**NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR**
**(AN AUTONOMOUS INSTITUTE)**

**Affiliated to**

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW**

# Evaluation Scheme & Syllabus

For

**Bachelor of Technology**

**Computer Science And Engineering (Artificial Intelligence & Machine Learning)**

**Second Year**

**(Effective from the Session: 2022-23)**

**NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR**
**(AN AUTONOMOUS INSTITUTE)**

# Bachelor of Technology
## Computer Science And Engineering (Artificial Intelligence & Machine Learning)
## EVALUATION SCHEME
### SEMESTER - III

| Sl. No. | Subject Codes | Subject Name | Periods | | | Evaluation Schemes | | | | End Semester | | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CT | TA | TOTAL | PS | TE | PE | | |
| **WEEKS COMPULSORY INDUCTION PROGRAM** | | | | | | | | | | | | | |
| 1 | AAS0303 | Statistics and Probability | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 2 | ACSE0306 | Discrete Structures | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 3 | ACSAI0302 | Logic Design and Computer Architecture | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 4 | ACSE0302 | Object Oriented Techniques using Java | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 5 | ACSE0301 | Data Structures | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 6 | ACSAI0301 | Introduction to Artificial Intelligence | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 7 | ACSE0352 | Object Oriented Techniques using Java Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 8 | ACSE0351 | Data Structures Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 9 | ACSAI0351 | Introduction to Artificial Intelligence Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 10 | ACSE0359 | Internship Assessment-I | 0 | 0 | 2 | | | | 50 | | | 50 | 1 |
| 11 | ANC0301/ ANC0302 | Cyber Security/ Environmental Science | 2 | 0 | 0 | 30 | 20 | 50 | | 50 | | 100 | |
| 12 | | MOOCs (For B.Tech. Hons. Degree) | | | | | | | | | | | |
| | | **GRAND TOTAL** | | | | | | | | | | **1100** | **24** |

**PLEASE NOTE:-**

- **Internship (3-4 weeks) shall be conducted during summer break after semester-II and will be assessed during Semester-III**
- **List of MOOCs (Coursera) Based Recommended Courses for Second Year (Semester-III) B. Tech Students**

1. Basic Data Descriptors, Statistical Distributions and Application to Business Decisions-Odd Semester- 21 hours-1.5 Credits
2. Getting Started with AI using IBM Watson-Odd Semester- 10 hours-0.5 Credit

- **Compulsory Audit Courses (Non Credit - ANC0301/ANC0302)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - Total and obtained marks are not added in the Grand Total.

**Abbreviation Used:-**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam.

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# Bachelor of Technology

## Computer Science And Engineering (Artificial Intelligence & Machine Learning)

## EVALUATION SCHEME

**SEMESTER -IV**

| Sl. No. | Subject Codes | Subject Name | Periods | | | Evaluation Schemes | | | | End Semester | | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CT | TA | TOTAL | PS | TE | PE | | |
| 1 | AAS0404 | Optimization and Numerical Techniques | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 2 | AASL0401 | Technical Communication | 2 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 3 | ACSE0403A | Operating Systems | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 4 | ACSAI0402 | Database Management Systems | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 5 | ACSML0401N | Machine Learning | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 6 | ACSE0404 | Theory of Automata and Formal Languages | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 7 | ACSE0453A | Operating Systems Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 8 | ACSAI0452 | Database Management Systems Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 9 | ACSML0451N | Machine Learning Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 10 | ACSE0459 | Mini Project using Open Technology | 0 | 0 | 2 | | | | 50 | | | 50 | 1 |
| 11 | ANC0402/ ANC0401 | Environmental Science/ Cyber Security | 2 | 0 | 0 | 30 | 20 | 50 | | 50 | | 100 | |
| 12 | | MOOCs (For B.Tech. Hons. Degree) | | | | | | | | | | | |
| | | **GRAND TOTAL** | | | | | | | | | | **1100** | **24** |

**PLEASE NOTE:-**

- **List of MOOCs (Coursera) Based Recommended Courses for Second Year (Semester-IV) B. Tech Students**

  1. Machine Learning Foundations: A case study -Even Semester-19 hours-1.5 Credit

  2. Building AI Powered Chatbots Without Programming-Even Semester- 9 hours- 0.5 Credit

- **Compulsory Audit Courses (Non Credit - ANC0401/ANC0402)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - Total and obtained marks are not added in the Grand Total.

**Abbreviation Used:-**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam.

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**AICTE Guidelines in Model Curriculum:**

A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 30 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits.

# B. TECH. SECOND YEAR

| Course Code | AAS0303 | L T P | Credit |
|---|---|---|---|
| Course Title | Statistics And Probability | 3 1 0 | 4 |

**Course objective:** The objective of this course is to familiarize the engineers with concept of Statistical techniques, probability distribution, hypothesis testing and ANOVA and numerical aptitude. It aims to show case the students with standard concepts and tools from B. Tech to deal with advanced level of mathematics and applications that would be essential for their disciplines.

**Pre-requisites:** Knowledge of Mathematics I and II of B. Tech or equivalent

## Course Contents / Syllabus

| UNIT-I | Descriptive measures | 8 Hours |
|---|---|---|

Measures of central tendency – mean, median, mode, measures of dispersion – mean deviation, standard deviation, quartile deviation, variance, Moment, Skewness and kurtosis, least squares principles of curve fitting,
Covariance, Correlation and Regression analysis, Correlation coefficient: Karl Pearson coefficient, rank correlation coefficient, uni-variate and multivariate linear regression, application of regression analysis, Logistic Regression, time series analysis- Trend analysis (Least square method).

| UNIT-II | Probability and Random variable | 8 Hours |
|---|---|---|

Probability Definition, The Law of Addition, Multiplication and Conditional Probability, Bayes' Theorem,
Random variables: discrete and continuous, probability mass function, density function, distribution function, Mathematical expectation, mean, variance. Moment generating function, characteristic function, Two dimensional random variables: probability mass function, density function,

| UNIT-III | Probability distribution | 8 Hours |
|---|---|---|

Probability Distribution (Continuous and discrete- Normal, Exponential, Binomial, Poisson distribution), Central Limit theorem

| UNIT-IV | Test of Hypothesis & Statistical Inference | 8 Hours |
|---|---|---|

Sampling and population, uni-variate and bi-variate sampling, re-sampling, errors in sampling, Sampling distributions, Hypothesis testing- p value, z test, t test (For mean), Confidence intervals, F test; Chi-square test, ANOVA: One way ANOVA,
Statistical Inference, Parameter estimation, Least square estimation method, Maximum Likelihood estimation.

| UNIT-V | Aptitude-III | 8 Hours |
|---|---|---|

Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Sitting Arrangement, Clock & Calendar.

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

| | | |
|---|---|---|
| CO 1 | Understand the concept of moments, skewness, kurtosis, correlation, curve fitting and regression analysis. | K1, K3 |
| CO 2 | Understand the concept of Probability and Random variables. | K1, K3 |
| CO 3 | Remember the concept of probability to evaluate probability distributions | K3, K4 |
| CO 4 | Apply the concept of hypothesis testing and estimation of parameter. | K2 |
| CO 5 | Solve the problems of Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat &Stream, Sitting Arrangement, Clock & Calendar. | K3 |

**Text books**

(1) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint)
(2) S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002
(3) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

**Reference Books**

(1) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
(2) T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi
(3) R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
(4) J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
(5) D.N.Elhance,V. Elhance& B.M. Aggarwal: Fundamentals of Statistics; KitabMahal Distributers, New Delhi.

**Link:**

| | |
|---|---|
| **Unit 1** | https://youtu.be/wWenULjri40<br>https://youtu.be/mL9-WX7wLAo<br>https://youtu.be/nPsfqz9EljY<br>https://youtu.be/nqPS29IvnHk<br>https://youtu.be/aaQXMbpbNKw<br>https://youtu.be/wDXMYRPup0Y<br>https://youtu.be/m9a6rg0tNSM<br>https://youtu.be/Qy1YAKZDA7k<br>https://youtu.be/Qy1YAKZDA7k<br>https://youtu.be/s94k4H6AE54<br>https://youtu.be/lBB4stn3exM<br>https://youtu.be/0WejW9MiTGg<br>https://youtu.be/QAEZOhE13Wg<br>https://youtu.be/ddYNq1TxtM0<br>https://youtu.be/YciBHHeswBM<br>https://youtu.be/VCJdg7YBbAQ<br>https://youtu.be/VCJdg7YBbAQ<br>https://youtu.be/yhzJxftDgms |
| **Unit 2** | https://youtu.be/bhp4nVkqA9o<br>https://youtu.be/8sJ9dFj_ydg<br>https://youtu.be/u_x8zQvWWLk<br>https://youtu.be/3rYYPWN_QS0<br>https://youtu.be/HZGCoVF3YvM<br>https://youtu.be/z4e4E9igjIE<br>https://youtu.be/dOr0NKyD31Q<br>https://youtu.be/YXLVjCKVP7U<br>https://youtu.be/l0ecMiNUZu8<br>https://youtu.be/L0zWnBrjhng<br>https://youtu.be/cbmfYoepHPk<br>https://youtu.be/_DWnI-gk0ys<br>https://youtu.be/d_9KT2abCAY<br>https://youtu.be/sSUCwLvmCLg<br>https://youtu.be/H2Ji-Q4MfqU<br>https://youtu.be/TwN79BuwiMM<br>https://youtu.be/yXsvMlqoiK4 |
| **Unit 3** | https://youtu.be/gT26Y_VJmOM<br>https://youtu.be/onFv73Btdno<br>https://youtu.be/mYFygtQrDxc<br>https://youtu.be/S8YrED3mf5s |

| | |
|---|---|
| | https://youtu.be/z5gongqrMv8<br>https://youtu.be/4vsGyghhxVg<br>https://youtu.be/CW-3qjcw-GA<br>https://youtu.be/RqiqhrZE6Uk |
| **Unit 4** | https://youtu.be/L3wQw0wva3g<br>https://youtu.be/n9qpktdFfLU<br>https://youtu.be/_Qlxt0HmuOo<br>https://youtu.be/YSwmpAmLV2s<br>https://youtu.be/KLnGOL_AUgA<br>https://youtu.be/cQp_bJdxjWw<br>https://youtu.be/geB0A7CPGaQ<br>https://youtu.be/zmyh7nCjmsg<br>https://youtu.be/ohquDY3fZqk<br>https://youtu.be/izGZLnB-mEo<br>https://youtu.be/q48uKU_KWas<br>https://youtu.be/lZFmFuZGQTk<br>https://youtu.be/iin6vthyzsQ<br>https://youtu.be/ysjkkBspbYY<br>https://youtu.be/pXjaMY29k1g<br>https://youtu.be/pvvoK4rlzqQ |
| **Unit 5** | https://www.youtube.com/playlist?list=PLFqNfk5W2ZuzjUsRqDp1Zj3S8n9yfdmN9<br>https://youtu.be/x3SEYdBUGaA<br>https://youtu.be/B7sMHZj_p18<br>https://youtu.be/4HRLswVPOG8<br>https://youtu.be/aHEWcn_bPYc<br>https://youtu.be/ePQiVq8WtL8 |

| B. TECH. SECOND-YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSAI0302** | **L T P** | **Credit** |
| **Course Title** | **Logic Design and Computer Architecture** | **3 0 0** | **3** |

**Course objective:** To understand the types of organizations, structures, and functions of computers, design of arithmetic and logic units, and float point arithmetic. To understand the concepts of the memory system, communication with I/O devices, and interfaces.

**Pre-requisites:**

- Basic knowledge of computer systems.
- Logic gates and their operations.

## Course Contents / Syllabus

| UNIT-I | Introduction | 8 Hours |
|---|---|---|

**Basics of Logic Design:** Basic of number System, Boolean algebra, Half Adder and Full Adder, Half Subtractor and Full Subtractor, Multiplexer, Encoder, Decoder.

**Computer Organization and Architecture**, Functional units of a digital system and their interconnections, buses, bus architecture, types of buses,and bus arbitration and its types. Register, bus, and memory transfer. Process or organization, general registers organization, stack organization,and addressing modes.

| UNIT-II | ALU Unit | 8 Hours |
|---|---|---|

**Arithmetic and logic unit**: Lookahead carries adders. Multiplication: Signed operand multiplication, Booth's algorithm, and array multiplier. Division and logic operations. Floating-point arithmetic operation, Arithmetic &logic unit design. IEEE Standard for Floating-Point Numbers.

| UNIT-III | Control Unit | 8 Hours |
|---|---|---|

**Control Unit:** Instruction types, formats, instruction cycles and sub-cycles (fetch and execute, etc.), micro-operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Complex Instruction Set Computer, Pipelining. Hardwire and microprogrammed control, Concept of horizontal and vertical microprogramming, Flynn's classification.

| UNIT-IV | Memory Unit | 8 Hours |
|---|---|---|

**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape, and optical disks Virtual memory: concept implementation, Memory Latency, Memory Bandwidth, Memory Seek Time.

| UNIT-V | Input/Output | 8 Hours |
|---|---|---|

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors. Serial Communication: Synchronous &asynchronous communication.

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

| | | |
|---|---|---|
| CO 1 | Understand the basic structure and operation of a digital computer system. | K2 |
| CO 2 | Analyze the design of arithmetic & logic unit and understand the fixed point and floating-point arithmetic operations. | K4 |
| CO 3 | Implement control unit techniques and the concept of Pipelining | K3 |
| CO 4 | Understand the hierarchical memory system, cache memories and virtual memory. | K2 |
| CO 5 | Understand different ways of communicating with I/O devices and standard I/O interfaces. | K2 |

**Text books:**


1) M. Mano, "Computer System Architecture", 3rd Edition, Pearson Publication, 2007.
2) John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.
3) William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventhedition,2006.


**Reference Books:**


1) Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint2012
2) Ray A K, Bhurchandi K M, "Advanced Microprocessors and Peripherals", TM.


**Links:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=L9X7XXfHYdU&list=PLxCzCOWd7aiHMonh3G6QNKq53C6oNXGrX |
| **Unit 2** | https://www.youtube.com/watch?v=WLgXUPOjKEc |
| **Unit 3** | https://www.youtube.com/watch?v=BPhWlFIU1rc |
| **Unit 4** | https://www.youtube.com/watch?v=6R7JDkpG1Wk&list=PLrjkTql3jnm8HbdMwBYIMAd3UdstWChFH |
| **Unit 5** | https://www.youtube.com/watch?v=nxryfWg5Hm4 |

| B.TECH SECOND YEAR | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **ACSE0306** | **L** | **T** | **P** | **Credits** |
| **Course Title** | **DISCRETE STRUCTURES** | **3** | **0** | **0** | **3** |

**Course objective:**

The subject enhances one's ability to develop logical thinking and ability to problem-solving. The objective of discrete structure is to enables students to formulate problems precisely, solve the problems, apply formal proofs techniques and explain their reasoning clearly.

**Pre-requisites:**

1. Basic Understanding of mathematics
2. Basic knowledge algebra.
3. Basic knowledge of mathematical notations

## Course Contents / Syllabus

### Unit 1 | Set Theory, Relation, Function | 8 Hours

**Set Theory**: Introduction to Sets and Elements, Types of sets, Venn Diagrams, Set Operations, Multisets, Ordered pairs. Proofs of some general Identities on sets.
**Relations:** Definition, Operations on relations, Pictorial Representatives of Relations, Properties of relations, Composite Relations, Recursive definition of relation, Order of relations.
**Functions:** Definition, Classification of functions, Operations on functions, Growth of Functions.
**Combinatorics :** Introduction, basic counting Techniques, Pigeonhole Principle.
**Recurrence Relation & Generating function:** Recursive definition of functions, Recursive Algorithms, Method of solving Recurrences.
Proof techniques: Mathematical Induction, Proof by Contradiction, Proof by Cases, Direct Proof.

### Unit 2 | Algebraic Structures | 8 Hours

**Algebraic Structures:** Definition, Operation, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric Groups, Group Homomorphisms, Rings, Internal Domains, and Fields.

### Unit 3 | Lattices and Boolean Algebra | 8 Hours

Ordered set, Posets, Hasse Diagram of partially ordered set, Lattices: Introduction, Isomorphic Ordered set, Well ordered set, Properties of Lattices, Bounded and Complemented Lattices, Distributive Lattices.
**Boolean Algebra**: Introduction, Axioms and Theorems of Boolean Algebra, Algebraic Manipulation of Boolean Expressions, Simplification of Boolean Functions.

### Unit 4 | Propositional Logic | 8 Hours

**Propositional Logic:** Introduction, Propositions and Compound Statements, Basic Logical Operations, Well-formed formula, Truth Tables, Tautology, Satisfiability, Contradiction, Algebra of Proposition, Theory of Inference.
**Predicate Logic:** First order predicate, Well-formed formula of Predicate, Quantifiers, Inference Theory of Predicate Logic.

### Unit 5 | Tree and Graph | 8 Hours

**Trees:** Introduction to trees, application of trees.
**Graphs:** Definition and terminology, Representation of Graphs, Various types of Graphs, Connectivity, Isomorphism and Homeomorphism of Graphs, Planar Graphs, Euler and Hamiltonian Paths, Graph Coloring

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

| | | |
|---|---|---|
| **Unit 1** | Apply the basic principles of sets, relations & functions and mathematical induction in computer science & engineering related problems. | K3 |
| **Unit 2** | Understand the algebraic structures and its properties to solve complex problems. | K2 |
| **Unit 3** | Describe lattices and its types and apply Boolean algebra to simplify digital circuit. | K2, K3 |
| **Unit 4** | Infer the validity of statements and construct proofs using predicate logic formulas. | K3, K5 |
| **Unit 5** | Design and use the non-linear data structure like tree and graphs to solve real world problems. | K3, K6 |

**Text books:**


1) B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, Edition 6th, 2018.

2) Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill, Edition 3rd, 2017.

3) Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill, Edition 1st, 2017.

4) Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill.


**Reference Books:**


1) Deo & Narsingh, "Graph Theory With application to Engineering and Computer Science.", PHI.

2) Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

3) Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, Mc Graw-Hill, Edition 7th, 2017.


**Links:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=hGtOLG3SsjI&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=9 |
| | https://www.youtube.com/watch?v=rGcTcGFx9_s&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=10 |
| | https://www.youtube.com/watch?v=oU60TuGHxe0&list=PL0862D1A947252D20&index=11 |
| **Unit 2** | https://www.youtube.com/watch?v=M8nh83bFJAA&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=38 |
| | https://www.youtube.com/watch?v=CjmWE-f3vEc&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=41 |
| **Unit 3** | https://www.youtube.com/watch?v=c6ARWh6lVgc&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=24 |
| | https://www.youtube.com/watch?v=QKP6sOnu1vg&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=22 |
| **Unit 4** | https://www.youtube.com/watch?v=hklHg9oMkGA&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=3 |
| | https://www.youtube.com/watch?v=ASDaXWCExzo&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=4 |
| **Unit 5** | https://www.youtube.com/watch?v=AtDgXyluW-Y&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=12 |
| | https://www.youtube.com/watch?v=cwbZUjfz_I0&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=13 |

| B.TECH SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0302** | **L T P** | **Credit** |
| **Course Title** | **Object Oriented Techniques using Java** | **3 0 0** | **3** |

## Course objective:

The objective of this course is to understand the object-oriented methodology and its techniques to design and develop conceptual models and demonstrate the standard concepts of object-oriented techniques modularity, I/O. and other standard language constructs. The basic objective of this course is to understand the fundamental concepts of object-oriented programming in Java language and also implement the Multithreading concepts, GUI based application and collection framework.

## Pre-requisites:

- Student must know at least the basics of how to use a computer, and should be able to start a command line shell.
- Knowledge of basic programming concepts, as covered in 'Programming Basic" course is necessary.

## Course Contents / Syllabus

| UNIT-I | Introduction | 8 Hours |
|---|---|---|

**Object Oriented Programming**: Introduction and Features: Abstraction, Encapsulation, Polymorphism, and Inheritance.

**Modeling Concepts:** Introduction, Class Diagram and Object Diagram.

**Control Statements:** Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument.

| UNIT-II | Basics of Java Programming | 8 Hours |
|---|---|---|

**Class and Object:** Object Reference, Constructor, Abstract Class, Interface and its uses, Defining Methods, Use of "this" and "super" keyword, Garbage Collection and finalize () Method.

**Inheritance:** Introduction and Types of Inheritance in Java, Constructors in Inheritance.

**Polymorphism**: Introduction and Types, Overloading and Overriding.

**Lambda expression:** Introduction and Working with Lambda Variables.

**Arrays:** Introduction and its Types.

| UNIT-III | Packages, Exception Handling and String Handling | 8 Hours |
|---|---|---|

**Packages:** Introduction and Types, Access Protection in Packages, Import and Execution of Packages.

**Exception Handling, Assertions and Localizations:** Introduction and Types, Exceptions vs. Errors, Handling of Exception. Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block, Tokenizer. Assertions and Localizations Concepts and its working.

**String Handling:** Introduction and Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class.

| UNIT-IV | Concurrency in Java and I/O Stream | 8 Hours |
|---|---|---|

**Threads**: Introduction and Types, Creating Threads, Thread Life-Cycle, Thread Priorities, Daemon Thread, Runnable Class, Synchronizing Threads.

**I/O Stream:** Introduction and Types, Common I/O Stream Operations, Interaction with I/O Streams Classes.

**Annotations:** Introduction, Custom Annotations and Applying Annotations.

| UNIT-V | GUI Programming, Generics and Collections | 8 Hours |
|---|---|---|

**GUI Programming:** Introduction and Types, Swing, AWT, Components and Containers, Layout Managers and User-Defined Layout and Event Handling.

**Generics and Collections:** Introduction, Using Method References, Using Wrapper Class, Using Lists, Sets, Maps and Queues, Working with Generics.

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

| | | |
|---|---|---|
| CO1 | Identify the concepts of object-oriented programming and relationships among them needed in modeling. | K2 |
| CO2 | Demonstrate the Java programs using OOP principles and also implement the concepts of lambda expressions. | K3 |
| CO3 | Implement packages with different protection level resolving namespace collision and evaluate the error handling concepts for uninterrupted execution of Java program. | K3, K5 |
| CO4 | Implement Concurrency control, I/O Streams and Annotations concepts by using Java program. | K3 |
| CO5 | Design and develop the GUI based application, Generics and Collections in Java programming language to solve the real-world problem. | K6 |

**Text books:**

1) Herbert Schildt," Java - The Complete Reference", McGraw Hill Education 12th edition
2) Herbert Schildt," Java: A Beginner's Guide", McGraw-Hill Education 2nd edition
3) James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI 2nd Edition

**Reference Books:**

1) Cay S. Horstmann, "Core Java Volume I – Fundamentals", Prentice Hall
2) Joshua Bloch," Effective Java", Addison Wesley
3) E Balagurusamy, "Programming with Java A Primer", TMH, 4th edition.

**Link:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=r59xYe3Vyks&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al |
| **Unit 2** | https://www.youtube.com/watch?v=ZHLdVRXIuC8&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al&index=18 |
| **Unit 3** | https://www.youtube.com/watch?v=hBh_CC5y8-s |
| **Unit 4** | https://www.youtube.com/watch?v=qQVqfvs3p48 |
| **Unit 5** | https://www.youtube.com/watch?v=2qWPpgALJyw |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0301** | **L T P** | **Credits** |
| **Course Title** | **Data Structures** | **3 1 0** | **4** |

**Course objective:**
Learn the basic concepts of algorithm analysis, along with implementation of linear and non-linear data structures, hashing and file structures.

**Pre-requisites:** Basics of C/Python programming, Identifiers, Constants, Operators, Conditional statements, Switch-case statements, Iterative statements, Functions, Structures.

**Course Contents / Syllabus**

| **UNIT-I** | **Introduction to data structure, Arrays, Searching and Sorting** | **8 Hours** |
|---|---|---|

Data types: Primitive and non-primitive, Types of Data Structures- Linear & Non-Linear Data Structures. Time and Space Complexity of an algorithm, Asymptotic notations (Big Oh, Big Theta and Big Omega), Abstract Data Types (ADT).

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of Arrays, Sparse Matrices and their Representations.

Searching: Linear search, Binary search. Sorting: Bubble sort, Insertion sort, Selection sort, Radix Sort, Merge sort, Quick sort.

| **UNIT-II** | **Linked lists** | **8 Hours** |
|---|---|---|

**Linked lists:** Advantages of linked list over array, Self-referential structure, Singly Linked List, Doubly Linked List, Circular Linked List,

Operations on a Linked List: Insertion, Deletion, Traversal, Reversal, Searching, Polynomial Representation and Addition of Polynomials

| **UNIT-III** | **Stacks and Queues** | **8 Hours** |
|---|---|---|

**Stacks:** Primitive Stack operations: Push & Pop, Array and Linked List Implementation of Stack, Application of stack: Infix, Prefix, Postfix Expressions and their mutual conversion, Evaluation of postfix expression.

**Recursion:** Principles of recursion, Tail recursion, Removal of recursion, Problem solving using iteration and recursion with examples such as binary search, Fibonacci series, and Tower of Hanoi, Trade-offs between iteration and recursion.

**Queues:** Array and linked List implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue.

| **UNIT-IV** | **Trees** | **8 Hours** |
|---|---|---|

Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, An Extended Binary Trees.

**Tree Traversal algorithms**: In-order, Pre-order and Post-order. Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search tree, Binary Heaps, Heap sort, Threaded Binary trees, Traversing Threaded Binary trees, AVL Tree, B-Tree.

| **UNIT-V** | **Graphs and File Structure** | **8 Hours** |
|---|---|---|

**Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency matrices, Adjacency List.

**Graph Traversal:** Depth First Search and Breadth First Search. Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prim' s and Kruskal's algorithm. Transitive Closure and Shortest Path algorithms: Dijkstra Algorithm.

**File Structure:** Concepts of files, records and files, Sequential, Indexed and Random File Organization, indexing structure for index files, Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, hashing for direct files, multi-Key file organization and Access Methods.

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

| | | |
|---|---|---|
| CO 1 | Describe the need of data structure and algorithms in problem solving and analyze Time space trade-off. | K2, K4 |
| CO 2 | Describe how arrays are represented in memory and how to use them for implementation of matrix operations, searching and sorting along with their computational efficiency. | K2, K6 |
| CO 3 | Compare and contrast the advantages and disadvantages of linked lists over arrays and implement operations on different types of linked list. | K4, K6 |
| CO 4 | Design, implement and evaluate the real-world applications using stacks, queues and non-linear data structures. | K5, K6 |
| CO 5 | Identify and develop the alternative implementations of data structures with respect to its performance to solve a real-world problem. | K1, K3, K5, K6 |

## Text books:


1) Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python (An Indian Adaptation)", Wiley Publication

2) Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India

3) Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.

4) Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.


## Reference Books:


1) Thareja, "Data Structure Using C" Oxford Higher Education.

2) AK Sharma, "Data Structure Using C", Pearson Education India.

3) P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.

4) R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.

| | |
|---|---|
| 5) Berztiss, AT: Data structures, Theory and Practice, Academic Press. | |
| 6) Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill. | |
| **Link:** | |
| **Unit 1** | https://nptel.ac.in/courses/106/106/106106127/ |
| | https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F |
| | https://www.youtube.com/watch?v=4OxBvBXon5w&list=PLBF3763AF2E1C572F&index=22 |
| | https://www.youtube.com/watch?v=cR4rxllyiCs&list=PLBF3763AF2E1C572F&index=23 |
| **Unit 2** | https://nptel.ac.in/courses/106/106/106106127/ |
| **Unit 3** | https://nptel.ac.in/courses/106/106/106106127/ |
| | https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLBF3763AF2E1C572F&index=2 |
| **Unit 4** | https://nptel.ac.in/courses/106/106/106106127/ |
| | https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6 |
| | https://www.youtube.com/watch?v=eWeqqVpgNPg&list=PLBF3763AF2E1C572F&index=7 |
| **Unit 5** | https://nptel.ac.in/courses/106/106/106106127/ |
| | https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24 |
| | https://www.youtube.com/watch?v=hk5rQs7TQ7E&list=PLBF3763AF2E1C572F&index=25 |
| | https://www.youtube.com/watch?v=KW0UvOW0XIo&list=PLBF3763AF2E1C572F&index=5 |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSAI0301** | **L T P** | **Credits** |
| **Course Title** | **Introduction to Artificial Intelligence** | **3 0 0** | **3** |

**Course objective:** Introductory knowledge of historical perspective of AI and its foundations and familiarity with principles of AI toward problem solving, inference, perception, knowledge representation, and learning. Acquiring the knowledge various forms of learning and computation statistics.

**Pre-requisites:** Basic Knowledge of Transform techniques

## Course Contents / Syllabus

| | | |
|---|---|---|
| **UNIT-I** | **INTRODUCTION** | **8 Hours** |

Introduction to Artificial Intelligence, Historical developments of Artificial Intelligence, well defined learning problems, Designing a Learning System, Basics of problem-solving: problem representation paradigms, state space, Problem reduction, Constraint satisfaction, Applications of AI

| | | |
|---|---|---|
| **UNIT-II** | **SEARCH TECHNIQUES** | **8 Hours** |

Searching for solutions, Uninformed Search Strategies: DFS, BFS, Informed Search Strategies: Local search algorithms and optimistic problems, adversarial Search, Search for games, minimax, Alpha - Beta pruning, Heuristic Search techniques, Hill Climbing, Best-first search, Means Ends Analysis, Iterative deepening Heuristic Search and A.

| | | |
|---|---|---|
| **UNIT-III** | **LOGIC AND KNOWLEDGE REPRESENTATION** | **8 Hours** |

Introduction of Logic, Propositional Logic Concepts, Semantic Tableaux and Resolution in Propositional logic, FOPL, Semantic Tableaux and Resolution in FOPL, Logic Programming in Prolog. Production systems and rules for some AI problems: Water Jug Problem, Missionaries-Cannibals Problem, n-Queen problem, monkey banana problem, Travelling Salesman Problem. Knowledge representation, semantic nets, partitioned nets, parallel implementation of semantic nets. Frames, Common Sense reasoning and thematic role frames.

| | | |
|---|---|---|
| **UNIT-IV** | **EXPERT SYSTEM** | **8 Hours** |

Architecture of knowledge-Based System, Rule-based systems, Forward and Backward Chaining, Frame Based systems. Architecture of Expert System, Agents and Environment, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

| | | |
|---|---|---|
| **UNIT-V** | **PLANNING &UNCERTAINTY** | **8 Hours** |

Planning with state Space Search, Conditional Planning, Continuous planning, Multi-Agent Planning, Forms of learning, inductive learning, Reinforcement Learning, learning decision trees, Neural Net learning and Genetic learning. Probabilistic Methods, Bayesian Theory, Dempster Shafer Theory, Bayes Network. 19 Evolutionary computations: Swarm Intelligence, ant colony optimization Agents, Intelligent Agents, Structure of Intelligent Agents, Virtual Agents, Multi-agent systems. Case Study: Health Care, E Commerce, Smart Cities.

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

| | | |
|---|---|---|
| CO 1 | After completion of this course students will be able to Understand fundamental understanding of the history of artificial intelligence (AI) and its foundations | K2 |
| CO 2 | Apply principles of AI in solutions that require problem solving, inference and perception. | K3 |
| CO 3 | Explain strong familiarity with a number of important AI techniques, including in particular intelligent search methods and solutions | K3 |
| CO4 | Apply the concepts of knowledge & reasoning of predicate logic and representing knowledge using rules, Probabilistic reasoning | K3 |
| CO 5 | Assess/ Evaluate critically the techniques presented and apply them to real world problems | K5 |

## Textbooks:

1) Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education. Fourth Edition 2021.

2) Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill 3rdEdition 2010.

## Reference Books:

1) Patrick Henry Winston, "Artificial Intelligence", Pearson Education Inc., Third edition.
2) Python Machine Learning: Learn Python in a Week and Master It. An Hands-On Introduction to Artificial Intelligence Coding, a Project-Based Guide with Practical Exercises (7 Days Crash Course, Book 2) 2020.
3) Nils J.Nilsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd
4) AI in the Wild: Sustainability in the Age of Artificial Intelligence 2020.
5) Knowledge-Based Systems Techniques and Applications (4-Volume Set).

## Links:

| | |
|---|---|
| **Unit 1** | https://nptel.ac.in/courses/106/106/106106198/ |
| **Unit 2** | https://nptel.ac.in/courses/111/107/111107137/ |
| **Unit 3** | https://nptel.ac.in/courses/106/106/106106202/ |
| **Unit 4** | https://nptel.ac.in/courses/106/106/106106213/ |
| **Unit 5** | https://nptel.ac.in/courses/106/105/106105152/ |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0352** | **L T P** | **Credit** |
| **Course Title** | **Object Oriented Techniques using Java Lab** | **0 0 2** | **1** |
| **List of Experiments:** | | | |
| **Sr. No.** | **Name of Experiments** | **Q.NO. (Codetantra)** | **CO** |
| 1. | Write a simple program in Java. | 1 | CO1 |
| 2. | Write a Java program to display default values of all primitive data types | 2 | CO1 |
| 3. | Write a Java program to understand Command line arguments. | 3 | CO1 |
| 4. | Write a Java program to understand if-then-else statement | 5 | CO1 |
| 5. | Write a Java Program to find the Factorial of a given number | 6 | CO1 |
| 6. | Write a Java Program to check whether the given number is Palindrome or not | 7 | CO1 |
| 7. | Write a JAVA program to display Fibonacci series. | 8 | CO1 |
| 8. | Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method. | - | CO2 |
| 9. | Write a Java program to illustrate the abstract class concept | 24 | CO2 |
| 10. | Write a Java program to Access the instance variables by using this keyword | 27 | CO2 |
| 11. | Write a Java class to show the concept of static class | 26 | CO2 |
| 12. | Write a Java program to Access the Class members using super Keyword | 20 | CO2 |

| | | | |
|---|---|---|---|
| 13. | Write a JAVA program to implement Single Inheritance. | - | CO2 |
| 14. | Write a JAVA program to implement multi-level inheritance. | 19 | CO2 |
| 15. | Write a Java program to implement Interface | 22 | CO2 |
| 16. | Write a JAVA program to implement constructor and constructor overloading. | 18 | CO2 |
| 17. | Write a JAVA program implement method overloading and method overriding. | - | CO2 |
| 18. | Write a JAVA program to implement a user defined functional interface using lambda expressions. | - | CO2 |
| 19. | Write a program prints a multidimensional array of integers. | 9 | CO2 |
| 20. | Write a JAVA program to show the multiplication of two matrices using arrays. | 11 | CO2 |
| 21. | Write a Java program to Search an element using Linear Search | 13 | CO2 |
| 22. | Write a Java program to Search an element using Binary Search | 14 | CO2 |
| 23. | Write a Java Program to Sort elements using Insertion Sort | 15 | CO2 |
| 24. | Write a Java Program to Sort elements using Selection Sort - Largest element method | 16 | CO2 |
| 25. | Write a Java program to Sort elements using Bubble Sort | 17 | CO2 |
| 26. | Write a Java program to handle an Arithmetic Exception - divided by zero | 33 | CO3 |
| 27. | Write a program to implement user defined exception in java. | - | CO3 |
| 28. | Write a Java program to illustrate Finally block | 34 | CO3 |
| 29. | Write a Java program to illustrate Multiple catch blocks | 35 | CO3 |
| 30. | Write a Java program for creation of illustrating throw | 36 | CO3 |
| 31. | To implement the concept of assertions in JAVA programming language. | - | CO3 |
| 32. | To implement the concept of localization in JAVA programming language. | - | CO3 |
| 33. | Write a Java program to print the output by appending all the capital letters in the input in a string. | 30 | CO3 |

| | | | |
|---|---|---|---|
| 34. | Write a JAVA program to show the usage of string builder. | 31 | CO3 |
| 35. | Write a JAVA program to show the usage of string buffer. | 32 | CO3 |
| 36. | Write a JAVA program to implement even and odd thread by using Thread class and Runnable interface. | - | CO4 |
| 37. | Write a JAVA program to synchronize the threads by using Synchronize statements and Synchronize block | - | CO4 |
| 38. | To demonstrate the concept of type annotations in JAVA programming language. | - | CO4 |
| 39. | To demonstrate the concept of user defined annotations in JAVA programming language. | - | CO5 |
| 40. | Write a JAVA program to implement the concept of Generic and Collection classes. | - | CO5 |

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

| | | |
|---|---|---|
| CO1 | To understand how to design and implement basic data types, command line arguments and control statements | K2 |
| CO2 | To demonstrate the Java programs using OOP principles and also implement the concepts of lambda expressions and arrays. | K3 |
| CO3 | To demonstrate, understand and use of different exceptional handling mechanisms, assertions, localizations and string handling. | K3 |
| CO4 | To solve the real time problems using multithreading and annotations concept. | K3 |
| CO5 | To design and develop collections and generic classes in JAVA programming language | K6 |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0351** | **L T P** | **Credit** |
| **Course Title** | **Data Structures Lab** | **0 0 2** | **1** |

**List of Experiments:**

| Sr. No. | Name of Experiment | CO |
|---|---|---|
| 1 | Program to create and display Linear Array | CO1 |
| 2 | Program to insert a data item at any location in a linear Array | CO1 |
| 3 | Program to delete a data item from a Linear Array | CO1 |
| 4 | Program to implement multiplication of two matrices. | CO1 |
| 5 | Program to create sparse matrix. | CO1 |
| 6 | Program to implement linear search in an Array. | CO4 |
| 7 | Program to implement binary search in an Array. | CO4 |
| 8 | Program to implement bubble sort in a non-recursive way. | CO4 |
| 9 | Program to implement selection sort in a non-recursive way. | CO4 |
| 10 | Program to implement insertion sort in a non-recursive way. | CO4 |
| 11 | Program to implement Merge sort in a non-recursive way. | CO4 |
| 12 | Program to implement Merge sort in a recursive way. | CO4 |
| 13 | Program to implement Quick sort in a recursive way. | CO4 |
| 14 | Program to implement Queue Using array. | CO3 |
| 15 | Program to implement Circular Queue Using array. | CO3 |
| 16 | Program to implement Stack Operation using array. | CO3 |
| 17 | Program to implement the Single Linked List<br>a. Insertion b. Deletion c. Traversal d. Reversal<br>e. Searching f. Updation g. Sorting h. Merging | CO2 |

| | | |
|---|---|---|
| 18 | Program to implement the doubly Linked List<br>a. Insertion b. Deletion c. Traversal d. Reversal<br>e. Searching f. Updation g. Merging | CO2 |
| 19 | Program to implement the circularly Single Linked List<br>a. Insertion b. Deletion c. Traversal d. Reversal<br>e. Searching f. Updation | CO2 |
| 20 | Program to implement Queue Using linked list. | CO3 |
| 21 | Program to implement Circular Queue Using linked list. | CO3 |
| 22 | Program to implement Priority Queue Using linked list. | CO3 |
| 23 | Program to implement Stack Operation using Linked list. | CO3 |
| 24 | Program to convert infix to postfix expression. | CO3 |
| 25 | Program to evaluate postfix expression. | CO3 |
| 26 | Program to compute factorial using tail recursion | CO3 |
| 27 | Program to implement Tower of Hanoi. | CO3 |
| 28 | Program implementing Addition of two polynomials via Linked Lists. | CO2 |
| 29 | Program to implement binary tree using linked list<br>a. Insertion b. Deletion c. Traversal d. Searching | CO5 |
| 30 | Program to implement binary search tree using linked list<br>a. Insertion b. Deletion c. Traversal d. Searching | CO5 |
| 31 | Program to implement Heap sort in a non-recursive way | CO5 |
| 32 | Program to implement Radix sort. | CO4 |
| 33 | Program to implement BFS algorithm. | CO5 |
| 34 | Program to implement DFS algorithm. | CO5 |
| 35 | Program to implement the minimum cost spanning tree. | CO5 |
| 36 | Program to implement the shortest path algorithm. | CO5 |

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

| | | |
|---|---|---|
| CO 1 | Implement operations on single and multi-dimensional array. | K3 |
| CO 2 | Implement various linear data structures like single Linked-list, doubly Linked-list, Circular linked-list. | K3, K6 |
| CO 3 | Implement Stack and Queue using array and linked list. | K3 |
| CO 4 | Analyze and Implement sorting and searching algorithms. | K4, K6 |
| CO5 | Solve complex problems using non-linear data structures like tree and graph. | K6 |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSAI0351** | **L T P** | **Credit** |
| **Course Title** | **Introduction to Artificial Intelligence Lab** | **0 0 2** | **1** |

**List of Experiments:**

| Sr. No. | Name of Experiment | CO |
|---|---|---|
| 1 | Write a python program to implement simple Chat-bot. | CO1 |
| 2 | Implement Tic-Tac-Toe using A algorithm. | CO1 |
| 3 | Implement alpha-beta pruning graphically with proper example and justify the pruning. | CO2 |
| 4 | Write a python program to implement Water Jug Problem. | CO2 |
| 5 | Use Heuristic Search Techniques to Implement Best first search (Best-Solution but not always optimal) and A algorithm (Always gives optimal solution). | CO3 |
| 6 | Use Heuristic Search Techniques to Implement Hill-Climbing Algorithm. | CO5 |
| 7 | Write a program to implement Hangman game using python. | CO5 |
| 8 | Write a program to solve the Monkey Banana problem | CO4 |
| 9 | Write a python program to implement Simple Calculator program. | CO4 |
| 10 | Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK | CO5 |
| 11 | Solve 8-puzzle problem using best first search | CO5 |
| 12 | Solve Robot (traversal) problem using means End Analysis. | CO5 |
| 13 | Implementation of Image features Processing using OPENCV AND OPEN VINO | CO4 |
| 14 | Write a program to implement Naïve Bayes Algorithm | CO5 |
| 15 | Write a Program to implement alpha-beta Pruning. | CO2 |

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

| | | |
|---|---|---|
| CO 1 | Apply searching problems using various algorithms. Explain functionality of Chat-bot. | K3 |

| | | |
|---|---|---|
| CO 2 | Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem. | K1 |
| CO 3 | Implement the program to POS (Parts of Speech) tagging for the give sentence using NLTK. | K3 |
| CO 4 | Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports. | K3 |
| CO5 | Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming). | K3 |

# B. TECH. SECOND YEAR

| Course Code | ANC0301 | L | T | P | Credit |
|---|---|---|---|---|---|
| Course Title | Cyber Security | 2 | 0 | 0 | 0 |

**Course objective:**

Achieve knowledge about Security of Information system and Risk factors and examine security threats and vulnerability in various scenarios, understand concept of cryptography and encryption technique to protect the data from cyber-attackand provide protection for software and hardware.

**Pre-requisites:** Basics recognition in the domain of Computer Science.
Concept of network and operating system.
Commands of programming language.

## Course Contents / Syllabus

| UNIT-I | Introduction | 8 Hours |
|---|---|---|

Introduction to Information Systems: Types of Information Systems, Development of Information Systems, Need for Information Security, Threats to Information Systems, Information Assurance, Guidelines for Secure Password and WI-FI Security and social media and Windows Security, Security Risk Analysis, and Risk Management.

| UNIT-II | Application Layer Security | 8 Hours |
|---|---|---|

Data Security Considerations-Backups, Archival Storage and Disposal of Data,Security Technology-Firewall, Intrusion Detection, Access Control, Security Threats -Viruses, Worms, Trojan Horse,Bombs,Trapdoors,Spoofs, E-mail Viruses, Macro Viruses, Malicious Software,Network and Denial of Services Attack, Security,Threats to E-Commerce: Electronic Payment System, e- Cash, Issues with Credit/Debit Cards.

| UNIT-III | Secure System Development | 8 Hours |
|---|---|---|

Application Development Security, Architecture & Design,Security Issues in Hardware: Data Storage and Downloadable Devices, Mobile Protection,Security Threats involving in social media, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.

| UNIT-IV | Cryptography And Network Security | 8 Hours |
|---|---|---|

Public key cryptography: RSA Public Key Crypto with implementation in Python,Digital Signature Hash Functions,Public Key Distribution.
Symmetric key cryptography: DES (Data Encryption Standard), AES (Advanced Encryption Standard), Secure hash algorithm(SHA-1).

Real World Protocols: Basic Terminologies, VPN, Email Security Certificates, Transport Layer Security, TLS, IP security, DNS Security.

| UNIT-V | Security Policy | 8 Hours |
|---|---|---|

Policy design Task, WWW Policies, Email based Policies, Policy Revaluation Process-Corporate Policies-Sample Security Policies,Publishing and Notification Requirement of the updated and new Policies.
Resent trends in security.

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

| | | |
|---|---|---|
| CO 1 | Analyze the cyber security needs of an organization. | K4 |
| CO 2 | Identify and examine software vulnerabilities and security solutions. | K1,K3 |

| | | |
|---|---|---|
| CO 3 | Comprehend IT Assets security (hardware and Software) and performance indicators | K2 |
| CO 4 | Measure the performance and encoding strategies of security systems. | K3, K5 |
| CO 5 | Understand and apply cyber security methods and policies to enhance current scenario security. | K2, K3 |

**Text books:**

1) Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security", Pearson Education India
2) V.K.Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India
3) Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House
4) Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage

**Reference Books:**

1) Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
2) CHANDER, HARISH," Cyber Laws and It Protection", PHI Learning Private Limited,Delhi
3) V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
4) William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010

**E-books& E-Contents:**

1) https://prutor.ai/welcome/
2) https://crypto.stanford.edu/cs155old/cs155-spring11/lectures/03-ctrl-hijack.pdf
3) https://cybermap.kaspersky.com/stats
4) https://www.fireeye.com/cyber-map/threat-map.html

**Reference Links:**

1) https://crypto.stanford.edu/cs155old/cs155-spring11/lectures/03-ctrl-hijack.pdf
2) https://cs155.stanford.edu/lectures/03-isolation.pdf
3) http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security.pdf

**NPTEL/ Youtube/ Faculty Video Link:**

1) https://www.youtube.com/watch?v=vv1ODDhXW8Q
2) https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8
3) https://www.youtube.com/watch?v=iTVyKbDCJrA&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2
4) https://www.youtube.com/watch?v=1plMO7ChXMU&list=PLJ5C_6qdAvBFAuGoLC2wFGruY_E2gYtev
5) https://www.youtube.com/watch?v=_9QayISruzo

# B. TECH. SECOND YEAR

| Course Code | ANC0302 | L T P | Credits |
|---|---|---|---|
| Course Title | Environmental Science | 2 0 0 | 0 |

**Course objective:**

| | |
|---|---|
| 1 | To help the students in realizing the inter-relationship between man and environment. and help the students in acquiring basic knowledge about environment. |
| 2 | To develop the sense of awareness among the students about environment and its various problems. |
| 3 | To create positive attitude about environment among the student. |
| 4 | To develop proper skill required for the fulfilment of the aims of environmental education and educational evaluations |
| 5 | To develop the capability of using skills to fulfil the required aims, to realise and solve environmental problems through social, political, cultural and educational processes |

**Pre-requisites:** Basic knowledge of nature.

**Course Contents / Syllabus**

## UNIT-I Basic Principle of Ecology — 8 Hours

Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles.

Basic concepts of sustainable development, SDGs, Ecosystem services, UN Decade for Ecorestoration.

## UNIT-II Natural Resources and Associated Problems — 8 Hours

Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles.

Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages.

## UNIT-III Biodiversity Succession and Non-Renewable Energy Resources — 8 Hours

Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book.

Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance.

Succession: Concepts of succession, Types of Succession. Trends in succession. Climax and stability.

## UNIT-IV Pollution and Solid Waste Management — 8 Hours

Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox, CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surrounding environment.

Solid waste disposal and its effects on surrounding environment, Climate change, global warming, acid rain, ozone layer depletion.

## UNIT-V Role of Community and Environmental Protection Acts — 8 Hours

Role of community, women and NGOs in environmental protection, Bioindicators and their role, Natural hazards, Chemical accidents and disasters risk management, Environmental Impact Assessment (EIA), Salient features of following Acts: a. Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.b. Water (Prevention and control of pollution) Act, 1974.c. Air (Prevention and control of pollution) Act, 1981. Forest (Conservation) Act, 1980.d. Wetlands (Conservation and Management) Rules, 2017; e. Chemical safety and Disaster Management law. F. District Environmental Action Plan. Climate action plans.

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

| | | |
|---|---|---|
| CO 1 | Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem., food chains and food webs. Ecological pyramids | K2 |
| CO 2 | Understand the different types of natural recourses like food, forest, minerals and energy and their conservation | K2 |
| CO 3 | Understand the importance of biodiversity, Threats of biodiversity and different methods of biodiversity conservation. | K2 |
| CO 4 | Understand the different types of pollution, pollutants, their sources, effects and their control methods | K3 |
| CO 5 | Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment | K3 |

## Text books:


1. Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York.
2. Botkin, D.B and Kodler E.A., 2000, Environmental Studies: The earth as a living planet. John Wiley and Sons Inc.
3. Rao M.N. and H.V.N. Rao, 1989: Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Singh J.S., Singh S.P. and Gupta S.R., 2006, Ecology Environment and Resource Conservation, Anamaya Publishers, New Delhi.
5.Environmental Studies -Benny Joseph-Tata McgrawHill-2005
6. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
7. Environmental studies- R, Rajagopalan -Oxford Pubtiotion2005.


## Reference Books:


1.Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.
2.Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.
3. Sharma P. D. (1996). Environmental Biology, Rastogi Publications, Meerut.
4. Verma P.S. and V.K. Agarwal. (1985). Principles of Ecology. S. Chand and Company (Pub.), New Delhi.
5.Principles of Environmental Sciences and Engineering -P. Venugoplan Rao, Prenitice Hall of India.
6. Environmental Science and Engineering Meenakshi, Prentice Hall India.


## NPTEL/ Youtube/ Faculty Video Link:

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDohttps://www.youtube.com/watch?v=yAK-m91Nxrshttps://www.youtube.com/watch?v=ha_O-1uOWkk, https://www.youtube.com/watch?v=brF0RWJyx9w |
| **Unit 2** | https://www.youtube.com/watch?v=mOwyPENHhbc,https://www.youtube.com/watch?v=yqev1G2iy20, https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2g0 |
| **Unit 3** | https://www.youtube.com/watch?v=GK_vRtHJZu4,https://www.youtube.com/watch?v=b6Ua_zWDH6U, https://www.youtube.com/watch?v=7tgNamjTRkk,https://www.youtube.com/watch?v=ErATB1aMiSU, https://www.khanacademy.org/science/high-school-biology/hs-ecology/hs-human-impact-on-ecosystems/v/conservation-and-the-race-to-save-biodiversity |
| **Unit 4** | https://www.youtube.com/watch?v=7qkaz8ChelI,https://www.youtube.com/watch?v=NuQE5fKmfME, https://www.youtube.com/watch?v=9CpAjOVLHII,https://www.youtube.com/watch?v=yEci6iDkXYw, https://www.youtube.com/watch?v=yEci6iDkXYw |
| **Unit 5** | https://www.youtube.com/watch?v=ad9KhgGw5iA,https://www.youtube.com/watch?v=nW5g83NSH9M, https://www.youtube.com/watch?v=xqSZL4Ka8xo,https://www.youtube.com/watch?v=WAI-hPRoBqs, https://www.youtube.com/watch?v=o-WpeyGlV9Y, https://www.youtube.com/watch?v=EDmtawhADnY |

# B. TECH. SECOND YEAR

| Course Code | AAS0404 | L T P | Credit |
|---|---|---|---|
| Course Title | Optimization and Numerical Techniques | 3 1 0 | 4 |

**Course objective:** The objective of this course is to familiarize the engineers with concept of Linear Programming Problem (LPP), Integer Programming Problems, Constraint programming, various numerical techniques for mathematical task such as roots, integration, differential equations and numerical aptitude. It aims to show case the students with standard concepts and tools from B. Tech to deal with advanced level of mathematics and applications that would be essential for their disciplines.

**Pre-requisites:** Knowledge of Mathematics I and II of B. Tech or equivalent.

## Course Contents / Syllabus

| UNIT-I | Linear Programming | 8 Hours |
|---|---|---|

Introduction, Mathematical formulation of LP Models, Graphical Method, Description of simplex method, Big-M method, Two phase method, Alternative optimum solutions, unbounded solutions, Degeneracy, Duality in LPP.

| UNIT-II | Integer Programming | 8 Hours |
|---|---|---|

Introduction, Importance of Integer Programming Problems, Gomory's Cutting Plane method, Branch-and-Bound Method, Cargo Loading for Knapsack problem, Applications of Integer Programming.

| UNIT-III | Non-linear programming | 8 Hours |
|---|---|---|

Basic facts of maxima, minima & convex optimization, Convex sets and convex functions, Continuity and differentiable properties of convex functions, Constrained Optimization- Local and Global Solution Introduction, Elements of Constraint Programming, Lagrange multiplier method, Kuhn Tucker Condition.

| UNIT-IV | Numerical Techniques | 8 Hours |
|---|---|---|

Errors analysis, Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Solution of system of linear equations, Crout's method, Gauss- Seidel method. Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of first order ordinary differential equations by fourth-order Runge- Kutta methods.

| UNIT-V | Aptitude-IV | 8 Hours |
|---|---|---|

Number System, Permutation & Combination, Probability, Function, Data Interpretation, Syllogism.

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

| | | |
|---|---|---|
| CO 1 | Understand the concepts to formulate and to solve a Linear Programming Problem. | K1, K3 |
| CO 2 | Understand the concepts of Integer Programming Problem. | K1, K3 |
| CO 4 | Apply the concept of numerical techniques to evaluate the zeroes of the Equation, concept of interpolation and numerical methods for various mathematical operations and tasks, such as integration, the solution of linear system of equations and the solution of differential equation. | K3 |
| CO 5 | Solve the problems of Number System, Permutation & Combination, Probability, Function, Data Interpretation, Syllogism. | K3 |

## Text books:

(1) Sharma J K - Operations Research (Pearson, 3rd Edition.

(2) Rao S.S,"Optimization – Theory and applications", Wiley Easter Ltd., 1979.

(3) Introduction to Linear Optimization by Dimitris Bertsimas & John N. Tsitsiklis, Athena Scientific 1997.

(4) TahaHamdy - Operations Research - An Introduction (Prentice-Hall, 9th edition).

(5) B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.

## Reference Books:

(1) An introduction to Optimization by Edwin P K Chong, Stainslaw Zak.

(2) Hillier F S and Lieberman G J, Operations Research, Holden Day Inc., San Francisco.

(3) David G.Luerbeggan, "Introduction to Linear and Non Linear Programming", Addison Wesley Publishing Co. 1973.

(4)Cordan C.C. Beveridge and Robert S. Schedther, "Optimization, Theory and Practice" McGraw Hill Co.1970.

## Link:

| | |
|---|---|
| **Unit 1** | https://youtu.be/a2QgdDk4Xjw<br>https://youtu.be/XEA1pOtyrfo<br>https://youtu.be/qxls3cYg8to<br>https://youtu.be/DUFcNysR-w8<br>https://youtu.be/OUduOnhO94k<br>https://youtu.be/_uRKG9tkrew<br>https://youtu.be/7w30ueP5ayI<br>https://youtu.be/gmDwUCvOJQ8 |
| **Unit 2** | https://youtu.be/gxLQ7Q26SkE<br>https://youtu.be/PkFKuoJQrN4<br>https://youtu.be/-cBkrzNdQn4<br>https://youtu.be/-Cg-aL1D8CM<br>https://youtu.be/-cLsEHP0qt0 |
| **Unit 3** | https://youtu.be/jGwA4hknYp4<br>https://youtu.be/ejol5TMpYJc<br>https://youtu.be/tJfizPGPo34<br>https://youtu.be/nZ40jnChzbs<br>https://youtu.be/nZ40jnChzbs<br>https://youtu.be/PlpJShHvNfQ |
| **Unit 4** | https://youtu.be/QH2WL92bzLs<br>https://youtu.be/DGmNbs5Cywo<br>https://youtu.be/FliKUWUVrEI<br>https://youtu.be/7eHuQXMCOvA<br>https://youtu.be/ZkvQR3ajm3k<br>https://youtu.be/zdyUwzOm1zw<br>https://youtu.be/BBuV14-isyU<br>https://youtu.be/xPr7YFSnmiQ<br>https://youtu.be/ajJD0Df5CsY<br>https://youtu.be/iviiGB5vxLA<br>https://youtu.be/Ym1EUjTWMnE |
| **Unit 5** | https://youtu.be/Dsi7x-A89Mw<br>https://youtu.be/mrCrjeqJv6U<br>https://youtu.be/jZXHzpq-vmM<br>https://youtu.be/KSFnfUYcxoI<br>https://youtu.be/i72ptXTEmkk |

# B. TECH. SECOND YEAR

| Course Code | AASL0401 | L T P | Credit |
|---|---|---|---|
| Course Title | Technical Communication | 2 1 0 | 3 |

**Course objective:**

| | |
|---|---|
| 1 | To help the students develop communication and critical thinking skills necessary for securing a job, and succeeding in the diverse and ever-changing workplace of the twenty first century |
| 2 | To enable students to communicate effectively in English at the workplace. |

**Pre-requisites:**

- The student must have a good degree of control over simple grammatical forms and some complex grammatical forms of English language.
- The student should be able to speak English intelligibly.

## Course Content / Syllabus

| UNIT-I | Introduction to Technical Communication and Reading | 4 Hours |
|---|---|---|

- Fundamentals of technical communication
- Role of technical communication
- Reading Comprehension - central idea, tone, and intention
- Critical reading strategies

| UNIT-II | Technical Writing 1 | 5 Hours |
|---|---|---|

- Characteristics of technical writing; technical vocabulary, etymology
- Business letters /emails – types, format, style and language
- Notices, agenda and minutes
- Job application, CV and resume

| UNIT-III | Technical Writing 2 | 5 Hours |
|---|---|---|

- Technical reports – types & formats
- Structure of a report
- Technical Proposal - structure and types
- Technical/ Scientific paper writing

| UNIT-IV | Public Speaking | 5 Hours |
|---|---|---|

- Components of effective speaking (emphasis on voice dynamics)
- Seminar and conference presentation
- Conducting/ participating in meetings
- Appearing for a job interview
- Mobile etiquettes

| UNIT-V | Manuscript Preparation | 5 Hours |
|---|---|---|

- Short report writing
- Copy editing and referencing
- Developing writing style – Jargons, Abbreviations
- Ethical writing

**Course outcome:** At the end of the course the students will be able to Levels.

| | | |
|---|---|---|
| CO 1 | Comprehend the fundamental principles of technical communication with special reference to reading. | K2 |
| CO 2 | Write various kinds of professional correspondence. | K5 |
| CO 3 | Recognise and produce different kinds of technical documents. | K2 |
| CO 4 | Apply effective speaking skills to communicate at the workplace. | K3 |
| CO 5 | Demonstrate their understanding of various ethical concerns in written communication. | K3 |

## Textbook:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

## Reference Books:


1. Personality Development and Soft Skills by Barun K Mitra, Oxford Univ. Press, 2012, New Delhi.

2. Spoken English- A Manual of Speech and Phonetics by R K Bansal & J B Harrison, Orient Blackswan, 2013, New Delhi.

3. Business Correspondence and Report Writing by Prof. R C Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.

4. Practical Communication: Process and Practice by L U B Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.

5. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; USA.

6. A Textbook of Scientific and Technical Writing by S D Sharma; Vikas Publication, Delhi.

7. Skills for Effective Business Communication by Michael Murphy, Harvard University, USA.

8. A Complete Guide to Write Right by Agarwal, Deepa. Scholastic, 1st edition.

9. Technical writing and communication, R S Sharma, V.P. Publication, 1st edition.

10. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

# B. TECH. SECOND YEAR

| Course Code | ACSE0403A | L T P | Credits |
|---|---|---|---|
| Course Title | Operating Systems | 3 0 0 | 3 |

**Course objective:**

The objective of the course is to provide an understanding of the basic modules and architecture of an operating system and the functions of the modules to manage, coordinate and control all the parts of the computer system. This course cover processor scheduling, deadlocks, memory management, process synchronization, system call and file system management.

**Pre-requisites:**

1. Basic knowledge of computer fundamentals, Data structure and Computer organization.

## Course Contents / Syllabus

| UNIT-I | Fundamental Concepts of Operating System | 8 Hours |
|---|---|---|

Introduction, Functions of Operating System, Characteristics of Operating System, Computer System Structure, Evolution of Operating Systems-Bare Machine, Single Processing, Batch Processing,Multiprogramming,Multitasking,Multithreaded,Interactive, Time sharing, Real Time System, Distributed System, Multiprocessor Systems, Multithreaded Systems, System Calls, System Programs and System Boot, Interrupt Handling, Operating System Structure- Simple structure, Layered Structure, Monolithic, Microkernel and Hybrid, System Components, Operating System Services, Case Studies: Windows, Unix and Linux.

| UNIT-II | Process Management | 8 Hours |
|---|---|---|

Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process Address Space, Process Identification Information, Threads and their management, Types of Scheduling: Long Term Scheduling, Mid Term Scheduling, Short Term Scheduling, Pre-emptive and Non Pre-emptive Scheduling, Dispatcher, Scheduling Algorithm: FCFS, Non Pre-emptive SJF, Pre-emptive SJF, Non Pre-emptive Priority, Pre-emptive Priority, Round Robin, Multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling.

| UNIT-III | Deadlock and Concurrent Processing | 8 Hours |
|---|---|---|

Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from Deadlock,Principle of Concurrency, Process Synchronization, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Peterson's Solution, Lamport Bakery Solution, Semaphores, Test and Set Operation; Critical Section Problems and their solutions - Bound Buffer Problem, Reader-Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication Models and Schemes, Process Generation.

| UNIT-IV | Memory Management | 8 Hours |
|---|---|---|

Memory Management function, Address Binding Loading : Compile Time, Load Time and Execution Time, MMU, Types of Linking, Types of Loading, Swapping, Multiprogramming with Fixed Partitions, Multiprogramming with variable partitions, Memory Allocation: Allocation Strategies First Fit, Best Fit, and Worst Fit, Paging, Segmentation, Paged Segmentation, Virtual Memory Concepts, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms: FIFO,LRU, Optimal and LFU, Belady'sAnomaly, Thrashing, Cache Memory Organization, Locality of Reference.

| UNIT-V | I/O Management and Disk Scheduling | 8 Hours |
|---|---|---|

I/O Devices, and I/O Subsystems, I/O Buffering, I/O Ports, Disk Storage: Seek Time, Rotational Latency, Data Transfer Time, Average Access Time and Controller Time,DiskStorage Strategies, Disk Scheduling:FCFS, SSTF, SCAN, C-SCAN, LOOK and C-LOOK. Directory and Directory Structure, File System: File concept, File Access Mechanism: - Sequential Access, Direct Access and Index Access methods, File Allocation Method: Contiguous, Linked and Indexed, Free Space Management: -Bit Vector, Linked List, Grouping and Counting File System Implementation Issues, File System Protection and Security, RAID.

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

| | | |
|---|---|---|
| CO 1 | Understand the fundamentals of an operating systems, functions and their structure and functions. | K1, K2 |
| CO 2 | Implement concept of process management policies, CPU Scheduling and thread management. | K5 |
| CO 3 | Understand and implement the requirement of process synchronization and apply deadlock handling algorithms. | K2, K5 |
| CO 4 | Evaluate the memory management and its allocation policies. | K5 |
| CO 5 | Understand and analyze the I/O management and File systems | K2, K4 |

**Text books:**

1) Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.

**Reference Books:**

1) Operating Systems: Internals and Design Principles. William Stallings.
2) Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3) Operating Systems: A Modern Perspective. Gary J. Nutt.
4) Design of the Unix Operating Systems. Maurice J. Bach.
5) Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.

**Link:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=783KAB-tuE4<br>https://www.youtube.com/watch?v=Bxx2_aQVeeg<br>https://www.youtube.com/watch?v=ZaGGKFCLNc0<br>https://nptel.ac.in/courses/106/105/106105214/ |
| **Unit 2** | https://www.youtube.com/watch?v=NShBeqTkXnQ<br>https://www.youtube.com/watch?v=4hCih9eLc7M<br>https://www.youtube.com/watch?v=9YRxhlvt9Zo |
| **Unit 3** | https://www.youtube.com/watch?v=UczJ7misUEk<br>https://www.youtube.com/watch?v=_IxqinTs2Yo |
| **Unit 4** | https://www.youtube.com/watch?v=IwESijQs9sM<br>https://www.youtube.com/watch?v=-orfFhvNBzY<br>https://www.youtube.com/watch?v=2OobPx246zg&list=PL3-wYxbt4yCjpcfUDz-TgD_ainZ2K3MUZ&index=10 |
| **Unit 5** | https://www.youtube.com/watch?v=AnGOeYJCv6s<br>https://www.youtube.com/watch?v=U1Jpvni0Aak |

# B. TECH. SECOND YEAR

| Course Code | ACSAI0402 | L T P | Credit |
|---|---|---|---|
| Course Title | Database Management Systems | 3 1 0 | 4 |

**Course objective:**

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information in relational and non-relation Database.

**Pre-requisites:** The student should have basic knowledge of discrete mathematics and data structures.

## Course Contents / Syllabus

### UNIT-I Introduction — 8 Hours

Overview, Database system Vs File system, Database system concepts, architecture and structures, data model schema and instances, Data independence and Database language and Interfaces, DDL, DML.

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, Candidate key, Primary key, Generalization, Aggregation, Reduction of an ER diagrams to tables, Extended ER model, Relationship of higher degree.

### UNIT-II Relational Data Model and Language — 8 Hours

Relational data model Concepts, Integrity constraints, Entity integrity, Referential integrity, Keys constraints, Domain constraints, Relational algebra, Relational calculus, Tuple and Domain calculus.

Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, Views and indexes. Queries and sub queries. Aggregate functions. Insert, Update and Delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL.

### UNIT-III Database Design-Normalization — 8 Hours

Normalization, Normal Form (NF), Functional Dependencies (FD), Closure of an attribute set and FD sets, Canonical Cover of FD Sets, Normal Forms based on Functional Dependencies (1 NF, 2 NF, 3 NF, BCNF), Multivalued Dependencies (MVDs) and 4NF, Join Dependencies (JDs) and 5NF and Domain Key Normal Formal (DKNF or 6NF), Inclusion Dependencies, Loss-Less Join Decompositions.

### UNIT-IV Transaction Processing and Recovery Concept — 8 Hours

Transaction system, Testing of serializability, Serializability of schedules, Conflict &View serializable schedule, Recoverability, Recovery from transaction failures, Log based recovery, Checkpoints, Deadlock handling.

Control Concurrency Techniques: Concurrency Control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, Validation-based protocol, Multiplegranularity, Multi version schemes, Recovery with concurrent transaction, Case study of Oracle.

Distributed Database: -Introduction Distributed Database, Centralized and Distributed System Database System.

### UNIT-V Introduction No-SQL with cloud Database — 8 Hours

Definition of NoSQL, History of NoSQL and Different NoSQL products, Exploring Mongo DB, Interfacing and Interacting with NoSQL, NoSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NoSQL Data stores, Indexing and ordering datasets(MongoDB).

**Cloud database**: - Introduction of Cloud database, NoSQL with Cloud Database, Introduction to Real time Database.

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

| | | |
|---|---|---|
| CO 1 | Analyze database used to solve real world and complex problem and design the ER, EER Model. | K4 |
| CO 2 | Analyze and apply Structured Query Language (SQL) or Procedural Query Language (PL/SQL) to solve the complex queries. Implement relational model, integrity constraints. | K4,K3 |
| CO 3 | Design and implement database for storing, managing data efficiently by applying the Normalization process on the database. | K6 |
| CO 4 | Synthesize the concepts of transaction management, concurrency control and recovery. | K5 |
| CO 5 | Understand and implement the concepts of NoSQL with cloud database. | K2, K5 |

**Text books:**

1) Korth, Silbertz, Sudarshan," Database System Concepts", Seventh Edition, McGraw - Hill.
2) Elmasri, Navathe, " Fundamentals of Database Systems", Seventh Edition, Addision Wesley.
3) Ivan Bayross "SQL,PL/SQL The programming language Oracle, Forth Edition, BPB Publication.

**Reference Books:**

1) Thomas Cannolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
2) Raghu Ramakrishan and Johannes Gehrke "Database Management Systems" Third Edition, McGraw-Hill.
3) NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software First Edition by Ted Hills.
4) Brad Dayley "NoSQL with MongoDB in 24 Hours" First Edition, Sams Publisher.

**NPTEL/ Youtube/ Faculty Video Link:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=TlbJk78TqYY<br>http://www.nptelvideos.com/lecture.php?id=6472<br>http://www.nptelvideos.com/lecture.php?id=6473 |
| **Unit 2** | http://www.nptelvideos.com/lecture.php?id=6474<br>http://www.nptelvideos.com/lecture.php?id=6475<br>http://www.nptelvideos.com/lecture.php?id=6476<br>http://www.nptelvideos.com/lecture.php?id=6477<br>http://www.nptelvideos.com/lecture.php?id=6478<br>http://www.nptelvideos.com/lecture.php?id=6479<br>http://www.nptelvideos.com/lecture.php?id=6480<br>http://www.nptelvideos.com/lecture.php?id=6481 |
| **Unit 3** | http://www.nptelvideos.com/lecture.php?id=6484<br>http://www.nptelvideos.com/lecture.php?id=6485 |

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|---|---|
| | http://www.nptelvideos.com/lecture.php?id=6486<br>http://www.nptelvideos.com/lecture.php?id=6487<br>http://www.nptelvideos.com/lecture.php?id=6493<br>http://www.nptelvideos.com/lecture.php?id=6495<br>http://www.nptelvideos.com/lecture.php?id=6496<br>http://www.nptelvideos.com/lecture.php?id=6497 |
| **Unit 4** | http://www.nptelvideos.com/lecture.php?id=6499<br>http://www.nptelvideos.com/lecture.php?id=6500<br>http://www.nptelvideos.com/lecture.php?id=6501<br>http://www.nptelvideos.com/lecture.php?id=6502<br>http://www.nptelvideos.com/lecture.php?id=6503<br>http://www.nptelvideos.com/lecture.php?id=6504<br>http://www.nptelvideos.com/lecture.php?id=6505<br>http://www.nptelvideos.com/lecture.php?id=6506<br>http://www.nptelvideos.com/lecture.php?id=6508<br>http://www.nptelvideos.com/lecture.php?id=6509<br>http://www.nptelvideos.com/lecture.php?id=6514<br>http://www.nptelvideos.com/lecture.php?id=6516<br>http://www.nptelvideos.com/lecture.php?id=6517<br>http://www.nptelvideos.com/lecture.php?id=6518<br>http://www.nptelvideos.com/lecture.php?id=6519 |
| **Unit 5** | http://www.nptelvideos.com/lecture.php?id=6516<br>http://www.nptelvideos.com/lecture.php?id=6517<br>http://www.nptelvideos.com/lecture.php?id=6518<br>http://www.nptelvideos.com/lecture.php?id=6519<br>https://www.youtube.com/watch?v=2yQ9TGFpDuM |

# B. TECH. SECOND YEAR

| Course code | ACSML0401N | L T P | Credits |
|---|---|---|---|
| Course title | MACHINE LEARNING | 3 0 0 | 3 |

**Course objective:** To introduction to the fundamental concepts in machine learning and popular machine learning algorithms. To understand the standard and most popular supervised learning algorithm.

**Pre-requisites:** Basic Knowledge of Machine learning.

## Course Contents / Syllabus

| UNIT-I | INTRODUCTION TO MACHINE LEARNING | 8 Hours |
|---|---|---|

INTRODUCTION – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches, Introduction to Model Building, Sensitivity Analysis, Underfitting and Overfitting, Bias and Variance, Concept Learning Task, Find – S Algorithms, Version Space and Candidate Elimination Algorithm, Inductive Bias, Issues in Machine Learning and Data Science Vs Machine Learning.

| UNIT-II | MINING ASSOCIATION AND SUPERVISED LEARNING | 8 Hours |
|---|---|---|

Classification and Regression, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Polynomial Regression, Decision Trees: ID3, C4.5, CART.
**Apriori Algorithm:** Market basket analysis, Association Rules.

**Neural Networks**: Introduction, Perceptron, Multilayer Perceptron, Support vector machine.

| UNIT-III | UNSUPERVISED LEARNING | 8 Hours |
|---|---|---|

Introduction to clustering, K-means clustering, K-Nearest Neighbor, Iterative distance-based clustering, Dealing with continuous, categorical values in K-Means, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, density-based clustering, Expectation Maximization, Gaussian Mixture Models.

| UNIT-IV | PROBABILISTIC LEARNING & ENSEMBLE | 8 Hours |
|---|---|---|

Bayesian Learning, Bayes Optimal Classifier, Naıve Bayes Classifier, Bayesian Belief Networks.

**Ensembles methods:** Bagging & boosting, C5.0 boosting, Random Forest, Gradient Boosting Machines and XGBoost.

| UNIT-V | REINFORCEMENT LEARNING & CASE STUDIES | 8 Hours |
|---|---|---|

**Reinforcement Learning:** Introduction to Reinforcement Learning, Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning – Q Learning function, QLearning Algorithm), Application of Reinforcement Learning.

**Case Study:** Health Care, E Commerce, Smart Cities.

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

| | | |
|---|---|---|
| CO1 | Understanding utilization and implementation proper machine learning algorithm. | K2 |
| CO2 | Understand the basic supervised machine learning algorithms. | K2 |

| | | |
|---|---|---|
| CO3 | Understand the difference between supervise and unsupervised learning. | K2 |
| CO4 | Understand algorithmic topics of machine learning and mathematically deep enough to introduce the required theory. | K2 |
| CO5 | Apply an appreciation for what is involved in learning from data. | K3 |

**Text books:**

1) Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017
2) Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016
3) Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995
4) Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010

**Reference Books:**

1) Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014
2) Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspective.
3) Ethem Alpaydin, (2004) "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press.
4) Fundamentals of Machine Learning for Predictive Data Anayltics: Algorithms, Worked Examples, and Case Studies 1st Edition by John D. Kelleher

**Links:**

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=fC7V8QsPBec&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=2 |
| **Unit 2** | https://www.youtube.com/watch?v=OTAR0kT1swg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=3<br>https://www.youtube.com/watch?v=OCwZyYH14uw<br>https://www.youtube.com/watch?v=9_LY0LiFqRQ<br>https://www.youtube.com/watch?v=EYeF2e2IKEo<br>https://www.youtube.com/watch?v=_PwhiWxHK8o<br>https://www.youtube.com/watch?v=wTF6vzS9fy4<br>https://www.youtube.com/watch?v=lt65K-REdHw |
| **Unit 3** | https://www.youtube.com/watch?v=HTSCbxSxsg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=4<br>https://www.youtube.com/watch?v=NnlS2BzXvyM<br>https://www.youtube.com/watch?v=7enWesSofhg |
| **Unit 4** | https://youtu.be/rthuFS5LSOo<br>https://youtu.be/kho6oANGu_A |

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|---|---|
| **Unit 5** | https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=5<br>Reinforcement Learning Tutorial \| Reinforcement Learning Example Using Python \| Edureka - YouTube<br>Association Rule Mining - Solved Numerical Question on Apriori Algorithm(Hindi) - YouTube<br>Q Learning Explained \| Reinforcement Learning Using Python \| Q Learning in AI \| Edureka - YouTube |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0404** | **L T P** | **Credits** |
| **Course Title** | **Theory of Automata and Formal Languages** | **3 0 0** | **3** |

**Course objective:**

To teach mathematical foundations of computation including automata theory, provide the design concepts of abstract computation model of finite automata, push down automata and turing Machine and familiarize the notions of algorithm, decidability, complexity, and computability.

**Pre-requisites:**

- Discrete Mathematics
- Fundamental of Computer System

**Course Contents / Syllabus**

| | | |
|---|---|---|
| **UNIT-I** | **Basic Concepts of Formal Language and Automata Theory** | **8 Hours** |

Introduction to Theory of Computation- Alphabet, Symbol, String, Formal Languages, Grammar, Derivation and Language generation by Grammar, Chomsky Hierarchy, Finite Automata, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non-Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ∈-Transition, Equivalence of NFA's with and without ∈-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA.

| | | |
|---|---|---|
| **UNIT-II** | **Regular Language and Finite Automata** | **8 Hours** |

Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into Regular grammar and Regular grammar into FA, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma.

Decidability- Decision properties, Finite Automata and Regular Languages, Simulation of Transition Graph and Regular language.

| | | |
|---|---|---|
| **UNIT-III** | **Context Free Language and Grammar** | **8 Hours** |

Context Free Grammar (CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Simplification of CFG, Normal Forms- Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Pumping Lemma for CFL, Closure properties of CFL, Decision Properties of CFL

| | | |
|---|---|---|
| **UNIT-IV** | **Push Down Automata** | **8 Hours** |

Pushdown Automata- Definition, Representation, Instantaneous Description (ID), Acceptance by PDA, Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, Pushdown Automata and Context Free Language, Pushdown Automata and Context Free Grammar, Two stack Pushdown Automata.

| | | |
|---|---|---|
| **UNIT-V** | **Turing Machine and Undecidability** | **8 Hours** |

Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Variations of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Closure Properties of Recursive and Recursively Enumerable Languages,

Non-Recursively Enumerable and Non-Recursive Languages, Undecidability, Halting Problem, Undecidability of Halting Problem, Post's Correspondence Problem.

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

| | | |
|---|---|---|
| CO 1 | Design and Simplify automata for formal languages and transform non-deterministic finite automata to deterministic finite automata. | K6 |
| CO 2 | Identify the equivalence between the regular expression and finite automata and apply closure properties of formal languages to construct finite automata for complex problems. | K3 |
| CO 3 | Define grammar for context free languages and use pumping lemma to disprove a formal language being context- free. | K3 |
| CO 4 | Design pushdown automata (PDA) for context free languages and Transform the PDA to context free grammar and vice-versa. | K6 |
| CO 5 | Construct Turing Machine for recursive and recursive enumerable languages. Identify the decidable and undecidable problems. | K6 |

**Text books:**


(1) Introduction to Automata theory, Languages and Computation, J.E. Hopcraft, R. Motwani, and Ullman. 3rdedition, Pearson Education Asia.
(2) Theory of Computer Science-Automata Language and Computation, K.L.P. Mishra, and N. Chandrasekharan, 3rd Edition, PHI.
(3) An Introduction to Formal Languages and Automata, P. Linz, 6th Edition, Jones & Bartlett Learning Publication.


**Reference Books:**


(1) Finite Automata and Formal Languages- A simple Approach, A. M. Padma Reddy, Cengage Learning Inc.
(2) Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI.
(3) Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill.
(4) Introduction to The Theory of Computation, M Sipser, 3rd Edition, Cengage Learning Inc.


**Links:**

| | |
|---|---|
| **Unit I** | https://nptel.ac.in/courses/106/104/106104028/Lecture 1 -10, Lecture 16, 17 18, 19<br>https://nptel.ac.in/courses/113/11111/1003016/<br>https://www.youtube.com/results?search_query=%23AutomataTheory |
| **Unit II** | https://nptel.ac.in/courses/106/104/106104028/Lecture 11 -15<br>https://nptel.ac.in/courses/113/11111/1003016/<br>https://www.youtube.com/results?search_query=%23AutomataTheory |
| **Unit III** | https://nptel.ac.in/courses/106/104/106104028/Lecture 20 -30<br>https://nptel.ac.in/courses/106/106/106106049/<br>https://www.youtube.com/results?search_query=%23AutomataTheory |
| **Unit IV** | https://nptel.ac.in/courses/106/104/106104028/Lecture 31 -33<br>https://nptel.ac.in/courses/113/11111/1003016/<br>https://www.youtube.com/results?search_query=%23AutomataTheory |
| **Unit V** | https://nptel.ac.in/courses/106/104/106104028/Lecture 34-42<br>https://nptel.ac.in/courses/113/11111/1003016/<br>https://www.youtube.com/results?search_query=%23AutomataTheory |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSE0453A** | **L T P** | **Credits** |
| **Course Title** | **Operating Systems Lab** | **0 0 2** | **1** |

**List of Experiments:**

| Sr. No. | Name of Experiment | CO |
|---|---|---|
| **1. Linux based Commands** | **Lab1:** Execute Various types of Linux Commands (Miscellaneous, File oriented, Directory oriented)<br>**Lab2:** Shell Programming<br>Write a shell program, which accepts the name of a file from standard input and perform the following test on it:<br>i. File readable<br>ii. File writable<br>iii. Both readable and writable | CO1 |
| **2. CPU Scheduling Algorithms** | **Lab3:** Implement CPU Scheduling Algorithms:<br>1. FCFS<br>2. SJF<br>3. PRIORITY<br>**Lab4:**<br>4. Round Robin<br>5. Multi-level Queue Scheduling | CO3 |
| **3. Deadlock Management** | **Lab5:** Implementation of Banker's algorithm for the purpose of Deadlock Avoidance. | CO3 |
| **4. Memory Management Techniques** | **Lab6:** Write a program to simulate the following contiguous memory allocation techniques:<br>a) First fit<br>b) Best fit<br>c) Worst Fit<br>**Lab7:** a) Write a Program for implementation of Contiguous memory fixed partition technique.<br>b) Write a program for implementation of Contiguous memory variable partition technique.<br>**Lab8:** Write a program to simulate page replacement algorithms:<br>a) FIFO<br>b) LRU<br>c) Optimal | CO4 |
| **5. Disk Scheduling Techniques** | **Lab9:** Write a program to simulate Disk Scheduling Algorithms:<br>a) FCFS<br>b) SSTF<br>**Lab 10:** c) SCAN & C-SCAN<br>d) Look & C-LOOK | CO5 |
| **6. Process Synchronization** | **Lab11:** Write a program to simulate Producer Consumer problem | CO2 |

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

| | | |
|---|---|---|
| CO1 | Gain all round knowledge of various Linux Commands. | K2 |
| CO2 | Analyze and implement Process Synchronization technique. | K4,K5 |

| | | |
|---|---|---|
| CO3 | Analyze and implement CPU scheduling algorithms. | K4, K5 |
| CO4 | Analyze and implement Memory allocation and Memory management techniques. | K4, K5 |
| CO5 | Analyze and implement Disk Scheduling Policies. | K4, K5 |

| B. TECH. SECOND YEAR | | | |
|---|---|---|---|
| **Course Code** | **ACSAI0452** | **L T P** | **Credit** |
| **Course Title** | **Database Management Systems Lab** | **0 0 2** | **1** |

**List of Experiments:**

| Sr. No. | Name of Experiment | CO |
|---|---|---|
| 1. | Installing ORACLE/ MYSQL/NOSQL. | CO1 |
| 2. | Creating Entity-Relationship Diagram using case tools with Identifying (entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) | CO1 |
| 3. | I. Implement DDL commands –Create, Alter, Drop etc.<br>II. Implement DML commands- Insert, Select, Update, Delete | CO2 |
| 4. | I. Implement DCL commands-Grant and Revoke<br>II. Implement TCL commands- Rollback, Commit, Save point<br>III. Implement different type key: -Primary Key, Foreign Key and Unique etc. | CO2 |
| 5. | Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys). | CO1, CO2 |
| 6. | Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping. | CO2 |
| 7. | Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc. | CO2 |
| 8. | Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi). | CO2 |
| 9. | **Practicing on Triggers** - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger | CO4 |
| 10. | **Procedures-** Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure | CO4 |
| 11. | **Cursors**- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor. | CO4 |
| 12. | Study of Open Source NOSQL Database: MongoDB (Installation, Basic CRUD operations, Execution) | CO5 |
| 13. | Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators) | CO5 |
| 14. | Implement aggregation and indexing with suitable example using MongoDB. | CO5 |
| 15. | Mini project (Design & Development of Data and Application) for following: -<br>a) Inventory Control System.<br>b) Material Requirement Processing.<br>c) Hospital Management System.<br>d) Railway Reservation System.<br>e) Personal Information System. | CO1 |

| | | |
|---|---|---|
| | f) Web Based User Identification System.<br>g) Timetable Management System.<br>h) Hotel Management System | |
| **Lab Course Outcome:** After completion of this course students will be able to | | |
| CO 1 | Design and implementthe ER, EER model to solve the real-world problem and transform an information model into a relational database schema and to use a data. | K6 |
| CO 2 | Formulate and evaluate query using SQL solutions to a broad range of query and data update problems. | K6 |
| CO 3 | Apply and create PL/SQL blocks, procedure functions, packages and triggers, cursors. | K3, K6 |
| CO 4 | Analyze entity integrity, referential integrity, key constraints, and domain constraints on database. | K4 |
| CO5 | Demonstrate understanding of MongoDB and its query operations. | K3 |

| B. TECH. SECOND-YEAR | | | |
|---|---|---|---|
| **Course code** | **ACSML0451N** | **L T P** | **Credit** |
| **Course title** | **MACHINE LEARNING LAB** | **0 0 2** | **1** |

**List of Experiments:**

| Sr. No. | Name of Experiment | CO |
|---|---|---|
| 1 | Write a program to perform various types of regression (Linear & Logistic). | CO2 |
| 2 | Implement Apriori algorithm using sample data in Python. | CO1 |
| 3 | Write a program to demonstrate the working of the decision tree based ID3algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | CO2 |
| 4 | Write a program to implement k-Nearest Neighbour algorithm to classify the iris dataset. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. | CO1 |
| 5 | Apply EM algorithm to cluster a set of data. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. | CO3 |
| 6 | Implement Support Vector Machine using Scikit-learn. | CO5 |
| 7 | Implement the non-parametric Locally Weighted Regression algorithm to fit data points. Select appropriate data set for your experiment and draw graphs. | CO1 |
| 8 | Implement Gradient Boosting Machine Ensemble in Python. | CO4 |
| 9 | Implement of ANN algorithm using a sample dataset. | CO2 |
| 10 | Implement naïve Bayesian Classifier model. Write the program to calculate the accuracy, precision, and recall for your data set. | CO4 |

**Lab Course Outcome:**

| | | |
|---|---|---|
| CO1 | Understand the implementation procedures for the machine learning algorithms. | K2 |
| CO2 | Identify and apply Machine Learning algorithms to solve real-world problems. | K1 |

## B. TECH. SECOND YEAR

| Course Code | ANC0402 | L T P | Credits |
|---|---|---|---|
| Course Title | Environmental Science | 2 0 0 | 0 |

**Course objective:**

| | |
|---|---|
| 1 | To help the students in realizing the inter-relationship between man and environment. and help the students in acquiring basic knowledge about environment. |
| 2 | To develop the sense of awareness among the students about environment and its various problems. |
| 3 | To create positive attitude about environment among the student. |
| 4 | To develop proper skill required for the fulfilment of the aims of environmental education and educational evaluations |
| 5 | To develop the capability of using skills to fulfil the required aims, to realise and solve environmental problems through social, political, cultural and educational processes |

**Pre-requisites:** Basic knowledge of nature.

**Course Contents / Syllabus**

### UNIT-I Basic Principle of Ecology — 8 Hours

Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles.

Basic concepts of sustainable development, SDGs, Ecosystem services, UN Decade for Ecorestoration.

### UNIT-II Natural Resources and Associated Problems — 8 Hours

Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles.

Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages.

### UNIT-III Biodiversity Succession and Non-Renewable Energy Resources — 8 Hours

Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book.

Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance.

Succession: Concepts of succession, Types of Succession. Trends in succession. Climax and stability.

### UNIT-IV Pollution and Solid Waste Management — 8 Hours

Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox, CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surrounding environment.

Solid waste disposal and its effects on surrounding environment, Climate change, global warming, acid rain, ozone layer depletion.

### UNIT-V Role of Community and Environmental Protection Acts — 8 Hours

Role of community, women and NGOs in environmental protection, Bioindicators and their role, Natural hazards, Chemical accidents and disasters risk management, Environmental Impact Assessment (EIA), Salient features of following Acts: a. Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.b. Water (Prevention and control of pollution) Act, 1974.c. Air (Prevention and control of pollution) Act, 1981. Forest (Conservation) Act, 1980.d. Wetlands (Conservation and Management) Rules, 2017; e. Chemical safety and Disaster Management law. F. District Environmental Action Plan. Climate action plans.

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

| | | |
|---|---|---|
| **CO 1** | Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem., food chains and food webs. Ecological pyramids | K2 |
| **CO 2** | Understand the different types of natural recourses like food, forest, minerals and energy and their conservation | K2 |
| **CO 3** | Understand the importance of biodiversity, Threats of biodiversity and different methods of biodiversity conservation. | K2 |
| **CO 4** | Understand the different types of pollution, pollutants, their sources, effects and their control methods | K3 |
| **CO 5** | Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment | K3 |

## Text books:


1. Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York.
2. Botkin, D.B and Kodler E.A., 2000, Environmental Studies: The earth as a living planet. John Wiley and Sons Inc.
3. Rao M.N. and H.V.N. Rao, 1989: Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Singh J.S., Singh S.P. and Gupta S.R., 2006, Ecology Environment and Resource Conservation, Anamaya Publishers, New Delhi.
5.Environmental Studies -Benny Joseph-Tata McgrawHill-2005
6. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
7. Environmental studies- R, Rajagopalan -Oxford Pubtiotion2005.


## Reference Books:


1.Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.
2.Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.
3. Sharma P. D. (1996). Environmental Biology, Rastogi Publications, Meerut.
4. Verma P.S. and V.K. Agarwal. (1985). Principles of Ecology. S. Chand and Company (Pub.), New Delhi.
5.Principles of Environmental Sciences and Engineering -P. Venugoplan Rao, Prenitice Hall of India.
6. Environmental Science and Engineering Meenakshi, Prentice Hall India.


## NPTEL/ Youtube/ Faculty Video Link:

| | |
|---|---|
| **Unit 1** | https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDohttps://www.youtube.com/watch?v=yAK-m91Nxrshttps://www.youtube.com/watch?v=ha_O-1uOWkk, https://www.youtube.com/watch?v=brF0RWJyx9w |
| **Unit 2** | https://www.youtube.com/watch?v=mOwyPENHhbc,https://www.youtube.com/watch?v=yqev1G2iy20, https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2g0 |
| **Unit 3** | https://www.youtube.com/watch?v=GK_vRtHJZu4,https://www.youtube.com/watch?v=b6Ua_zWDH6U, https://www.youtube.com/watch?v=7tgNamjTRkk,https://www.youtube.com/watch?v=ErATB1aMiSU, https://www.khanacademy.org/science/high-school-biology/hs-ecology/hs-human-impact-on-ecosystems/v/conservation-and-the-race-to-save-biodiversity |
| **Unit 4** | https://www.youtube.com/watch?v=7qkaz8ChelI,https://www.youtube.com/watch?v=NuQE5fKmfME, https://www.youtube.com/watch?v=9CpAjOVLHII,https://www.youtube.com/watch?v=yEci6iDkXYw, https://www.youtube.com/watch?v=yEci6iDkXYw |
| **Unit 5** | https://www.youtube.com/watch?v=ad9KhgGw5iA,https://www.youtube.com/watch?v=nW5g83NSH9M, https://www.youtube.com/watch?v=xqSZL4Ka8xo,https://www.youtube.com/watch?v=WAI-hPRoBqs, https://www.youtube.com/watch?v=o-WpeyGlV9Y, https://www.youtube.com/watch?v=EDmtawhADnY |

| B. TECH. SECOND YEAR | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **ANC0401** | **L** | **T** | **P** | **Credit** |
| **Course Title** | **Cyber Security** | **2** | **0** | **0** | **0** |

**Course objective:**

Achieve knowledge about Security of Information system and Risk factors and examine security threats and vulnerability in various scenarios, understand concept of cryptography and encryption technique to protect the data from cyber-attackand provide protection for software and hardware.

**Pre-requisites:** Basics recognition in the domain of Computer Science.
Concept of network and operating system.
Commands of programming language.

## Course Contents / Syllabus

| UNIT-I | Introduction | 8 Hours |
|---|---|---|

Introduction to Information Systems: Types of Information Systems, Development of Information Systems, Need for Information Security, Threats to Information Systems, Information Assurance, Guidelines for Secure Password and WI-FI Security and social media and Windows Security, Security Risk Analysis, and Risk Management.

| UNIT-II | Application Layer Security | 8 Hours |
|---|---|---|

Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall, Intrusion Detection, Access Control, Security Threats -Viruses, Worms, Trojan Horse,Bombs,Trapdoors,Spoofs, E-mail Viruses, Macro Viruses, Malicious Software,Network and Denial of Services Attack.
E-Commerce: Electronic Payment System, e- Cash, Issues with Credit/Debit Cards.

| UNIT-III | Secure System Development | 8 Hours |
|---|---|---|

Application Development Security, Architecture &Design,Security Issues in Hardware: Data Storage and Downloadable Devices, Mobile Protection,SecurityThreats involving in social media, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.

| UNIT-IV | Cryptography And Network Security | 8 Hours |
|---|---|---|

Public key cryptography: RSA Public Key Crypto with implementation in Python,Digital Signature Hash Functions,Public Key Distribution.
Symmetric key cryptography: DES (Data Encryption Standard), AES (Advanced Encryption Standard), Secure hash algorithm(SHA-1).

Real World Protocols: Basic Terminologies, VPN, Email Security Certificates, Transport Layer Security, TLS, IP security, DNS Security.

| UNIT-V | Security Policy | 8 Hours |
|---|---|---|

Policy design Task, WWW Policies, Email based Policies, Policy Revaluation Process-Corporate Policies-Sample Security Policies,Publishing and Notification Requirement of the updated and new Policies.
Resent trends in security.

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

| | | |
|---|---|---|
| CO 1 | Analyze the cyber security needs of an organization. | K4 |
| CO 2 | Identify and examine software vulnerabilities and security solutions. | K1,K3 |

| | | |
|---|---|---|
| CO 3 | Comprehend IT Assets security (hardware and Software) and performance indicators | K2 |
| CO 4 | Measure the performance and encoding strategies of security systems. | K3, K5 |
| CO 5 | Understand and apply cyber security methods and policies to enhance current scenario security. | K2, K3 |

**Text books:**

1) Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security", Pearson Education India
2) V.K.Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India
3) Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House
4) Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage

**Reference Books:**

1) Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
2) CHANDER, HARISH," Cyber Laws and It Protection", PHI Learning Private Limited,sDelhi
3) V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
4) William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010

**E-books& E-Contents:**

1) https://prutor.ai/welcome/
2) https://crypto.stanford.edu/cs155old/cs155-spring11/lectures/03-ctrl-hijack.pdf
3) https://cybermap.kaspersky.com/stats
4) https://www.fireeye.com/cyber-map/threat-map.html

**Reference Links:**

1) https://crypto.stanford.edu/cs155old/cs155-spring11/lectures/03-ctrl-hijack.pdf
2) https://cs155.stanford.edu/lectures/03-isolation.pdf
3) http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security.pdf

**NPTEL/ Youtube/ Faculty Video Link:**

1) https://www.youtube.com/watch?v=vv1ODDhXW8Q
2) https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8
3) https://www.youtube.com/watch?v=iTVyKbDCJrA&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2
4) https://www.youtube.com/watch?v=1plMO7ChXMU&list=PLJ5C_6qdAvBFAuGoLC2wFGruY_E2gYtev
5) https://www.youtube.com/watch?v=_9QayISruzo