz, John Wiley, Software Engineering, an Engineering approach, 1998.
2. Waman S Jawadekar, Software Engineering principles and practice, The McGraw-Hill, 2004.

**Web Link ;**1 <https://nptel.ac.in/courses/106101061>

2 <https://www.javatpoint.com/software-engineering>



## Operating Systems Lab

**B. Tech. III Sem.**

**L T P C**  
**0 0 3 1.5**

**Subject Code: 22AM308PC**

**Prerequisites:** A course on Data Structures using C

**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 using UNIX/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 memorymanagement 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- 7<sup>th</sup> Edition,
2. W.R.Stevens ,Advanced programming in the Unix environment, Pearson education 3<sup>rd</sup> 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. III Semester**

**L T P C**  
**0 0 2 1**

**Subject Code: 22AM309PC**

**Prerequisites: A Course on Object Oriented Programming through Java and HTML.**

**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. Define and 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. Compile the server – side implementation using Node JS.
5. Design a Single Page Application using React.

**[25 Lectures]**

**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 and experiment 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 in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking 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 CRUD operations 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 display the current and historical weather information using graphical representation using chart.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, new edition, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasanth Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, A Press, 2<sup>nd</sup> Edition, 2019.



## Constitution of India

**B.Tech. III Semester.**

**L T P C**

**3 0 0 0**

**Subject Code: 22EN310MC**

**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. Appraise and address the role of governments.

### UNIT-1

History of Making of the Indian Constitution - History of Drafting Committee.

**[5 Lectures ]**

### UNIT-2

Philosophy of the Indian Constitution - Preamble Salient Features

**[5 Lectures]**

### UNIT-3

Contours of Constitutional Rights & Duties - Fundamental Rights

**[3 Lectures ]**

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties

### UNIT-4

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

**[6 Lectures ]**

**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 Zila Panchayat: Position and role. 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, 16<sup>th</sup> 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, 7th Edn., Lexis Nexis, 2018.
4. D.D. Basu, Introduction to the Constitution of India, 23<sup>rd</sup> 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](https://youtu.be/vq2Q1_v6TNU)



## Automata Theory and Compiler Design

**B.Tech. IV Semester.**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM401PC**

**Prerequisites:** A course on **Computer Organization**

**Course Objectives:**

1. To introduce the fundamental concepts of formal languages, grammars and automata theory.
2. To understand about deterministic and non-deterministic machines.
3. To introduce the major concepts of language translation and compiler design.
4. To study the phases of compiler.

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

1. Define about the finite state machines for modeling and solving computing problems.
2. Design context free grammars for formal languages.
3. Compare decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Evaluate skills in using lexical tool and design LR parsers.

**[10 Lectures]**

**UNIT - I**

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

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

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

**UNIT – II**

**[8 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 the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT – III**

**[8 Lectures]**

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA and CFG's, Acceptance by final state

**Turing Machines:** Introduction to Turing Machine, Formal Description, Instantaneous description, The 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****[6 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****[8 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. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education, 3<sup>rd</sup> Edition. 1999.
2. Mishra and Chandrashekar, Theory of Computer Science – Automata languages and computation, PHI, 2<sup>nd</sup> Edition. 2007.

**REFERENCE BOOKS:**

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Pearson, 2<sup>nd</sup> Edition, 1996.
2. Kamala Krithivasan, Rama R., Introduction to Formal languages Automata Theory and Computation, Pearson, 2019.
3. John C Martin, Introduction to Languages and The Theory of Computation, TMH, 2004.
4. John R. Levine, Tony Mason, Doug Brown, lex & yacc – O'reilly, Compiler Construction, Course Technology. 2020

**Web Link** 1) <https://www.javatpoint.com/automata-tutorial>2) <https://nptel.ac.in/courses/106105196>

## Database Management Systems

**B.Tech. IV Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM402PC**

**Prerequisites:** A course on Data Structures.

**Course Objectives:**

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To study about data models and design of database.

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

1. Design a database conceptually using ER Diagrams.
2. Demonstrate a database using Relational Model.
3. Make use of SQL for managing databases.
4. Function different transaction processing and Concurrency control mechanisms.
5. Compare different file organization methods.

**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**

**[8 Lectures]**

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables 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****[6 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:**

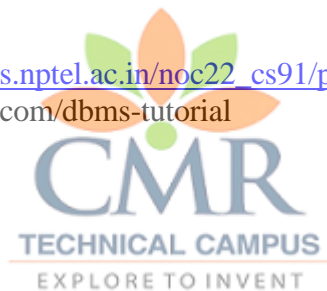
1. , Silberschatz, Korth ,Database System Concepts, McGraw hill, 3rd Edition, V edition.
2. Raghurama Krishnan, Johannes Gehrke ,Database Management Systems,Tata Mc Graw Hill. 3<sup>rd</sup> Edition 2002.

**REFERENCE BOOKS:**

1. Peter Rob & Carlos Coronel ,Database Systems design, Implementation, and Management, 7thEdition.
2. Elmasri Navrate ,Fundamentals of Database Systems, Pearson Education 2017
3. C. J. Date,Introduction to Database Systems, Pearson Education 2003
4. The X Team, S.Shah and V. Shah ,Oracle for Professionals, SPD. 2022
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.4<sup>th</sup> Edition 2005

**Web Link 1)** [https://onlinecourses.nptel.ac.in/noc22\\_cs91/preview](https://onlinecourses.nptel.ac.in/noc22_cs91/preview)

2) <https://www.javatpoint.com/dbms-tutorial>



## Mathematical and Statistical Foundations

**B.Tech. IV Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22MA403BS**

**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 out comes:** After completion of this course, the student will be able to:

1. Apply the concepts of probability and Random variables
2. Analyse the concept of Probability distributions to some case studies
3. Formulate and solve problems by applying statistical methods for analyzing experimental data.
5. Demonstrate the concept of estimation and distinguish regression analysis and to compute and interpret the coefficient of correlation.
6. 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. Ranganatham and Dr.M.V.S.S.N.Prasad, Probability and statistics , S.Chand, Eighth Revised edition ,2020.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, S.Chand publications, 12<sup>th</sup> revised edition ,2020 .
3. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi,2014.

**REFERENCE BOOKS:**

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

**WEBLINKS:**

1. <https://youtu.be/r1s>
2. <https://youtu.be/enDYkFxJE9W>
3. <https://youtu.be/VVYLPmKRfQ8>



## Introduction to Artificial Intelligence

**B.Tech. IV Semester**

**L T P C**  
**3 0 0 3**

**Subject Code: 22AM404PC**

**Prerequisites:** A course on Data Structures, Probability

**Course Objectives:**

1. To learn the distinction between optimal reasoning Vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive and, heuristic search.
3. To search together with the time and space complexities.
4. To learn different knowledge representation techniques.
5. To understand the applications of AI.

**Course Outcomes:** After completion of this course, student 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 - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

**UNIT – II**

**[10 Lectures]**

Games - Optimal Decisions in Games, Alpha-Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**

**[8 Lectures]**

First-Order Logic - 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, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

**UNIT-IV**

**[8 Lectures]**

Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

**UNIT-V**

**[6 Lectures]**

Probabilistic Reasoning:

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

1. E. Rich and K. Knight (TMH), Artificial Intelligence, 3rd Edition, 2010
2. Patrick Henry Winston, Artificial Intelligence, Pearson Education, 3rd Edn.2010
- Shivani Goel ,Artificial Intelligence, Pearson Education,2013
- Patterson ,Artificial Intelligence and Expert systems , Pearson Education,2010

Web Link:1) [https://onlinecourses.nptel.ac.in/noc22\\_cs56/preview](https://onlinecourses.nptel.ac.in/noc22_cs56/preview)

2) <https://www.javatpoint.com/artificial-intelligence-ai>



## Object Oriented Programming Through Java

**B.Tech. IV Semester**

**L T P C**

**3 0 0 3**

**Subject Code: 22AM405PC**

**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. Apply the 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**- Away 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, 2<sup>nd</sup> 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](https://education.oracle.com/java/java/pFamily_48)

# Database Management Systems Lab

**B.Tech. IV Semester**

**L T P C**  
**0 0 2 1**

**Subject Code: 22AM406PC**

Prerequisites: A course on Data Structures.

Co-requisite: A course on Database Management Systems

## Course Objectives:

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

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

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures
4. Make use of Cursors and triggers to demonstrate database applications.
5. Perform queries using Aggregation function.

## 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.)  
B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

## TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke ,Database Management Systems, Tata Mc Graw Hill,3<sup>rd</sup> Edition, 2003.
2. Silberschatz, Korth ,Database System Concepts, McGraw Hill, V edition,2019

## REFERENCE BOOKS:

1. Peter Rob & Carlos Coronel ,Database Systems design, Implementation, and Management, 7<sup>th</sup>Edition, 2007.
2. Elmasri Navrate ,Fundamentals of Database Systems, , Pearson Education,2010.
3. C.J. Date ,Introduction to Database Systems, Pearson Education,2003
4. The X Team, S. Shah and V. Shah , SPD ,Oracle for Professionals, 2008.
5. Shah,Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI new edition 2001.
6. M. L. Gillenson, Fundamentals of Database Management Systems, WileySecond Edition, 2011.

Web Link : 1) <https://nptel.ac.in/courses/106105175>

# Java Programming Lab

**B.Tech. IV Sem.**

**L T P C**  
**0 0 2 1**

**Subject Code: 22AM407PC:**

Prerequisites: A course on Programming for Problem Solving using C

Co-requisite: A course on Java Programming

## Course Objectives:

1. To understand OOP principles.
2. To understand the Exception Handling mechanism.
3. To understand Java collection framework.
4. To understand multithreaded programming.
5. To understand swing controls in Java.

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

1. Explain the programs for solving real world problems using Java OOP principles.
2. Design programs using Exceptional Handling approach.
3. Compile program on multithreaded applications.
4. Construct Graphical User Interfaces using applets and swing control.
5. Experiment with all mouse events.

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 to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]
3. Write a Java program to handle checked and unchecked exceptions. Also, demonstrate the usage of custom exceptions in real time scenario.
4. Write a Java program on Random Access File class to perform different read and write operations.
5. Write a Java program to demonstrate the working of different collection classes. [Use package structure to store multiple classes].
6. Write a program to synchronize the threads acting on the same object. [Consider the example of any reservations like railway, bus, movie ticket booking, etc.]
7. Write a program to perform CRUD operations on the student table in a database using JDBC.
8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]

**REFERENCE BOOKS:**

1. P. J. Deitel and H. M. Deitel ,Java for Programmers, Pearson education,10th Edition, 2010.
2. Bruce Eckel ,Thinking in Java, Pearson Education, 2006.
3. D. S. Malik and P. S. Nair ,Java Programming, Cengage Learning, 2011
4. CayS. Horstmann and G Cornell, Core Java ,Pearson, Volume 1, 9th edition, 2012

**Web Link ;1)** <https://www.programiz.com › java-programming>





# Gender Sensitization Lab

B.Tech. IV Semester

L T P C  
0 0 2 1

**Subject Code: 22EN408MC**

## Course Objectives:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To introduce students to information about some key biological aspects of genders.
3. To expose the students to debates on the politics and economics of work.
4. To help students reflect critically on 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 Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

## UNIT-III: GENDER AND LABOUR

[4 Lectures]

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 Eye-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life...."

## UNIT-V: GENDER AND CULTURE

[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 Parks The 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](http://ncw.nic.in/sites/default/files/Booklet-%20Gender%20Sensitization_0.pdf)
2. [http://gmmrcg.in/Content/284\\_464\\_7.1.1%20weblink%20annual%20gender%20sensitization%20action%20plan.pdf](http://gmmrcg.in/Content/284_464_7.1.1%20weblink%20annual%20gender%20sensitization%20action%20plan.pdf)



# Prolog/ Lisp/ Pyswip

B.Tech. IV Semester

L T P C  
0 0 2 1

**Subject Code: 22AM409PC**

Prerequisites: A Course on Basic knowledge in English communication

## Course Objectives:

1. To help students in learning prolog/lisp
2. To help students to make critical decision.
3. To develop Skills awareness of how to work with and negotiate with people.
4. To resolve stress and conflict in ourselves and others
5. To help students reflect knowledge of Artificial Intelligence.

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

1. Develop the program in Prolog/Lisp/PYSWIP
2. Demonstrate Real time application
3. Solve Real time problems
4. Experiment program using functions
5. Analyze the prolog predicate

## List of Programs:

1. Write simple fact for following:
  - A. Ram likes mango.
  - B. Seema is a girl.
  - C. Bill likes Cindy.
  - D. Rose is red.
  - E. John owns gold
2. Write predicates one converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
3. Write a program to solve the Monkey Banana problem
4. WAP in turbo prolog for medical diagnosis and show the advantages and disadvantages of green and red cuts.
5. Write a program to solve the 4-Queen problem.
6. Write a program to solve traveling salesman problems.
7. Write a program to solve water jug problems using Prolog.
8. Write simple Prolog functions such as the following. Take into account lists which are too short.  
-- remove the Nth item from the list. -- insert as the Nth item.
9. Assume the prolog predicate  $gt(A, B)$  is true when A is greater than B. Use this predicate to define the predicate  $addLeaf(Tree, X, NewTree)$  which is true if NewTree is the Tree produced by adding the item X in a leaf node. Tree and NewTree are binary search trees. The empty tree is represented by the atom nil.
10. Write a Prolog predicate,  $countLists(Alist, Ne, Nl)$ , using accumulators, that is true when Nl is the number of items that are listed at the top level of Alist and Ne is the number of empty lists. Suggestion: First try to count the lists, or empty lists, then modify by adding the other counter.



11. Define a predicate `memCount(AList,Blist,Count)` that is true if `AList` occurs `Count` times within `Blist`. Define without using an accumulator. Use "not" as defined in `utilities.pro`, to make similar cases are unique, or else you may get more than one count as an answer.
12. Examples:  
`memCount(a,[b,a],`

`N).N = 1 ;`

`no`

`memCount(a,[b,[a,a,[a],c],a],`

`N).N = 4 ;`

`no`

`memCount([a],[b,[a,a,[a],c],a],`

`N).N = 1 ;`

`No`

### REFERENCE BOOK:

1.3e, by BRATKO, PROLOG: Programming for Artificial Intelligence, WILEY 3<sup>rd</sup> edition, 2015.

Web Link 1) [https://onlinourses.nptel.ac.in/noc20\\_hs16/preview](https://onlinourses.nptel.ac.in/noc20_hs16/preview).



## DESIGN AND ANALYSIS OF ALGORITHMS

**B. Tech. V Semester**

**L T P C**

**3 1 0 4**

**Subject code: 22AM501PC**

**Prerequisites:**

A course on “Programming for Problem Solving”.

A course on “Data Structures”.

**Course Objectives:**

1. To analyze the performance of algorithms.
2. To learn about backtracking approach to solve a problem.
3. To apply dynamic programming to solve problem.
4. To solve a problem using Greedy method.
5. To apply branch and bound technique to solve a problem

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

1. Analyzing the algorithm in terms of space and time.
2. Design the algorithm using the Back Tracking approach.
3. Implement dynamic programming strategy.
4. Apply the Greedy methods and Search Techniques
5. Construct the algorithm using branch and bound and 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- All pairs shortest path problem, Single source shortest path problem, Optimal binary search tree, 0/1 knapsack problem, Traveling salesperson 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 - Traveling salesperson 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.

**TEXTBOOKS:**

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 Hopcroft, Design and Analysis of algorithms, Pearson Education, 1<sup>st</sup> Edition, 2002.
4. R. Neapolitan and K.Naimipour, Foundations of Algorithms, 4<sup>th</sup> edition, JonesAndBartlett India Private Limited, 2010.
5. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and Stein, Introduction to Algorithms, 3<sup>rd</sup> 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>



## MACHINE LEARNING

**B.Tech. V Semester**

**L T P C**  
**3 0 0 3**

**Subject code: 22AM502PC**

**Prerequisites:**

- A course on “Mathematical and Statistical Foundations”
- A course on “Programming with Python”.
- 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 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 the 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 Neighbor 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 andall/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-es18/preview>





## COMPUTER NETWORKS

**B.Tech. V Semester**

**L T P C**

**3 0 0 3**

**Subject code: 22AM503PC**

### Prerequisites

A course on “Programming for problem solving”

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.

**Datalinklayer:**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:** The 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, The 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, 1<sup>st</sup> 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>



**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****B.Tech. V Semester****L T P C****3 0 0 3****Subject code: 22MB504HS****Prerequisites: None****Course Objectives:**

1. To learn about the basic types of Business entities.
2. To know about demand and supply analysis.
3. To acquire the knowledge of production and cost analysis.
4. To analyze the Business from the Financial Perspective.
5. To interpret the performance of the business with the help of ratios.

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

1. Enumerate the various Forms of Business entities.
2. Apply the demand and supply analysis.
3. Make use of production and cost analysis.
4. Analyze the Business from the Financial Perspective.
5. Interpret the performance of the business with the help of ratios.

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

**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 in 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****[8 Lectures]****Demand and Supply Analysis:**

**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 & Law of Supply.

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

**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****[10 Lectures]**

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

**UNIT – V****[8 Lectures]**

**Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

**TEXT BOOKS:**

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd., 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw 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, Vikas Publications, 2013.

**WEB LINKS:**

1. <https://nptel.ac.in/courses/110101005>
2. <https://www.coursera.org/specializations/managerial-economics-business-analysis>
3. <https://www.udemy.com/course/engineering-economics-take-decision-between-alternatives/>
4. <https://www.classcentral.com/course/youtube-mefa-managerial-economics-financial-analysis-91420>
5. <https://www.emerald.com/insight/publication/issn/1569-3759>

**GRAPH THEORY (Professional Elective – I)****B. Tech. V Semester****L T P C****3 0 0 3****Subject code: 22AM511PE****Prerequisites:**

A course on “Discrete Mathematics”

**Course Objectives:**

1. To introduce the fundamental concepts of graphs.
2. To know about the connected graphs and shortest paths.
3. To learn about Trees algorithms and different types of Graphs.
4. To describe independent sets and matching algorithms in graphs.
5. To explore vertex coloring in Graphs.

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

1. Enumerate the fundamental concepts of graphs.
2. Apply some basic algorithms for graphs to find the shortest paths.
3. Apply different Trees algorithms.
4. Develop independent sets and matching algorithms for graphs.
5. Solve graph coloring problems.

**UNIT – I****[10 Lectures]**

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

**UNIT – II****[8 Lectures]**

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

**UNIT – III****[10 Lectures]**

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

**UNIT – IV****[7 Lectures]**

**Independent sets coverings and matchings:** Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall’s Theorem, Konig’s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**UNIT – V****[9 Lectures]**

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

**TEXTBOOKS:**

1. J. A. Bondy, U. S. R. Murty, Graph Theory, volume 244 of Graduate Texts in Mathematics, Springer, 1st edition, 2008.
2. J. A. Bondy, U. S. R. Murty, Graph Theory with Applications, Elsevier Science Ltd/North- Holland, 1984.

**REFERENCEBOOKS:**

1. Douglas Brent West, Introduction to Graph Theory, Pearson College Div, Subsequent edition, 2000.
2. V. Balakrishnan, Schaum's Outline of Graph Theory: Including Hundreds of Solved Problems, McGraw Hill, 1st edition, 1997.
3. Robin J. Wilson, Introduction to Graph Theory, Pearson Education Limited, 5<sup>th</sup> edition, 2010.
4. Deo, Graph theory with applications to engineering & computer science, prentice hall india, new edition, 1979.
5. Robin J. Wilson, John J. Watkins, Graphs: An Introductory Approach--A First Course in Discrete Mathematics, Wiley, 1st edition, 1990.

**WEB LINKS:**

1. <https://nptel.ac.in/courses/111106102>
2. <https://www.coursera.org/learn/graphs>
3. <https://www.udemy.com/course/graph-theory/>
4. <https://freecomputerbooks.com/compscGraphTheoryBooks.html>
5. <https://link.springer.com/book/10.1007/978-3-662-53622-3>

**INTRODUCTION TO DATA SCIENCE (Professional Elective – I)****B. Tech. V Semester****L T P C****3 0 0 3****Subject code: 22AM512PE****Prerequisites:**

A Course on “Mathematical and Statistical Foundations”.

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 this 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, Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attributes, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus 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, subsetting 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 Steinbach, 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](https://onlinecourses.nptel.ac.in/noc24_cs54/preview)





**WEB PROGRAMMING (Professional Elective – I)****B.Tech. V Semester.****L T P C****3 0 0 3****Subject code: 22AM513PE****Prerequisites:**

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 serverside 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, their attributes and values, Difference 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-statements 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 & 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: 22AM514PE****Prerequisites**

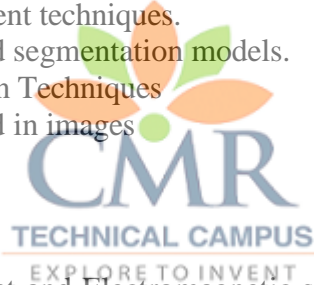
1. A course on “Mathematical and Statistical Foundations”.

**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 the 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.<sup>9</sup>

**UNIT – V****[10 Lectures]**

**Recognition:** Patterns and 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:**

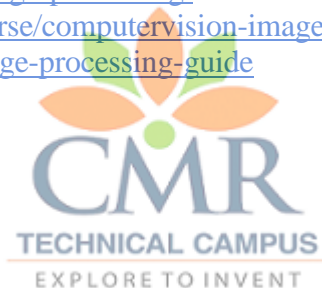
1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

**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 Wiley, 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: 22AM515PE****Prerequisites:**

- A course on “Programming for Problem Solving”
- 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 this 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 and 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 algorithm.

**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]**

**3D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations composite transformations.

**3D 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:**

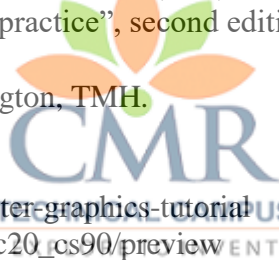
1. “Computer Graphics C version”, Donald Hearn and M. Pauline Baker, Pearson Education

**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](https://onlinecourses.nptel.ac.in/noc20_cs90/preview)



**MACHINE LEARNING LAB****B.Tech. V Semester****L T P C**  
**0 0 3 1.5****Subject code: 22AM505PC****Co-requisites:**

A course on “ Machine learning ”

**Prerequisites:**

A Course on “Mathematical and Statistical Foundations”.

A Course on “Programming with Python”.

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, kmeans 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, kmeans 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, matplotlib 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 sklearn 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 sklearn library
8. Write a python program to apply Logistic regression algorithm for a classification problem using sklearn library
9. Write a python program to apply k-means algorithm for a clustering problems
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>





**COMPUTER NETWORKS LAB****B.Tech. V Semester.****L T P C**

0 0 3 1.5

**Subject code: 22AM506PC****Co-requisites:**

A course on “Computer Network”

**Prerequisites:**

A course on “Programming for problem solving”

A course on “Data Structures”

**Course Objectives**

1. To learn about data link layer farming methods.
2. To know about different flow control mechanisms.
3. To gain knowledge about distance vector routing algorithm.
4. To learn about Leaky bucket algorithm for congestion control.
5. To know about network configuration commands.

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

1. Develop data link layer farming methods.
2. Analyze different flow control mechanisms.
3. Apply distance vector routing algorithm for routing.
4. Apply Leaky bucket algorithm for congestion control.
5. Make use of network configuration commands.

**List of Experiments**

1. Write a Program to implement the data link layer farming methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Write a Program to implement a simple data link layer that performs the flow control using the slidingwindow protocol, and loss recovery using the Go-Back-N mechanism.
4. Write a Program to Implement Dijkstra’s algorithm to compute the shortest path through a network.
5. Write a Program to simulate the subnet of hosts and obtain a broadcast tree for the subnet.
6. Write a Program to Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Write a Program to Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. Demonstrate how to run N Map scan.

11. Demonstration of Operating System Detection using Nmap.
12. Study of basic Network configuration commands and utilities to debug the network issues.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networks, S. Keshav, 2<sup>nd</sup> Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH

**WEBLINKS:**

1. <https://github.com/Amey-Thakur/COMPUTER-NETWORK-AND-COMPUTER-NETWORK-LAB>
2. [https://www.youtube.com/playlist?list=PLletCzWRuhgg\\_Z9p5USL9DshJ1bwU02Ff](https://www.youtube.com/playlist?list=PLletCzWRuhgg_Z9p5USL9DshJ1bwU02Ff)



**UI DESIGN-FLUTTER****B.Tech. V Semester****L T P C****0 0 2 1****Subject code: 22AM507PC****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 fields, 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](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/>



## INTELLECTUAL PROPERTY RIGHTS

**B.Tech. V Semester**

**L T P C**  
**3 0 0 0**

**Subject code: 22AM508MC**

**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 secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret 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, and 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. VKAhuja, LawRelatingToIntellectual PropertyRights, LexisNexis, Thirdeedition, 2017.

**WEB LINKS:**

1. [https://onlinecourses.nptel.ac.in/noc22\\_hs59/preview](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>



**KNOWLEDGE REPRESENTATION AND REASONING****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code: 22AM601PC****Prerequisites:**

A course on “Introduction to Artificial Intelligence”

**Course Objectives:**

1. To learn about the key concepts of knowledge, Representation and Reasoning.
2. To gain knowledge about different ontological categories.
3. To apply the principles of knowledge representations.
4. To identify different types of processes and contexts.
5. To know about vagueness, uncertainty, randomness and ignorance.

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

1. Enumerate the key concepts of knowledge, Representation and Reasoning.
2. Interpret different ontological categories.
3. Apply the principles of knowledge representations.
4. Classify different types of processes and contexts.
5. Interpret vagueness, uncertainty, randomness and ignorance.

**UNIT – I****[10 Lectures]**

**The Key Concepts:** Knowledge, Representation, Reasoning, need of knowledge representation and reasoning, Knowledge based systems, Role of logic

**Logic:** Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity.

**UNIT – II****[10 Lectures]**

**Ontology:** Ontological categories, micro worlds, cyc categories, Philosophical background, Aristotles Categories, Kant’s categories, Top-level categories, describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

**UNIT – III****[7 Lectures]**

**Knowledge Representations:** Knowledge Engineering, Informal Specifications, Formalization, Principles of Knowledge Representations, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

**UNIT – IV****[8 Lectures]**

**Processes:** Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change.

**Contexts:** Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts, Agents.

**UNIT – V****[8 Lectures]**

**Knowledge Soup:** Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics.

**Knowledge Acquisition and Sharing:** Sharing Ontologies, Conceptual schema, accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

**TEXT BOOKS:**

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

**WEBLINKS:**

1. <https://www.javatpoint.com/knowledge-representation-in-ai>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs14/prev](https://onlinecourses.nptel.ac.in/noc24_cs14/prev)





**DATA ANALYTICS****B. Tech. VI Semester****L T P C****3 0 0 3****Subject code: 22AM602PC****Prerequisites**

A course on “Database Management Systems”.

**Course Objectives:**

1. To learn about the different data management techniques.
2. To know about different data modelling techniques.
3. To gain knowledge on model development using logistic regression.
4. To know about object segmentation and time series methods.
5. To apply different data visualization techniques.

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

1. Enumerate the different data management techniques.
2. Apply different data modelling techniques.
3. Develop model using logistic regression.
4. Examine object segmentation and time series methods.
5. Apply different data visualization techniques.

**UNIT – I****[10 Lectures]**

**Data Management:** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors, Signals, GPS. Data Management, Data Pre Processing, Data Quality, Data Cleaning, noise outliers, missing values, duplicate data, Data Processing.

**UNIT – II****[10 Lectures]**

**Data Analytics:** Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases, Types of Data and Variables, Data Modeling Techniques, Missing Imputations, Need for Business Modeling.

**UNIT – III****[9 Lectures]**

**Regression:** Definition, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building.

**Logistic Regression:** Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains.

**UNIT – IV****[9 Lectures]**

**Object Segmentation:** Regression Vs Segmentation, Supervised and Unsupervised Learning, Tree Building, Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees.

**Time Series Methods:** ARIMA, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy and analyze for prediction.

**UNIT – V****[9 Lectures]**

**Data Visualization:** Need of data visualization, Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Scatter Plots, Icon-Based Visualization Techniques, Chernoff faces, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

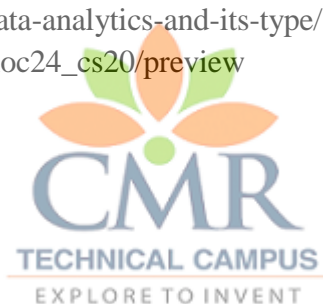
1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.

**WEBLINKS:**

1. <https://www.geeksforgeeks.org/data-analytics-and-its-type/>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs20/preview](https://onlinecourses.nptel.ac.in/noc24_cs20/preview)



**NATURAL LANGUAGE PROCESSING****B.Tech. VI Semester****L T P C**  
**3 0 0 3****Subject code:22AM603PC****Prerequisites:**

- A course on “Data structures”
- A course on “compiler design”

**Course Objectives:**

1. To learn about the structure of words and documents.
2. To know about different models for ambiguity resolution in parsing.
3. To apply Semantic Parsing and remove ambiguity.
4. To make use of different Language Modeling Techniques.
5. To learn about multilingual sentiment and subjectivity.

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

1. Interpret the structure of words and documents.
2. Apply different models for ambiguity resolution in parsing.
3. Apply Semantic Parsing and remove ambiguity.
4. Make use of different Language Modeling Techniques.
5. Analyze multilingual sentiment and subjectivity.

**UNIT – I****[9 Lectures]****Introduction :** Definition , challenges of NLP, Application of NLP.**Finding the Structure of Words:** Words and their Components, Tokens, Lexemes, Morphemes, Typology, issues and Challenges, Morphological Models**Finding the Structure of Documents:** Sentence Boundary Detection, Topic Boundary Detection, Methods, Complexity of the Approaches, Performances of the Approaches.**UNIT – II****[8 Lectures]****Syntax:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in parsing, Multilingual issues, Tokenization, Case and Encoding, Word Segmentation, Morphology.**UNIT – III****[8 Lectures]****Semantic Parsing:** Introduction, Semantic Interpretation, Structural Ambiguity, wordsense Disambiguation, Entity and Event Resolution, Predicate Argument Structure, Meaning Representation, System Paradigms, Resources, Systems and software for word sense, Resources, Systems and software for predicate argument structure, Resources, Systems and software for meaning representation.**UNIT – IV****[7 Lectures]****Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific

Modeling Problems, Multilingual and Crosslingual Language Modeling.

**UNIT – V****[10 Lectures]**

**Multilingual Sentiment and Subjectivity Analysis:** Introduction, Sentiment and Subjectivity on English, word and phrase level annotations, sentence level annotations, document level annotations, manually annotated corpora, corpus based cross lingual projections, Bootstrapping a lexicon, translating a lexicon.

**TEXT BOOKS:**

1. Daniel M. Bikel and Imed Zitouni Multilingual natural Language Processing Applications: From Theory to Practice, Pearson Publication
2. Tanvir Siddiqui, U.S.Tiwary Natural Language Processing and Information Retrieval

**REFERENCE:**

1. Daniel Jurafsky & James H Martin, Pearson Publications Speech and
2. Natural Language Processing.
3. Dan Jurafsky and James Martin. Speech and Language Processing: An Introduction
4. to Natural Language Processing, Computational Linguistics and Speech Recognition.
5. Prentice Hall, Second Edition, 2009.

**WEBLINKS:**

1. <https://www.geeksforgeeks.org/natural-language-processing-overview/>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs39/preview](https://onlinecourses.nptel.ac.in/noc24_cs39/preview)



**SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code: 20AM621PE****Prerequisites:**

A course on “Software Engineering”.

**Course Objectives:**

1. To learn about the purpose of software testing and path testing.
2. To apply flow based and domain based testing strategies.
3. To know about the logic-based testing method.
4. To gain knowledge of transition testing using state graphs.
5. To learn about automated testing using modern tools

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

1. Enumerate the purpose of software testing and path testing.
2. Apply flow based and domain based testing strategies.
3. Illustrate the logic-based testing method.
4. Apply transition testing using state graphs.
5. Develop automated testing using modern tools.

**UNIT – I****[10 Lectures]**

**Introduction:** Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

**Flow graphs and Path testing:** Basic 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 dataflow testing.

**Domain Testing:** domains and paths, Nice and ugly domains, domain testing, domains and interfaces testing, domains and testability.

**UNIT – III****[9 Lectures]**

**Paths, Path products and Regular expressions:** path products, path expression, reduction procedure, applications, regular expressions, flow anomaly detection.

**Logic Based Testing:** overview, decision tables, path expressions, kv charts, specifications.

**UNIT – IV****[9 Lectures]**

**State, State Graphs and Transition testing:** State, State graphs, State table, Software Implementation, good and bad state graphs, state bugs, Transition bugs, Encoding bugs, state testing, Limitations and Extensions, Test ability tips

**UNIT – V****[9 Lectures]**

**Graph Matrices and Application:** Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, Introduction to building tools, Jmeter, winRunner, selenium, soapUI, Catalon.

**TEXT BOOKS:**

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

**REFERENCE BOOKS:**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

**WEBLINKS:**

1. <https://www.geeksforgeeks.org/software-testing-techniques/>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc24_cs47/preview)



**INFORMATION RETRIEVAL SYSTEMS (Professional Elective – II)****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code: 22AM622PE****Prerequisites:**

A course on “Data Structures”.

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](https://onlinecourses.nptel.ac.in/noc24_ee47/preview)





**PATTERN RECOGNITION (Professional Elective – II)****B.Tech. VI Semester****L T P C  
3 0 0 3****Subject code: 22AM623PE****Prerequisites:**

A Course on “Machine Learning”

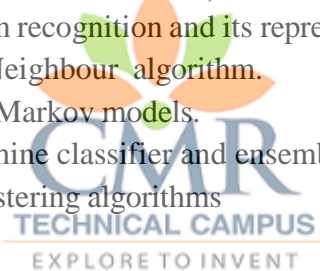
A Course on “Mathematics and Statistical Foundation “

**Course Objectives:**

1. To learn about the importance of pattern recognition and its representation.
2. To know about the variants of Nearest Neighbour algorithm.
3. To Identify the necessity of Hidden Markov models.
4. To gain the knowledge of ensembles of classifiers.
5. To learn different types of clustering algorithms

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

1. Interpret the importance of pattern recognition and its representation.
2. Analyze the variants of Nearest Neighbour algorithm.
3. Identify the necessity of Hidden Markov models.
4. Examine the support vector machine classifier and ensembles of classifiers.
5. Design the different types of clustering algorithms

**UNIT – I****[10 Lectures]**

**Introduction:** Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition.

**Representation:** Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

**UNIT – II****[10 Lectures]**

**Nearest Neighbor Based Classifier:** Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection.

**Bayes Classifier:** Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

**UNIT – III****[9 Lectures]**

**Hidden Markov Models:** Markov Models for Classification, Hidden Markov Models, Classification using HMMs.

**Decision Trees:** Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

**UNIT – IV****[9 Lectures]**

**Support Vector Machines:** Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification.

**Combination of Classifiers:** Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

**UNIT – V****[9 Lectures]**

**Clustering:** Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets.

**An Application-Hand Written Digit Recognition:** Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

**TEXT BOOK:**

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Springer Pub, 1st Ed.

**REFERENCE BOOKS:**

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. PrenticeHall Pub.

**WEBLINKS:**

1. <https://www.geeksforgeeks.org/pattern-recognition-introduction/>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs40/preview](https://onlinecourses.nptel.ac.in/noc24_cs40/preview)



**COMPUTER VISION AND ROBOTICS (Professional Elective – II)****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code: 22AM624PE****Pre-Requisites:**

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 Gestalt, 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, Behavioural Sensor Fusion, Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOKS:**

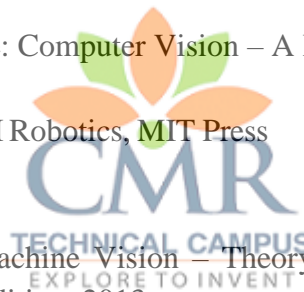
1. David A. Forsyth and Jean Ponce: *Computer Vision – A Modern Approach*, PHILearning (Indian Edition), 2009.
2. Robin Murphy, *Introduction to AI Robotics*, MIT Press

**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](https://onlinecourses.nptel.ac.in/noc24_ee38/preview)



**DATA WAREHOUSING AND BUSINESS INTELLIGENCE**  
(Professional Elective – II)

**B.Tech. VI Semester**

**L T P C**

**3 0 0 3**

**Subject code: 22AM625PE**

**Pre-Requisites:**

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 4<sup>th</sup> 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](https://onlinecourses.nptel.ac.in/noc24_cs65/preview)



**FUNDAMENTALS OF AI (Open Elective – I)****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code:22AM611OE****Prerequisites:**

A course on “Mathematical and Statistical Foundations”

**Course Objective:**

1. To learn about fundamental concepts of Artificial Intelligence.
2. To know about uninformed and informed search strategies.
3. To explore logical agents and inference in first order logic.
4. To learn about uncertainty and probabilistic reasoning.
5. To know about applications of Artificial Intelligence.

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

1. Enumerate the fundamental concepts of Artificial Intelligence.
2. Solve problems by uninformed and informed search strategies.
3. Apply first order logic to solve problems.
4. Solve the problems using probabilistic reasoning.
5. List the applications of Artificial Intelligence.

**UNIT – I****[12 Lectures]**

**Foundations of AI:** Introduction to AI, History of AI, Strong and Weak AI, Risks and Benefits of AI

**Philosophy, Ethics and Safety of AI:** Limits of AI, Machine thinking capability, Ethics of AI  
**Intelligent Agents:** Agents and Environments, Good Behavior: Concept of Rationality, Nature of Environments, Structure of Agents.

**UNIT – II****[10 Lectures]**

**Uninformed Search Strategies:** Best-First Search, Breadth-First Search, Uniform-Cost Search, Depth-First Search, Iterative Deepening Search and Bidirectional Search

**Informed Search Strategies:** Greedy Best-First Search, A\* Search.

**UNIT – III****[10 Lectures]**

**Logical Agents:** Knowledge-based agents, Propositional Logic.

**First-Order Logic:** Syntax and Semantics of First-Order Logic.

**Inference in First-Order Logic:** Propositional Vs First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining.

**UNIT – IV****[9 Lectures]**

**Quantifying Uncertainty:** Basic Probability Notation, Inference using Full-Joint Distributions, Independence, Bayes' Rule and its Use, Naive Bayes Models.

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, semantics of Bayesian Networks, Exact Inference in Bayesian Networks.

**UNIT – V****[9 Lectures]**

**Learning from Examples:** Forms of Learning, Supervised Learning, Learning Decision Trees, Model Selection, Linear Regression and Classification, Ensemble Learning.

**Natural Language Processing:** Language Models, Grammar, Parsing, Complications of Real Natural Language, Natural Language Tasks.

**TEXT BOOKS:**

1. “Artificial Intelligence a Modern Approach”, Fourth Edition, Stuart J. Russell & Peter Norvig – Pearson.

**REFERENCE BOOKS:**

1. Elaine Rich, Kevin Knight & Shivashankar B Nair “Artificial Intelligence”, –McGraw Hill Education.
2. E. Rich and K. Knight Artificial Intelligence, 3rd Edn (TMH)
3. Patrick Henny Winston, Artificial Intelligence, 3rd Edn., Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

**WEBLINKS:**

1. <https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/>
2. [https://onlinecourses.nptel.ac.in/noc24\\_mg05/preview](https://onlinecourses.nptel.ac.in/noc24_mg05/preview)





**MACHINE LEARNING BASICS (Open Elective – I)****B.Tech. VI Semester****L T P C****3 0 0 3****Subject code: 22AM612OE****Pre requisits:**

- A Course on “Mathematical and Statistical Foundations”.
- A Course on “Programming for Problem Solving”.
- A Course on “Data Structures”.

**Course Objectives:**

1. To introduce the basic concepts of Machine Learning.
2. To learn about multi layer perceptron and support vector machine.
3. To know about decision trees and ensemble learning.
4. To learn about K Means clustering and evolutionary learning.
5. To know about Reinforcement learning and markov Markov Chain Monte Carlo methods.

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

1. Enumerate the basic concepts of machine learning.
2. Build classifiers using Multi layer perceptron
3. Apply ensemble learning to increase the classification accuracy.
4. Make use of K Means clustering and evolutionary computing algorithms.
5. Apply Markov Chain Monte Carlo methods on real datasets.

**UNIT – I****[10 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, the Candidate Elimination Algorithm, 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 – Overview – Deriving Back-Propagation, Support Vector Machine.

**UNIT – III****[8 Lectures]**

**Learning with Trees:** Decision Trees, Constructing Decision Trees, Classification and Regression Trees

**Ensemble Learning:** Boosting, Bagging, Different ways to Combine Classifiers, Nearest Neighbor Methods

**UNIT – IV****[9 Lectures]**

**Unsupervised Learning:** Clustering, K means Algorithm, Strengths and weaknesses of K-Means.

**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, Hidden Markov Models**TEXT BOOKS:**

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/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.javatpoint.com/basic-concepts-in-machine-learning>
2. [https://onlinecourses.nptel.ac.in/noc24\\_cs51/preview](https://onlinecourses.nptel.ac.in/noc24_cs51/preview)



**DATA ANALYTICS LAB****B.Tech. VI Semester****L T P C****0 0 2 1****Subject code: 22AM604PC****Co-requisites:**

A course on “ Data Analytics“

**Prerequisites:**

A course on “ Programming with python “

A course on “ Mathematical and statistical Foundations “

**Course Objectives:**

1. To learn about data preprocessing methods
2. To gain the knowledge of linear regression and logistic regression models.
3. To design different classification models.
4. To apply data visualization techniques using different graphs.
5. To learn about predictive models for different types of data.

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

1. Apply data preprocessing methods
2. Develop linear regression and logistic regression models.
3. Design different classification models.
4. Apply data visualization techniques using different graphs.
5. Design predictive models for different types of data.

**List of Experiments:**

1. Write a python program to perform the following Data Preprocessing methods
  - a) Handling missing values
  - b) Noise detection and removal
  - c) Identifying data redundancy and elimination
2. Write a python program to apply any one imputation model on a sample data set
3. Write a python program to apply Linear Regression algorithm on a data set
4. Write a python program to apply Logistic Regression algorithm on a data set
5. Write a python program to apply Decision Tree Induction for classification on a data set
6. Write a python program to apply Random Forest algorithm on a data set
7. Write a python program to apply ARIMA on Time Series data
8. Write a python program for Object segmentation using hierarchical based methods
9. Write a python program to perform Visualization techniques (types of maps - Bar, Colum, Line, Scatter, 3D Cubes)
10. Write a python program to Descriptive analytics on healthcare data
11. Write a python program to Perform Predictive analytics on Product Sales data
12. Write a python program to Apply Predictive analytics for Weather forecasting.

**TEXT BOOKS:**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman  
Milliway Labs Jeffrey D Ullman Stanford Univ.

**WEBLINKS:**

1. <https://onlinecourses.nptel.ac.in/noc21-cs45/preview>
2. <https://github.com/hetshanh99/big-data-analytics-lab-practical>
3. <https://www.analyticsvidhya.com>



**ADVANCED ENGLISH COMMUNICATION SKILLS LAB****B.Tech. VI Semester****L T P C**  
**0 0 2 1****Subject code: 22EN605HS****Co-reequisites:**

A Course on “English Communication” .

**INTRODUCTION:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> 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:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Engaging in debates.
3. Participating in group discussions.
4. Facing interviews.
5. Writing project/research reports/technical reports.
6. Making oral presentations.
7. Writing formal letters.
8. Transferring information from non-verbal to verbal texts and vice-versa.
9. Taking part in social and professional communication.

**OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. 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.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

**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.

#### MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

1. Spacious room with appropriate acoustics.
2. Round Tables with movable chairs
3. Audio-visual aids
4. LCD Projector
5. Public Address system
6. P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
7. T. V, a digital stereo & Camcorder
8. Headphones of High quality

#### SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner’s Compass, 7<sup>th</sup> 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)

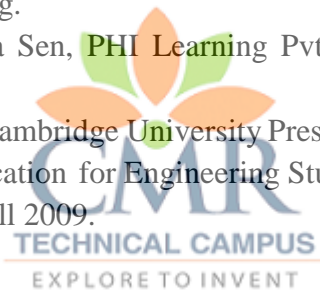


**TEXT BOOKS:**

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

## NATURAL LANGUAGE PROCESSING LAB

**B.Tech. VI Semester**

**L T P C**

**0 0 2 1**

**Subject code: 22AM606PC**

**Co-requisites:**

A course on “ Natural Language Processing”

**Prerequisites:**

A course on “Data structures”.

A course on “Automata theory and compile Design”.

A course on “Mathematical and statistical Foundations”.

**Course Objectives:**

1. To learn about Tokenization and Stop word Removal techniques.
2. To develop Porter stemmer algorithm for stemming.
3. To design nlp model for POS tagging.
4. To know about Morphological Analysis using NLTK library.
5. To develop a model that converts audio into text using NLTK.

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

1. Apply Tokenization and Stop word Removal techniques.
2. Develop Porter stemmer algorithm for stemming.
3. Design NLP model for POS tagging.
4. Develop Morphological Analysis using NLTK library.
5. Build a model that converts audio into text using NLTK.

**List of Experiments**

1. Write a Python Program to perform the following tasks on text
  - a) Tokenization
  - b) Stop word Removal
2. Write a Python program to implement Porter stemmer algorithm for stemming
3. Write Python Program for a) Word Analysis b) Word Generation
4. Create a Sample list for at least 5 words with ambiguous sense and Write a Python program to implement WSD ( Word Sense Disambiguation)
5. Install NLTK tool kit and perform stemming
6. Create Sample list of at least 10 words POS tagging and write a program to find the POS for any given word
7. Write a Python program to
  - a) Perform Morphological Analysis using NLTK library
  - b) Generate n-grams using NLTK N-Grams library
  - c) Implement N-Grams Smoothing
8. Write a python program to convert audio file to text and text file to audio files using NLTK Package .



**TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Oreilly Practical natural Language Processing, A Comprehensive Guide to Building Real World NLP Systems.
3. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

**REFERENCE BOOKS:**

1. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.



**ENVIRONMENTAL SCIENCE****B.Tech. VI Semester**

L	T	P	C
3	0	0	0

**Subject code : 22CH607MC****Course Objectives:**

1. To learn about the scope and importance of ecosystem.
2. To gain the knowledge of Classifying Natural Resources.
3. To know about Biodiversity and Biotic Resources.
4. To examine Environmental Pollution and Control Technologies.
5. To learn about Environmental Policy, Legislation & EIA

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

1. Enumerate the scope and importance of ecosystem.
2. Classify Natural Resources.
3. Interpret Biodiversity and Biotic Resources.
4. Examine Environmental Pollution and Control Technologies.
5. Identify Environmental Policy, Legislation & EIA

**UNIT – I****[12 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, 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 & 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 PHI 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, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

**DEVOPS****B.Tech. VI Semester****L T P C****0 0 4 2****Subject code: 22AM608PC****Course Objectives:**

1. To learn about Git and GitHub commands.
2. To develop the environment for a software application development.
3. To know about different project management, integration and development tools.
4. To Integrate Kubernetes and Docker.
5. To design automated testing of an application using selenium.

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

1. Make use of Git and GitHub commands.
2. Develop the environment for a software application development.
3. Apply different project management, integration and development tools.
4. Demonstrate integration of Kubernetes and Docker.
5. Design automated testing of an application using selenium.

**List of Experiments:**

1. Write code for a simple user registration form for an event.
2. Demonstrate the use of Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins's installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application for exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

**TEXT BOOKS:**

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. Edureka DevOps Full Course - [https://youtu.be/S\\_0q75eD8Yc](https://youtu.be/S_0q75eD8Yc)
2. <https://business-support.udemy.com/hc/en-us/articles/6806664783639-DevOps-Labs->
3. <https://azuredevopslabs.com/>
4. <https://devopslabs.tech/>
5. <https://cloudacademy.com/library/dev>

