**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**
**(AUTONOMOUS)**
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

# CSE
# R19 Regulation

# Course Structure and Syllabus

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**
**(AUTONOMOUS)**
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

## INSTITUTE VISION

To emerge as one of the premier institutions through excellence in education and research, producing globally competent and ethically strong professionals and entrepreneurs

## INSTITUTE MISSION

**M1:** Imparting high-quality technical and management education through the state-of-the- art resources.

**M2:** Creating an eco-system to conduct independent and collaborative research for the betterment of the society

**M3:** Promoting entrepreneurial skills and inculcating ethics for the socio-economic development of the nation.

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**
**(AUTONOMOUS)**
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

## DEPARTMENT VISION

To impart quality education and research in Computer Science and Engineering for producing technically competent and ethically strong IT professionals with contemporary knowledge

## DEPARTMENT MISSION

**M1:** Achieving academic excellence in computer science through effective pedagogy, modern curriculum and state-of-art computing facilities.

**M2:** Encouraging innovative research in Computer Science and Engineering by collaborating with Industry and Premier Institutions to serve the nation.

**M3:** Empowering the students by inculcating professional behavior, strong ethical values and leadership abilities

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** To provide software solutions for arising problems in diverse areas with strong knowledge in innovative technologies of computer science.

**PEO2:** To serve in IT industry as professionals and entrepreneurs or in pursuit of higher education and research.

**PEO3:** To attain professional etiquette, soft skills, leadership, ethical values meld with a commitment for lifelong learning.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1:** **Analysis & Design:**
Ability to design, develop and deploy customized applications in all applicable domains using various algorithms and programming languages.

**PSO2:** **Computational Logic:**
Ability to visualize and configure computational need in terms of hardware and software to provide solutions for various complex applications.

**PSO3:** **Software Development:**
Ability to apply standard procedures, tools and strategies for software development.

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| INDUCTION PROGRAM (MANDATORY) | 3 WEEKS DURATION |
|---|---|
| Induction program for students to be offered right at the start of the first year. | • Physical activity<br>• Creative Arts<br>• Universal Human Values<br>• Literary<br>• Proficiency Modules<br>• Lectures by Eminent People<br>• Visits to local Areas<br>• Familiarization to Dept./Branch & Innovations |

### I B. Tech. – I Semester (CSE)

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19HS0830 | Algebra and Calculus | 3 | - | - | 3 |
| 2 | 19HS0851 | Semiconductor Physics | 3 | 1 | - | 4 |
| 3 | 19ME0302 | Engineering Graphics | 1 | - | 4 | 3 |
| 4 | 19CS0501 | Python Programming | 3 | - | - | 3 |
| 5 | 19HS0855 | Semiconductor Physics Lab | - | - | 3 | 1.5 |
| 6 | 19CS0502 | Python Programming Lab | - | - | 3 | 1.5 |
| 7 | 19ME0301 | Workshop Practices Lab | - | - | 4 | 2 |
| | Contact Periods / Week | | 10 | 01 | 14 | 18 |
| | | | Total/Week 25 | | | |

### I B. Tech. – II Semester (CSE)

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19HS0801 | Applied Chemistry | 3 | 1 | - | 4 |
| 2 | 19HS0810 | Communicative English | 3 | - | - | 3 |
| 3 | 19HS0835 | Probability & Statistics | 3 | 1 | - | 4 |
| 4 | 19EE0240 | Basic Electrical & Electronics Engineering | 3 | - | - | 3 |
| 5 | 19CS0503 | Digital Logic Design | 3 | - | - | 3 |
| 6 | 19HS0803 | Applied Chemistry Lab | - | - | 3 | 1.5 |
| 7 | 19HS0811 | Communicative English Lab | - | - | 3 | 1.5 |
| **Non-Credit Course** | | | | | | |
| 8 | 19HS0817 | Essence of Indian Traditional Knowledge | 3 | - | - | - |
| | Contact Periods / Week | | 18 | 02 | 6 | 20 |
| | | | Total/Week26 | | | |

**II B. Tech. – I Semester (CSE)**

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19EC0421 | Microprocessors & Microcontrollers | 3 | - | - | 3 |
| 2 | 19CS0504 | Computer Organization & Architecture | 3 | 1 | - | 4 |
| 3 | 19CS0505 | C and Data Structures | 3 | - | - | 3 |
| 4 | 19CS0506 | Database Management Systems | 3 | - | - | 3 |
| | | **Open Elective-I** | | | | |
| 5 | 19CE0136 | Water Technology | 3 | - | - | 3 |
| | 19EE0238 | Generation of Energy Through Waste | | | | |
| | 19ME0349 | Fundamentals of Mechanical Engineering | | | | |
| | 19EC0448 | Introduction to Communication Systems | | | | |
| | 19HS0813 | Management Science | | | | |
| 6 | 19EC0424 | Microcontroller and Applications Lab | - | - | 3 | 1.5 |
| 7 | 19CS0507 | C and Data Structures Lab | - | - | 3 | 1.5 |
| 8 | 19CS0508 | Database Management Systems Lab | - | - | 2 | 1 |
| | | **Non- Credit Course** | | | | |
| 9 | 19HS0816 | Indian Constitution | 3 | - | - | - |
| | | Contact Periods / Week | 18 | 1 | 8 | 20 |
| | | | Total/Week 27 | | | |

**II B. Tech. – II Semester (CSE)**

| S.No | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19HS0836 | Discrete Mathematics | 4 | - | - | 4 |
| 2 | 19CS0509 | Formal Languages and Automata Theory | 3 | 1 | - | 3 |
| 3 | 19CS0510 | Object Oriented Programming through Java | 3 | - | - | 3 |
| 4 | 19CS0511 | Operating Systems | 3 | - | - | 3 |
| | | **Open Elective-II** | | | | |
| 5 | 19CE0143 | Fundamentals of Urban Planning | 3 | - | - | 3 |
| | 19EE0233 | Industrial Instrumentation | | | | |
| | 19ME0350 | Mechanical Measurements & Control Systems | | | | |
| | 19EC0449 | Elements of Embedded Systems | | | | |
| | 19HS0814 | Intellectual Property Rights | | | | |
| 6 | 19CS0512 | Object Oriented Programming through Java Lab | - | - | 3 | 1.5 |
| 7 | 19CS0513 | Operating Systems lab | - | - | 3 | 1.5 |
| 8 | 19CS0514 | Object oriented Analysis and design lab | - | - | 2 | 1 |
| | | **Non- Credit Course** | | | | |
| 9 | 19HS0805 | Environmental Science | 3 | - | - | - |
| | | Contact Periods / Week | 19 | 1 | 8 | 20 |
| | | | Total/Week 28 | | | |

**III B. Tech. – I Semester (CSE)**

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19CS0515 | Compiler Design | 3 | - | - | 3 |
| 2 | 19CS0516 | Design and Analysis of Algorithms | 3 | 1 | - | 4 |
| 3 | 19CS0517 | Data Warehousing and Data Mining | 3 | - | - | 3 |
| 4 | 19CS0518 | Software Engineering | 3 | - | - | 3 |
| | **Open Elective-III** | | | | | |
| 5 | 19CE0129 | Elements of Road Traffic Safety | 3 | - | - | 3 |
| | 19EE0239 | Solar Photovoltaic Systems | | | | |
| | 19ME0313 | Non-Conventional Energy Resources | | | | |
| | 19EC0450 | Introduction to IOT | | | | |
| | 19HS0861 | Business Ethics | | | | |
| 6 | 19CS0519 | Analysis of Algorithms Lab | - | - | 3 | 1.5 |
| 7 | 19CS0520 | Data Mining Lab | - | - | 3 | 1.5 |
| 8 | 19CS0521 | Linux Programming Lab | - | - | 2 | 1 |
| | **Non- Credit Course** | | | | | |
| 9 | 19HS0858 | Human Values & Professional Ethics | 3 | - | - | - |
| | Contact Periods / Week | | **18** | **1** | **8** | **20** |
| | | | **Total/Week 27** | | | |

**III B. Tech. – II Semester (CSE)**

| S.No | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19CS0522 | Artificial Intelligence & Machine Learning | 3 | - | - | 3 |
| 2 | 19CS0523 | Big Data Analytics | 3 | 1 | - | 4 |
| 3 | 19CS0524 | Computer Networks | 3 | - | - | 3 |
| 4 | 19CS0525 | Web Technologies | 3 | - | - | 3 |
| | **Open Elective-IV** | | | | | |
| 5 | 19CE0147 | Project Planning and Control | 3 | - | - | 3 |
| | 19EE0231 | Neural Networks & Fuzzy Logic | | | | |
| | 19ME0353 | Computer Aided Process Planning | | | | |
| | 19EC0451 | MAT LAB Programming | | | | |
| | 19HS0862 | Strategic Management | | | | |
| 6 | 19CS0526 | Machine Learning Lab | - | - | 2 | 1 |
| 7 | 19CS0527 | Big Data Analytics Lab | - | - | 3 | 1.5 |
| 8 | 19CS0528 | Web Technologies Lab | - | - | 3 | 1.5 |
| | **Non- Credit Course** | | | | | |
| 9 | 19HS0859 | English for Corporate Communication Skills Lab | 3 | - | - | - |
| | Contact Periods / Week | | **18** | **01** | **08** | **20** |
| | | | **Total/Week 27** | | | |

**IV B. Tech. – I Semester (CSE)**

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 19HS0815 | Entrepreneurship Development | 3 | - | - | 3 |
| 2 | 19CS0529 | Cloud Computing | 3 | - | - | 3 |
| 3 | 19CS0530 | Cyber Security | 3 | - | - | 3 |
| **Professional Elective Course (PEC)– I** | | | | | | |
| 4 | 19CS0536 | Deep Learning | 3 | - | - | 3 |
| | 19CS0537 | Software Project Management | | | | |
| | 19CS0538 | Information Retrieval Systems | | | | |
| **Professional Elective Course (PEC) – II** | | | | | | |
| 5 | 19CS0539 | Human Computer Interaction | 3 | - | - | 3 |
| | 19CS0540 | Information Security | | | | |
| | 19CS0541 | Mobile Application Development | | | | |
| **Professional Elective Course (PEC) – III** | | | | | | |
| 6 | 19CS0542 | Data Science | 3 | - | - | 3 |
| | 19CS0543 | Adhoc Wireless Networks | | | | |
| | 19CS0544 | Soft Computing | | | | |
| 7 | 19CS0531 | Internship (60 hours) | - | - | - | 3 |
| 8 | 19CS0532 | Project Phase-I | - | - | 4 | 2 |
| Contact Periods / Week | | | 18 | - | 4 | 23 |
| | | | **Total/Week 22** | | | |

**IV B. Tech. – II Semester (CSE)**

| S. No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | - | **MOOC** | 3 | - | - | 3 |
| 2 | 19CS0533 | Seminar | - | - | 6 | 3 |
| 3 | 19CS0534 | Comprehensive Viva Voce | - | - | - | 2 |
| 4 | 19CS0535 | Project Phase-II | - | - | 22 | 11 |
| Contact Periods / Week | | | 3 | - | 28 | 19 |
| | | | **Total/Week 31** | | | |

**\*L-Lecture hours, T-Tutorial, P-Practical, C-Credit**

**TOTAL NO. OF CREDITS**

| Year | I | | II | | III | | IV | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| SEM | I | II | I | II | I | II | I | II | |
| CREDITS | 18 | 20 | 20 | 20 | 20 | 20 | 23 | 19 | 160 |

### Department of Computer Science and Engineering
### List of Subjects

| S.No. | Subject Code | Name of Subject |
|---|---|---|
| | | **Core Subjects** |
| 1 | 19CS0501 | Python Programming |
| 2 | 19CS0502 | Python Programming Lab |
| 3 | 19CS0503 | Digital Logic Design |
| 4 | 19CS0504 | Computer Organization & Architecture |
| 5 | 19CS0505 | C and Data Structures |
| 6 | 19CS0506 | Database Management System |
| 7 | 19CS0507 | C and Data Structures Lab |
| 8 | 19CS0508 | Database Management System Lab |
| 9 | 19CS0509 | Formal Languages and Automata Theory |
| 10 | 19CS0510 | Object Oriented Programming through Java |
| 11 | 19CS0511 | Operating Systems |
| 12 | 19CS0512 | Object Oriented Programming through Java Lab |
| 13 | 19CS0513 | Operating Systems lab |
| 14 | 19CS0514 | Object oriented Analysis and design lab |
| 15 | 19CS0515 | Compiler Design |
| 16 | 19CS0516 | Design and Analysis of Algorithms |
| 17 | 19CS0517 | Data Warehousing and Data Mining |
| 18 | 19CS0518 | Software Engineering |
| 19 | 19CS0519 | Analysis of Algorithms lab |
| 20 | 19CS0520 | Data Mining  Lab |
| 21 | 19CS0521 | Linux Programming Lab |
| 22 | 19CS0522 | Artificial Intelligence & Machine Learning |
| 23 | 19CS0523 | Big Data Analytics |
| 24 | 19CS0524 | Computer Networks |
| 25 | 19CS0525 | Web Technologies |
| 26 | 19CS0526 | Machine Learning Lab |
| 27 | 19CS0527 | Big data Analytics Lab |
| 28 | 19CS0528 | Web Technologies Lab |
| 29 | 19CS0529 | Cloud Computing |
| 30 | 19CS0530 | Cyber Security |
| 31 | 19CS0531 | Internship |
| 32 | 19CS0532 | Project Phase-I |
| 33 | 19CS0533 | Seminar |
| 34 | 19CS0534 | Comprehensive Viva Voce |

| | | |
|---|---|---|
| 35 | 19CS0535 | Project Phase-II |
| **Professional Elective Course (PEC)** | | |
| 36 | 19CS0536 | Deep Learning |
| 37 | 19CS0537 | Software Project Management |
| 38 | 19CS0538 | Information Retrieval Systems |
| 39 | 19CS0539 | Human Computer Interaction |
| 40 | 19CS0540 | Information Security |
| 41 | 19CS0541 | Mobile Application Development |
| 42 | 19CS0542 | Data Science |
| 43 | 19CS0543 | Adhoc Wireless Networks |
| 44 | 19CS0544 | Soft Computing |
| **Subjects for Other Departments** | | |
| 45 | 19CS0501 | Python Programming |
| 46 | 19CS0502 | Python Programming Lab |
| **Open Electives from CSE Department** | | |
| 47 | 19CS0545 | Software Development & Testing |
| 48 | 19CS0546 | Introduction to Cyber Security |
| 49 | 19CS0549 | LINUX Programming |
| 50 | 19CS0550 | Relational Database Management System |
| 51 | 19CS0551 | Java Programming |
| **Open Electives from Other Departments** | | |
| 52 | 19CE0136 | Water Technology |
| 53 | 19EE0238 | Generation Energy Through Waste |
| 54 | 19ME0349 | Fundamentals of Mechanical Engineering |
| 55 | 19EC0448 | Introduction to Communication Systems |
| 56 | 19HS0813 | Management Science |
| 57 | 19CE0143 | Fundamentals of Urban Planning |
| 58 | 19EE0233 | Industrial Instrumentation |
| 59 | 19ME0350 | Mechanical Measurements & Control Systems |
| 60 | 19EC0449 | Elements of Embedded Systems |
| 61 | 19HS0814 | Intellectual Property Rights |
| 62 | 19CE0129 | Elements of Road Traffic Safety |
| 63 | 19EE0239 | Solar Photovoltaic Systems |
| 64 | 19ME0313 | Non-Conventional Energy Resources |
| 65 | 19EC0450 | Introduction to IOT |
| 66 | 19HS0861 | Business Ethics |
| 67 | 19CE0147 | Project Planning And Control |
| 68 | 19EE0231 | Neural Networks & Fuzzy Logic |
| 69 | 19ME0353 | Computer Aided Process Planning |

| 70 | 19EC0451 | MAT LAB Programming |
|----|----------|---------------------|
| 71 | 19HS0862 | Strategic Management |
| **Subjects from Other Departments** | | |
| 72 | 19HS0830 | Algebra and Calculus |
| 73 | 19HS0851 | Semiconductor Physics |
| 74 | 19HS0855 | Semiconductor Physics Lab |
| 75 | 19ME0302 | Engineering Graphics |
| 76 | 19ME0301 | Workshop  Practices Lab |
| 77 | 19HS0801 | Applied Chemistry |
| 78 | 19HS0803 | Applied Chemistry Lab |
| 79 | 19HS0810 | Communicative English |
| 80 | 19HS0811 | Communicative English Lab |
| 81 | 19HS0835 | Probability & Statistics |
| 82 | 19EE0240 | Basic Electrical & Electronics Engineering |
| 83 | 19EC0421 | Microprocessor & Microcontroller |
| 84 | 19HS0424 | Microprocessor & Microcontroller Lab |
| 85 | 19HS0836 | Discrete Mathematics |
| 86 | 19HS0815 | Entrepreneurship Development |
| **Non-Credit Courses** | | |
| 87 | 19HS0817 | Essence of Indian Traditional Knowledge |
| 88 | 19HS0816 | Indian Constitution |
| 89 | 19HS0805 | Environmental Science |
| 90 | 19HS0858 | Human Values & Professional Ethics |
| 91 | 19HS0859 | English for Corporate Communication Skills Lab |

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**I B. Tech – I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

### (19HS0830) ALGEBRA AND CALCULUS
(**Common to All Branches**)

**COURSE OBJECTIVES**

The objectives of this course:

1. *This course will illuminate the students in the concepts of calculus and linear algebra.*
2. *To equip the students with standard concepts and tools at an intermediate to the advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.*
3. *To evaluate multiple integrals in Cartesian, cylindrical and spherical geometries*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Develop the use of matrix algebra techniques that is needed by engineers for Practical applications*
2. *Utilize mean value theorems to real life problems*
3. *Familiarize with functions of several variables which is useful in optimization*
4. *Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems*
5. *Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions.*

**UNIT – I**

**Matrices:** Rank of a matrix by echelon form - Solutions of system of homogeneous and non-homogeneous linear equations - Eigen values and Eigen vectors and their properties - Cayley-Hamilton theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton theorem - Diagonalization of a matrix - Quadratic forms and nature  of  the quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation.

**UNIT – II**

**Calculus and Mean Value Theorems:** Rolle"s Theorem - Lagrange"s mean value theorem - Cauchy"s mean value theorem - Taylor"s and Maclaurin"s theorems (without proofs).

**UNIT – III**

**Multivariable Calculus:** Partial derivatives - Total derivatives - Chain rule - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange multipliers.

**UNIT – IV**

**Integral Calculus:** Evaluation of definite and  improper  integrals  (single  variable)
**Multiple Integration:** Double integrals (Cartesian) - Change of order of integration in double integrals - Change of variables (Cartesian to polar) - Evaluation of Triple integrals

(Cartesian).

**UNIT – V**

**Special Functions:** Beta and Gamma functions and their properties - Relation between Beta and Gamma functions - Evaluation of definite integrals using Beta and Gamma functions.

**TEXT BOOKS**

1. B. S. Grewal, *Higher Engineering Mathematics,* Khanna Publishers, 42$^{nd}$ Edition, 2017
2. B. V. Ramana, *Higher Engineering Mathematics*, Tata Mc Graw Hill Companies, Third Edition

**REFERENCES**

1. T.K.V. Iyengar, *Engineering Mathematics Volume-I,* S.Chand Publication, 5$^{th}$ Edition, 2010
2. T.K.V. Iyengar, *Engineering Mathematics Volume-II,* S.Chand Publication, 5$^{th}$ Revised Edition, 2011
3. T.K.V. Iyengar, *Engineering Mathematics Volume-III,* S.Chand Publication, 10$^{th}$ Revised Edition, 2015
4. E.Rukmangadachari, *Engineering mathematics, volume-I,* Pearson Publishers, 1$^{st}$ Edition, 2015
5. Dr.C. Sankaraiah, *Mathematical Methods,* Unitech series, First Edition, 2008

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| L | T | P | C |
|---|---|---|---|
| 3 | 1 | - | 4 |

## (19HS0851) SEMICONDUCTOR PHYSICS

**COURSE OBJECTIVES**

The objectives of this course:

1. *Basic concepts of free electron theory and energy bands in solids.*
2. *Key points, formation and importance of semiconductors.*
3. *To understand the dual nature of Matter and propagation of Electromagnetic waves.*
4. *To recognize the basic concepts related properties of Lasers and Optical Fibers.*
5. *To understand the fundamentals Nano Science & Technology.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Explain concepts of free electron theory and energy bands in solids.*
2. *Identify the applications of semiconductors in electronic devices.*
3. *Explain the applications of magnetic materials.*
4. *Evaluate the Maxwell equations and asses the EM wave propagation in non- conducting medium.*
5. *Apply the basic properties of nano-materials in various engineering branches.*

**UNIT – I**

**ELECTRON THEORY OF METALS:** Classical free electron theory – Postulates – Drawbacks - Quantum free electron theory – Fermi Dirac distribution – Effective mass of electron - Sources of electrical resistance - Energy bands in solids - Types of electronic materials: metals - Semiconductors and Insulators.

**UNIT – II**

**SEMICONDUCTORS:** Intrinsic semiconductors - Carrier concentration - Fermi level - Electrical conductivity - Energy band gap. Extrinsic semiconductors – Life time of charge carriers - Carrier generation and recombination - Diffusion and drift – Einstein‟s Relation - Hall Effect - Applications – Theory of p -n junction – Construction and working of LED and Photo diode.

**UNIT –III**

**PRINCIPLES OF QUANTUM MECHANICS:** Wave nature of Particles – Matter waves- Properties - de Broglie hypothesis - Time-dependent and time - Independent Schrodinger equation for wave function – Physical significance of wave function - Solution of stationary - state Schrodinger equation for one dimensional problem – Particle in a box.

**ELECTROMAGNETIC THEORY**: Divergence and Curl of Electric and Magnetic Fields - Gauss‟ theorem for divergence and Stokes‟ theorem for curl - Maxwell‟s Equations (Quantitative) - Electromagnetic wave propagation (Non-conducting medium).

## UNIT – IV

**LASERS:** Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation - Einstein‟s coefficients - Population inversion - Pumping Mechanisms - He-Ne laser, Nd-YAG laser - Applications of laser.

**FIBER OPTICS**: Introduction to Optical Fibers-Total Internal Reflection-Construction of optical fibers - Critical angle of propagation - Acceptance angle - Numerical Aperture - Classification of fibers based on Refractive index profile & modes – Propagation of electromagnetic wave through optical fiber - Block Diagram of Fiber optic Communication system - Applications.

## UNIT-V

**PHYSICS OF NANOMATERIALS:** Introduction - Nano science and Nanotechnology – Surface area to volume ratio and Quantum confinement - Classifications of Nanomaterials – Advantages of nanotechnology - Synthesis of nano-materials - Top Down Process - Ball Milling - Bottom Up Process: Sol-Gel method – Applications.

## TEXT BOOKS

1. B.E.A. Saleh and M.C. Tech, *Fundamentals of Photonics*, John Wiley & Sons, 2$^{nd}$ ed.2012.
2. K.Thyagarajan ,*Engineering Physics* , Mc Graw Hill Education Private Ltd, New Delhi.2$^{nd}$ ed,2019.

## REFERENCES

1. J. Singh, *Semiconductor optoelectronics* : *Physics and Technology*, McGraw-Hill Inc.2$^{nd}$ 1995.
2. S.M. Sze, *Semiconductor Devices: Physics and Technology*, Wiley, 2$^{rd}$ ed. 2015.
3. P. Bhattacharya, *Semiconductor Optoelectronic devices*, Prentice Hall of India , 2$^{nd}$ ed.1997.
4. R. Fitzpdricle , *Maxwell's equations and the principles of Electromagnetism*, Infinity Science Press, 1$^{st}$ ed.2010.
5. John David Jackson , *Classical Electrodynamics,* Wiley,3$^{rd}$ ed. 2007.

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**I B. Tech – I Sem.**

| L | T | P | C |
|---|---|---|---|
| 1 | - | 4 | 3 |

## (19ME0302) ENGINEERING GRAPHICS
### (Common to All Branches)

**COURSE OBJECTIVES**

The objectives of this course:

1. *Understand the importance graphics in engineering*
2. *To introduce the students to the "universal language of Engineers" for effective*
3. *Communication through drafting*
4. *Develop the graphical skills for communication of concepts, ideas and design of engineering products through engineering drawings.*
5. *Increase ability to take data and transform it into graphic drawings*
6. *To familiarize the students in basic concept of conic sections, projections and development of object.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Graphically construct and understand the importance of mathematical curves in engineering applications*
2. *Able to draw the basic views related to projections of Points, Lines and Planes*
3. *Able to draw the projections of geometrical solids and sectional view of solids*
4. *Understand the concept of projection and acquire visualization skills, development of surfaces and interpenetrations of solids*
5. *To draw multi view orthographic and other projections including isometric*

**UNIT – I**

**Introduction To Engineering Drawing:** Principles of Engineering Graphics and their significance - Usage of Drawing instruments – lettering - Conic sections - Cycloids and Involutes.

**UNIT – II**

**Projections of Points:** Principles of Orthographic Projections - Conventions - Projections of Points

**Projections Of Straight Lines:** Inclined to both the planes (Trapezoidal Method & Rotating line method) - Simple problems only - Traces

**Projections of Planes:** Surface inclined to both reference planes

**UNIT – III**

**Projections of Solids:** Introduction – Projections of right regular solids-Prisms, Pyramids in different positions. (Inclined to one plane only)

**Sections of Solids:** Sectional Views of Right regular Solids – Prisms - Pyramids.

## UNIT – IV

**Development Of Surfaces:** Development of surfaces of Right Regular Solids – Prisms -Pyramids.

**Interpenetration of Solids:** Cylinder to Cylinder - Prism to Prism - Cone to Cone (simple Problems Only

## UNIT – V

**Orthographic Projections:** Principles of Orthographic projection - Conversion of objects from 3D to 2D.

**Isometric Projections:** Principles of Isometric projection – Isometric Scale  -  Isometric Views - Conventions; Isometric Views of lines – Planes - Simple and compound Solids - Conversion of 2D to 3D.

## TEXT BOOKS

1. Basant Agarwal & CM Agarwal, *Engineering Drawing & Graphics*, Mcgraw Hill Education, 2013.
2. N.D.Bhatt, *Engineering Drawing*, Charotar Publishers, 2011.
3. K.L.Narayana, Kannaiah, *A text Book of Engineering Drawing*, Scitech Publishers, 2010.

## REFERENCES

1. K.Venugopal *A text Book of Engineering Drawing and Graphic*, New Age Publishing New Delhi, 2008.
2. P.J.Shah, *A Text Book of Engineering Graphics*, S.Chand & Company Ltd., New Delhi,2016
3. R.K.Dhawan, *A text book of Engineering Drawing*, S.Chand & Company Ltd., New Delhi, 2013.

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**I B. Tech – I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**(19CS0501) PYTHON PROGRAMMING**
**(Common to CSE and ECE)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Introduce Scripting Language*
2. *Exposure to various problem solving approaches of computer science*
3. *Introduce function-oriented programming paradigm*
4. *Exposure to solve the problems using object oriented concepts, exceptional handling*
5. *Exposure to solve the problems using Files, Regular Expressions and, Standard Libraries*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Solve the problems using control structures, input and output statements.*
2. *Summarize the features of lists, tuples, dictionaries, strings and files*
3. *Experience the usage of standard libraries, objects, and modules*
4. *Solve the problems using Object Oriented Programming Concepts*
5. *Build the software for real time applications using python*
6. *Install various Python packages*

**UNIT – I**

**Introduction:** History of Python- Python features- Applications-Programming Using the REPL-Running Python Scripts-Variables – Assignment- Keywords- Input-Output-Indentation.
**Data Types: Single-Value data types** - int, float, Complex and Boolean.
**Multi-Valued Data types** - Lists, Tuples, Sets, Dictionaries, Strings- indexing and slicing.

**UNIT – II**

**Operators and Expressions:** Operators-Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators- Expressions and order of evaluations
**Control Flow**: Branching- simple if, if-else, if-elif-else, nested if, looping-while and for-jumping – break- continue and pass

**UNIT – III**

**Functions:** Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions-Nested functions, Recursive functions- Scope of the Variables in a Function.
**Object Oriented Programming in Python:** Classes and Objects- self-variable- Methods – Constructor- Inheritance-polymorphism- Method Overloading- Method Overriding.

**UNIT – IV**

**Modules:** Creating modules, import statement, from...import statement and name spacing.

**Python packages**: Introduction to PIP- Installing Packages via PIP (Numpy, Pandas, MatPlotlib etc.,)-  Using Python Packages.

**Exception Handling:** Introduction to Errors and Exceptions, Handing Exceptions, Raising Exceptions, User Defined Exceptions, Regular Expressions-Searching and Matching.

**UNIT – V**

**Functional Programming:** Iterators and Generators - Maps and Filters.

**Files:** Text files- Reading and Writing files- Command line arguments.

**Brief Tour of the Standard Library:** Dates and Times- Data Compression- Python Runtime Services- Data Management and Object Persistence.

**GUI Programming** - Turtle Graphics

**TEXT BOOKS**
1. Reema Thareja, *Python Programming: Using Problem Solving Approach*, First Edition,  Oxford University Press.
2. Vamsi Kurama, *Python Programming: A Modern Approach,* Pearson.

**REFERENCES**
1. Mark Lutz , *Learning Python*, O Reily, 4th Edition, 2009.
2. Mark Lutz , *Programming Python* , O Reily, 4th Edition, 2010.
3. Tim Hall and J-P Stacey , *Python 3 for Absolute Beginners*, 2009.
4. Magnus Lie Hetland , *Beginning Python: From Novice to Professional*, 2nd Edition, 2009.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python,*1st Edition , Kindle.

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### (19HS0855) SEMICONDUCTOR PHYSICS LAB
### (Common to CSE & ECE)

## COURSE OBJECTIVES

The objectives of this course:

1. *Physics practical course is meant for making the students to gain practical knowledge to correlate with the theoretical studies. It covers experiments on principle of Mechanics and Optics, measurement of magnetic field and studying resonance using LCR circuit.*

## COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *To explore the application of Interference and Diffraction by doing concerned experiments.*
2. *Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.*
3. *To understand the concept of energy gap, B-H curve and resonance phenomena in LCR circuits.*
4. *Develop an ability to apply the knowledge of physics experiments in the later studies.*

**List of experiments from the following: (Perform any TEN experiments from the following)**

1. Determination of wavelengths of various colors of Mercury vapor lamp using Diffraction Grating – Normal Incidence method.
2. Determination of Dispersive power of prism.
3. Rigidity Modulus – Torsional Pendulum
4. Determination of thickness of thin object by wedge method.
5. Determination of radius of curvature of Plano convex lens – Newton"s Rings.
6. Determination of wavelength of a given laser source by using diffraction grating.
7. Determination of particle size (Lycopodium particles deposited on glass plates) using Laser source.
8. Determination of energy gap of a semi conductor using p – n junction diode.
9. B- H curve.
10. Magnetic field along the axis of current carrying coil – Stewart & Gee"s Method.
11. Determination of frequency of tuning fork - Melde"s Apparatus.
12. Determination of Spring constant – Coupled Oscillator.
13. Determination of di electric constant of dielectric material using charging and discharging of capacitor.
14. Determination of Numerical Aperture of an Optical fiber.
15. Measurement of resistance with varying temperature –Thermistor.

**TEXT BOOKS**

1. B.E.A. Saleh and M.C, Tech, *Fundamentals of photonics*, John Wiley & Sons.
2. K.Thyagarajan, *Engineering Physics*, MC GrawHill Education Private Ltd, New Delhi.

**REFERENCES**

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,2017
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University
3. R. Fitzpdricle, *Maxwell's equations and the principles of Electromagnetism*.
4. X .R. Fitzpdricle, *Classical Electrodynamics*.

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**(19CS0502) PYTHON PROGRAMMING LAB**
**(Common to CSE and ECE)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Exposure to various problem  solving approaches of computer science*
2. *Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.*
3. *Explore data-sets to create testable hypotheses and identify appropriate statistical tests.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Write, Test and Debug Python Programs*
2. *Implement Conditionals and Loops for Python Programs*
3. *Use functions and represent Compound data using Lists, Tuples and Dictionaries*
4. *Read and write data from & to files in Python and develop Application using Pygame*
5. *Build software for real needs.*
6. *Ability to work on a real life Project, implementing R Analytics to create  Business insights.*

**List of Experiments:**

1. Implement the following tasks
   a) Write a python program to check whether the number is positive or negative.
   b) Write a python program to find whether a given number is even or odd.
   c) Write a python program to find biggest number among three numbers.
2. Implement the following tasks
   a) Write a python program to displaying reversal of a number.
   b) Write a python program to print factorial of a number
   c) Write a python program to generate prime numbers series up to N
3. Implement following problems using python script
   a) Swapping of two numbers with and without using temporary variable.
   b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.
   c) Arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard.
4. Implement the following tasks
   a) Implement the python program to generate the multiplication table.
   b) Implement Python program to find sum of natural numbers
   c) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.

5. Implement the following tasks
   a) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the SISTK examination policy.
   b) Given a number x, determine whether it is Armstrong number or not.
      Hint: For example, 371 is an Armstrong number since $3**3 + 7**3 + 1**3 = 371$. Write a program to find all Armstrong number in the range of 0 and 999.

6. Implement the following tasks
   a) Write a Python script to
   1) create a list
   2) access elements from a list
   3) slice lists
   4) change or add elements to a list
   5) delete or remove elements from a list
   b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
   c) Write a Python script to compute the similarity between two lists.

7. Implement the following tasks
   a) Write a Python script to read set of values from a Tuple to perform various operations.
   b) Write a Python script to perform basic dictionary operations like insert, delete and Display.
   c) Write a Python program to count the occurrence of each word in a given sentence.

8. Implement the following tasks
   a) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
   b) Implement Python script to display power of given numbers using function.
   c) Implement a Python program that takes a list of words and returns the length of the longest one using function.

9. Implement the following tasks
   a) Implement Python program to perform various operations on string using string libraries.
   b) Implement Python program to remove punctuations from a given string.
   c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is "computer", your program should output "COMPUTER" without using library functions.

10. Implement the following tasks
    a) Implement Python program to capitalize each word in a string. For example, the entered sentence "god helps only people who work hard" to be converted as "God Helps Only People Who Work Hard"
    b) Write a Python script to display file contents.
    c) Write a Python script to copy file contents from one file to another.

11. Implement the following tasks

    a) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.

    b) Write a Python commands to perform the following directory operations.

       1) List Directories and Files

       2) Making a New Directory

       3) Renaming a Directory or a File

       4) Removing Directory or File

12. Implement the following tasks

    a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the init .py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.

    b) Write a python script to display following shapes using turtle.
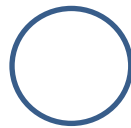
## TEXT BOOKS

1. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson
2. Reema Thareja, *Python Programming - Using Problem Solving Approach,* First Edition (English, Paperback), Oxford University Press.

## REFERENCES

1. Mark Lutz , *Learning Python*, O Reily, 4th Edition, 2009.
2. Mark Lutz , *Programming Python* , O Reily, 4th Edition, 2010.
3. Tim Hall and J-P Stacey , *Python 3 for Absolute Beginners*, 2009.
4. Magnus Lie Hetland , *Beginning Python: From Novice to Professional*, 2nd Edition, 2009.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python,* 1st Edition , Kindle.

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## (19ME0301) WORKSHOP PRACTICE LAB

**COURSE OBJECTIVES**

The objectives of this course:

1. *The course provides hands-on training in the trades of Carpentry, Fitting, House-wiring, Tin Smithy. Overview of metal cutting processes, plumbing is provided through live demonstrations.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Apply wood working skills in real world applications.*
2. *Build different parts with metal sheets in real world applications.*
3. *Apply fitting operation in various applications.*
4. *Apply different types of basic electric circuit connections.*
5. *Demonstrate soldering and brazing.*

## LIST OF EXPERIMENTS

**Carpentry:**

Familiarity with different types of woods and tools used in wood working and make following joints

    a)  T-Bridle joint
    b)  Corner Dovetail joint

**Sheet Metal Working:**

Familiarity with different types of tools used in sheet metal working,
Developments of following sheet metal job from GI sheets.

    a)  Tapered tray
    b)  Conical funnel

**Fitting:**

Familiarity with different types of tools used in fitting and do the following fitting exercises

    a)  Step Fitting
    b)  V-Fit

**Electrical Wiring:**

Familiarity with different types of basic electrical circuits and makes the following connections

    a)  Parallel and series
    b)  Two way switch
    c)  Go down lighting
    d)  Tube light
    e)  Three phase motor
    f)  Soldering of wires

**TEXT BOOKS**
1. V. Ramesh Babu, *Engineering Work shop practice for JNTU*, VRB Publishers Pvt. Ltd., 2009
2. P.Kannaiah & K.L.Narayana,*Work shop Manual*, SciTech Publishers, 2010

## Part B - IT WORKSHOP

**COURSE OBJECTIVES**

The objectives of this course:

> *1. To provide students with hands-on experience in basic hardware, productivity tools and basic operating system installations.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to
1. *Identify the basic computer peripherals.*
2. *Gain sufficient knowledge on assembling and disassembling a PC.*
3. *Learn the installation procedure of Windows and Linux OS.*
4. *Acquire knowledge on basic networking infrastructure.*
5. *Learn productivity tools like Word, Excel and Power point.*
6. *Acquire knowledge on basics of internet and worldwide web.*

**List of Experiments:**

**Task 1:**

Identification of the peripherals of a computer: To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

**Task 2:**

A practice on disassembling the components of a PC and assembling them.

**Task 3:**
1. Basic DOS commands, Installation of MS windows.
2. Basic Linux Commands, Installation of Linux.

**Task 4:**

Hardware Troubleshooting (Demonstration): Identification of a problem and fixing the solution (improper assembly or defective peripherals). Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues

**Productivity tools Task 5:**

1. **MS Word Orientation:** Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving
2. **Presentations:** Creating, opening, saving and running the presentations, selecting the

style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

3. **Spread sheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 6:**

**Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

**TEXT BOOKS**
1. Peter Norton ,*Introduction to Computers*, , McGraw Hill, 2001
2. Joan Lambert, Joyce Cox *, MOS study guide for word, Excel, Power point & amp; Outlook Exams*, , PHI. 2008

**REFERENCES**
1. ITL Education Solutions limited*, Introduction to Information  Technology*,Pearson Education.2009
2. Rusen ,*Networking your computers and devices*,PHI, 2009
3. Bigelows,*Trouble shooting, Maintaining & amp; Repairing PCs*, TMH, 2010

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## (19HS0801) APPLIED CHEMISTRY

**COURSE OBJECTIVES**

The objectives of this course:

1. *To familiarize engineering chemistry and its applications*
2. *To train the students on the principles and applications of electrochemistry and polymers*
3. *To introduce instrumental methods, molecular machines and switches*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Apply Nernst equation for calculating electrode and cell potentials, differentiate between pH metry, potentiometric and conductometric titrations, explain the theory of construction of battery and fuel cells, solve problems based on cell potential.*
2. *Apply Schrodinger wave equation to hydrogen and particle in a box, illustrate the molecular orbital energy level diagram of different molecular species, semiconductors and insulators discuss the magnetic behavior and colour of complexes.*
3. *Explain the different types of polymers and their applications, explain the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres, describe the mechanism of conduction in conducting polymers, discuss Buna-S and Buna-N elastomers and their applications.*
4. *Explain the different types of spectral series in electromagnetic spectrum, understand the principles of different analytical instruments, Explain the different applications of analytical instruments.*
5. *Explain the band theory of solids for conductors, semiconductors and insulators, explain supramolecular chemistry and self-assembly, demonstrate the application of Rotaxanes and Catenanes as artificial molecular machines*

**UNIT – I**

**ELECTROCHEMISTRY AND APPLICATIONS:** Electrochemical cell - Nernst equation, cell potential calculations and Numerical problems - Potentiometry - Potentiometric titrations (Redox titrations) - Conductometric titrations (Acid-Base titrations) - Photovoltaic cell – working and applications - Photogalvanic cells with specific examples - Electrochemical sensors - Potentiometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries - Secondary cells – Lead acid - Lithium ion cells (Rechargeable) - Fuel cells – Hydrogen – Oxygen – Methanol - Oxygen fuel cell – Working of the cells.

**UNIT – II**

**STRUCTURE AND BONDING MODELS:** Planck's quantum theory - Dual nature of matter - Schrodinger equation - Significance of $\Psi$ and $\Psi^2$ - Applications to hydrogen –

Particle in a box and their applications for conjugated molecules - Molecular Orbital Theory – bonding in Homo and Heteronuclear diatomic molecules – Energy level diagrams of $O_2$ and CO etc. $\pi$-molecular orbitals of Butadiene and Benzene - Calculation of bond order - Crystal field theory – salient features – Splitting in Octahedral and Tetrahedral - Geometry - Magnetic properties and colour - Band theory of solids – Band diagrams for conductors - Semiconductors and insulators - Role of doping on band structures.

## UNIT -III
**POLYMER CHEMISTRY:** Introduction to Polymers - Functionality of monomers - Nomenclature of polymers - Chain growth and Step growth polymerization - Coordination polymerization - Co-polymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.
**PLASTICS -** Thermoplastics and Thermosetting – Preparation - Properties and applications of – Bakelite - Nylon-6,6 - Carbon fibers - Elastomers – Buna-S, Buna-N– preparation - Properties and applications - Conducting polymers – Classification - Synthesis and applications.

## UNIT - IV
**INSTRUMENTAL METHODS AND APPLICATIONS:** Electromagnetic spectrum - **Absorption of radiation:** Beer-Lambert‟s law - Principle and applications of pH Metry – Potentiometry – Conductometry - UV-spectroscopy - IR and AAS - Principles of Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC) - Separation of gaseous mixtures and Liquid mixtures.

## UNIT - V
**ADVANCED ENGINEERING MATERIALS :** Concepts and terms of Supra molecular chemistry – Complementarity - Basic Lock and Key principle - Examples of Supra molecules - Applications of Supra molecules (sensors, catalysts, gas storage, medical and molecular switches) - Semiconducting and Super Conducting materials - Principles and some examples - **Electrical Insulators or Dielectric materials:** Definition and classification - Characteristics of electrical insulators and applications of electrical insulating materials - Super capacitors. **Nano chemistry**: Introduction - Classification of nano-materials properties and  applications of Fullerenes - Carbon nano-tubes.

**TEXT BOOKS**
1. K N Jayaveera, G V Subba Reddy and C. Ramachandraiah, *Engineering Chemistry*, McGraw Hill Higher Education, Forth Edition, New Delhi, 2019.
2. Jain and Jain, *A Text Book of Engineering Chemistry*, Dhanapathi Rai Publications, New Delhi, 2010.

**REFERENCES**
1. S.S Dhara, *A Text book of Engineering Chemistry,* S. Chand Publications, New Delhi, 2010.
2. K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, *Engineering Chemistry,* SCITECH Pubblications India Pvt Limited, 2015.
3. H.D. Gesser, *Applied Chemistry,* Springer International Edition, 2010.

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**(19HS0810) COMMUNICATIVE ENGLISH**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.*
2. *To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.*
3. *To help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.*
4. *To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.*
5. *To provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *To understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information.*
2. *To employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.*
3. *To Participate in informal discussions and speak clearly on a specific topic or in general.*
4. *To Comprehend, discuss and respond to academic texts and use appropriate language for description and interpretation in writing*
5. *To form sentences using proper grammatical structures and correct word forms.*

**UNIT – I**
**Part-1**
**Listening:** Identifying the topic, the context and specific pieces of information by listening to Short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home – Family - Work - Studies and interests - Introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Beginnings and endings of paragraphs - introducing the topic, Letter writing. **Grammar and Vocabulary:** Parts of speech - Singular and plural; Basic sentence structures; simple question form - wh-questions - word order in sentences and Content words
**Part-2**
*Half a Rupee Worth* by R K Narayan from Engage with English.

## UNIT – II
**Part-1**

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Mechanics of writing - punctuations **Grammar and Vocabulary:** Cohesive devices – Linkers - Sign posts and transition signals - Use of articles and zero article – Prepositions and function words

**Part-2**

*The Thakur's Well* by Premchand from Paths to Skills in English.


## UNIT – III
**Part-1**

**Listening:** Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences - Recognizing and interpreting specific context clues;- Strategies to use text clues for comprehension. **Writing:** Summarizing Report Writing. **Grammar and Vocabulary:** Verbs – Tenses-Subject-Verb agreement - Direct and indirect speech - Reporting verbs for academic purposes and word forms

**Part-2**

*I am not that Woman* by Kishwar Naheed from Engage with English.


## UNIT – IV
**Part-1**

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Conversational English in academic contexts (formal and informal). **Reading:** Studying the use of graphic elements in texts to convey information - Reveal trends/patterns/relationships - Communicate processes or display complicated data. **Writing:** Information transfer **Grammar and Vocabulary:** Quantifying expressions - Adjectives and adverbs; Comparing and Contrasting - Degrees of comparison - Use of synonyms and antonyms.

**Part-2**

*What is my name?* By Sathyavathi from Paths to Skills in English.

## UNIT – V
**Part-1**

**Listening:** Identifying key terms. **Speaking:** Formal oral presentations on topics from academic contexts - Without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts – Identifying and correcting common errors in grammar and usage (Articles – Prepositions – Tenses - Subject verb agreement).

**Part-2**

The Power of Prayer by A P J Abdul Kalam from Paths to Skills in English.

**TEXT BOOKS**

1. Board of Editors *Engage with English* Orient Blackswan First Edition, 2016
2. Prof. G.M. Sundaravalli & A.S.Kamalakar *Paths to Skills in English* Orient Blackswan, First Edition, 2015.

**REFERENCES**

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. Eric H.Glendinning & Beverly Holmström *Study Reading: A Course in Reading Skills for Academic Purposes* Cambridge University Press; 2 edition, 14 October 2004.

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### (19HS0835) PROBABILITY & STATISTICS

**COURSE OBJECTIVES**

The objectives of this course:

1. *To train the students thoroughly in Mathematical concepts fundamentals of probability, test of hypothesis, Test of significance.*
2. *To prepare students for lifelong learning and successful careers using mathematical Concepts of probability test of hypothesis, Test of significance.*
3. *To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to Synthesize information*

**COURSE OUTCOMES (COs)**

After completion of this course, a successful student will be able to

1. *Have acquired ability to participate effectively in group discussions*
2. *Have developed ability in writing in various contexts*
3. *Have acquired a proper level of competence for employability*
4. *To understand the basic notions of discrete and continuous probability.*
5. *To understand the methods of statistical inference and the role that sampling distributions play in those methods.*

**UNIT – I**
**Probability:** Sample spaces and Events - Definition of probability - Addition theorem - Conditional probability - Independence - Baye's theorem.
**Random variables**: Discrete and Continuous random variables - Probability distribution functions – properties - Expectation of Discrete - Continuous random variables.

**UNIT - II**
**Probability Distributions:** Binomial distribution – Poisson distribution - Normal distributions - Mean and Variance of Binomial – Poisson - Normal distributions - Related problems.

**UNIT - III**
**Basic Statistics:** Measures of Central tendency (Mean, Median & Mode) – Moments – Skewness – Kurtosis - Correlation – Regression – Rank correlation.

**UNIT- IV**
**Curve fitting**: Curve fitting by the method of least squares - Fitting of straight lines - Second degree parabolas - More general curves (Exponential & Power curve).
**Test of Hypothesis**: Large sample test for single proportion – Difference of proportions - Single mean - Difference of means.

**UNIT - V**

**Tests of significance of Small Samples:** t-test for single mean - Difference of means - F-test - Chi-square test for goodness of fit and Independence of attributes

**TEXT BOOKS**
1. B.S. Grewal, *Higher Engineering Mathematics,* Khanna Publishers, 42$^{nd}$ Edition,2015
2. T.K.V. Iyengar, *Probability & Statistics*, S.Chand publications, Fourth revised Edition, 2012.

**REFERENCES**
1. S.P. Gupta, *Statistical methods,* Sultan publications, Thirty four Reprint Edition, 2006.
2. Dr. Shahnaz Bathul, *Probability and Statistics,* Unitech Series, 2005-2006.
3. E. Rukmangadachari, *Probability and Statistics*, Pearson Publication, 2015.
4. G.S.S. Bhishma Rao, *Probability and Statistics,* SCI Tech, 3$^{rd}$ Edition, 2007
5. K. Murugesan, *Probability, Statistics and Random Process,* Anuradha Publication, 2000

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## (19EE0240) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the nature of different circuit elements, fundamental laws and network Theorems.*
2. *Understand the operation of dc machines and single phase transformers.*
3. *Understand the characteristics of the p-n junction diode.*
4. *Understand the characteristics of the p-n junction diode.*
5. *Understand the characteristics of BJT, FET, MOSFET and characteristics of special purpose electronic devices*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Determine the equivalent impedance of given network by using network reduction techniques.*
2. *Determine the current through any element and voltage across any element*
3. *Apply the network theorems suitably.*
4. *Analyze the operating principles of motor and transformer.*
5. *Analyze the operating principles of major electronic devices, its characteristics and applications.*
6. *Design and analyze the DC bias circuitry of BJT and FET.*

### PART-A

**UNIT – I**

**INTRODUCTION TO ELECTRICAL ENGINEERING:** Ohm‚s Law - Basic Circuit Components - Kirchhoff‚s Laws - Types of Sources - Resistive Networks, Inductive Networks, Capacitive Networks - Series Parallel Circuits, Star Delta and Delta Star Transformation - Principle of AC Voltages - Root Mean Square and Average Values of Alternating Currents and Voltage - Form Factor and Peak Factor.

**UNIT – II**

**NETWORK THEOREMS:** Thevenin‚s - Norton‚s - Maximum Power Transfer - Reciprocity and Superposition Theorems for DC Excitations.

**TWO PORT NETWORKS:** Two Port Network Parameters – Impedance – Admittance – Transmission and Hybrid Parameters and their Relations.

**UNIT – III**

**DC Motors:** Principle of Operation of DC Motors - Types of DC Motors - Torque Equation - Losses and Efficiency calculation in DC Motor - Applications.

**Transformers:** Principles of Operation - EMF equation - Losses and Efficiency - Regulation of Transformer.

**PART-B**

**UNIT-I**

**SEMICONDUCTOR DEVICES:** Intrinsic Semiconductors - Electron-Hole Pair Generation - Conduction in Intrinsic Semiconductors - Extrinsic Semiconductors-N-Type and P-Type Semiconductors - Comparison of N-Type and P-Type Semiconductors - The p-n Junction – Drift and Diffusion Currents - The p-n Junction Diode-Forward Bias Reverse Bias - Volt- - Ampere Characteristics - Diode Specifications - Applications of Diode - Diode as a Switch. Diode as a Rectifier - Half-wave Rectifier - Full-Wave Rectifier - Full-Wave Bridge Rectifier - Rectifiers with Filters - Zener Diode-Volt-Ampere Characteristics - Zener Diode as Voltage Regulator.

**UNIT – II**

**BJT:** Bipolar Junction Transistor (BJT) – Types of Transistors, Operation of npn and pnp Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations - Relation between IC, IB and IE - Transistor Biasing- Fixed Bias - Transistor Applications- Transistor as an Amplifier - Transistor as a Switch.

**UNIT – III**

**JFET & MOSFET**: Junction Field Effect Transistor (JFET) - Theory and Operation of JFET
- Output Characteristics - Transfer Characteristics - Configurations of JFET-CD, CS and CG Configurations - JFET Applications - JFET as an Amplifier - JFET as a Switch - Comparison of BJT and JFET – MOSFET - Static Characteristics of MOSFET - Applications of MOSFET.

**TEXT BOOKS**
   1. M.S. Naidu and S. Kamakshiah, *Basic Electrical Engineering* ,TMH,2011
   2. T.K. Nagasarkar and M.S. Sukhija, *Basic Electrical Engineering*, Oxford University Press, 2005.

**REFERENCES**
   1. D.P. Kothari & I.J. Nagrath, *Theory and Problems of Basic Electrical Engineering*, PHI,2009
   2. V. K Mehta, *Principles of Electrical Engineering*, S. Chand Publications,2011
   3. T. Thyagarajan, *Fundamentals of Electrical Electronics Engineering*, SCITECH Publications 5th Edition , 2007.
   4. Hughes, *Electrical and Electronic Technology*, Pearson Education, 2012.

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**(19CS0503) DIGITAL LOGIC DESIGN**

**COURSE OBJECTIVES**
The objectives of this course:
1. *To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.*
2. *To prepare students to perform the analysis and design of various digital electrnic circuits.*

**COURSE OUTCOMES (COs)**
On successful completion of this course, the student will be able to
1. *Understand the working of logic families and logic gates.*
2. *Design and implement Combinational and Sequential logic circuits.*
3. *Understand the process of Analog to Digital conversion and Digital to Analog conversion.*
4. *Design and develop sequential logic circuits*
5. *Use PLDs to implement the given logical problem.*

**UNIT- I**
**Binary systems and Boolean algebra:** Digital Systems - Binary Numbers - Number Base Conversions - Octal and Hexa decimal Numbers – Complements - Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Axiomatic Definition of Boolean Algebra - Basic Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates.

**UNIT- II**
**Gate–Level Minimization:** The Map Method - Four Variable Map - Five-Variable Map - Product of Sums Simplification - Don,,t-Care Conditions - NAND and NOR Implementation - Other Two Level Implementations - EX-OR Function - Tabular Minimization method.

**UNIT- III**
**Combinational Logic:** Combinational Circuits - Analysis Procedure - Design Procedure - Binary Adder - Subtractor - Decimal Adder-Binary Multiplier - Magnitude Comparator -Decoders-Encoders – Multiplexers - De-Multiplexers.

**UNIT- IV**

**Synchronous Sequential Logic**: Sequential Circuits – Latches - Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure – Registers - Shift Registers - Ripple counters - Synchronous counters - Ring Counter and Johnson Counter.

**UNIT- V**

**Memory And Programmable Logic**: Random access memory - Memory decoding - Error Detection and Correction - Read-only Memory - Programmable Logic Array - Programmable Array Logic - Sequential Programmable Devices - Integrated circuits.

**TEXT BOOKS**

1. M.Morris Mano, Micheal D.Ciletti, *Digital Design*, 5th Edition, 2013, Pearson.

**REFERENCES**

1. David J. Comer, *Digital Logic & State Machine Design*, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
2. R.D.Sudhakar Samuel*, Digital Logic Design*, Elsevier
3. Roth, Fundamentals of Logic Design, 5/e, Cengage.
4. M.Morris Mano, *Digital Logic and Computer Design*, Paper Back, Pearson Education, 2016.
5. A.P.Godse, D.A.Godse, *Digital Logic Design*, Technical Publications Pune, 2009.

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## (19HS0803) APPLIED CHEMISTRY LAB

**COURSE OBJECTIVES**

The objectives of this course:
1. *Verify the fundamental concepts with experiments.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to
1. *Determine the cell constant and conductance of solutions*
2. *Prepare advanced polymer materials*
3. *Estimate the Iron and Calcium in cement*
4. *Calculate the hardness of water*

**List of Experiments**
1. Conductometric Titration of Strong acid vs Strong base
2. Conductometric Titration of Weak acid vs. Strong base
3. Determination of Hardness of a Groundwater sample.
4. pH metric titration of Strong acid vs. Strong base,
5. Potentiometry - Determination of Redox potentials and emfs
6. Determination of Strength of an Acid in Pb-Acid battery
7. Preparation of a Polymer
8. Determination of viscosity of an oil by Redwood viscometer .
9. Determination of percentage of Iron in Cement sample by Colorimetry
10. Estimation of Calcium in Port land Cement
11. Adsorption of Acetic acid by Charcoal
12. Determination of Percentage Moisture content in a Coal sample

**TEXT BOOKS**
1. J. Mendham et al, *Vogel's Text book of Quantitative Chemical Analysis,* Pearson Education, Sixth Edition, 2002.
2. Chandra Sekhar, G.V. Subba Reddy and Jayaveera, *Chemistry Practical – Lab Manual,*
   McGraw Hill Higher Education, 2015.

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**(19HS0811) COMMUNICATIVE ENGLISH LAB**
**(Common to All Branches of Engineering, MBA & MCA)**

**COURSE OBJECTIVES**
The objectives of this course:
1. *Students will be exposed to a variety of self instructional, learner friendly modes of language learning.*
2. *Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.*
3. *Students will learn better pronunciation through stress, intonation and rhythm.*
4. *Students will be trained to use language effectively to face interviews, group discussions, public speaking.*
5. *Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.*

**COURSE OUTCOMES (COs)**
On successful completion of this course, the student will be able to
1. *Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.*
4. *Evaluate and exhibit acceptable etiquette essential in social and professional Settings.*
5. *Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.*

**UNIT – I**
**Part-1**
Introduction to Phonetics
**Part-2**
Word Stress- Intonation

**UNIT – II**
**Part-1**
JAM - Oral Presentation

**Part-2**
Describing objects/places/persons- Minutes of Meeting

**UNIT – III**
**Part-1**
Situational dialogues – Greeting and Introduction - Telephonic Conversations
**Part-2**
Book Review-Report Writing

**UNIT – IV**
**Part-1**
Non-verbal Communication – Dumb Charade
**Part-2**
Debate/Group Discussion- Movie Review- Reading Comprehension.

**UNIT – V**
**Part-1**
Information Transfer
**Part-2**
Job Application and Resume Writing - Interview Skills

**Suggested Software:**
Walden InfoTech Software.

**TEXT BOOKS**
1. T. Balasubramanian, *A Textbook of English Phonetics for Indian Students,* Second Edition , Mc Millian, 2012.
2. *A Course in Phonetics and spoken English*, DhamijaSethi, Prentice-hall of India Pvt. Ltd, 2000.

**REFERENCES**
1. Krishna Mohan & NP Singh, *Speaking English Effectively,* second Edition 2011 (Mcmillian).
2. E.Sureshkumar , P.Sreehari, *A Hand Book of English Laboratories,* Foundation books, 2011.
3. M Ashraf Rizvi, *Effective Technical Communication* McGraw Hill Education; Second edition (27 July 2017)

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### (19HS0817) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
### (NON-CREDIT COURSE)

**COURSE OBJECTIVES**

The objectives of this course:

1. *The course aims at imparting basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.*

2. *The course focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Ability to understand, connect up and explain basics of Indian traditional Knowledge in modern scientific perspective.*

**UNIT-I**

Basic structure of Indian Knowledge System: Astadash Vidya- 4 ved 4 Upaved (Ayurved – Dhanurved - Gandharva Ved & Sthapthya Adi.,)

**UNIT-II**

6 Vedanga (Shisha – Kalppa – Nirukha – Vykaran - Jyothish & Chand) Upanga (Dharma Shastra – Meemamsa - Purana & Tharka Shastra)

**UNIT-III**

Modern Science and Indian Knowledge System - Yoga and Holistic Health care - Case studies

**UNIT-IV**

Philosophical Tradition (Sarvadarshan) Nyaya - Vyshepec - Sankhya – Yoga –Meemamsa – Vedanth – Chavanka - Jain & Boudh.
Indian Linguistic Tradition – (Phonology – Morphology - Syntax and semantics).

**UNIT-V**

Indian Artistic Tradition - Chitra kala - Moorthi kala - Vasthu kala – Sthapthya – Sangeetha - Nruthya Yevam Sahithya - Case studies

**TEXT BOOKS**

1. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan Fritzof Capra, Tao of Physics

**REFERENCES**

1. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam
2. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
3. RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi Prakashan, Delhi 2016
4. P B Sharma (English translation), Shodashang Hridayan
5. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
6. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan Fritzof Capra, The Wave of life

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## (19EC0421) MICROPROCESSORS AND MICROCONTROLLERS

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the basic architecture of computer, evolution, and its applications*
2. *To learn the architectures of Microprocessor and Microcontroller*
3. *To learn the programming of Microprocessors and Microcontrollers using their programming model*
4. *To learn the interfacing of memory, I/O, sensors and actuators to microprocessors and microcontrollers*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Understand the evolution of computers, processors, and its applications*
2. *Explain the various software and hardware parts of a microprocessors and computer*
3. *Understand the architectures of 8085 microprocessor and 8051 microcontroller system*
4. *Analyze the programming model of 8085 Microprocessor & 8051 microcontroller development environment.*
5. *Implement the techniques of interfacing memories, various I/O devices, sensors and actuators with microprocessor and microcontrollers*
6. *Design and develop various microprocessor/microcontroller-based systems for the real-life problems*

**UNIT – I**

**Microprocessors, Microcomputers and Assembly Language:** Microprocessors – Microprocessor instruction set and computer languages – From large computers to single chip microcontrollers – Application: Microprocessor controlled temperature system (MCTS)

**Microprocessor Architecture and Microcomputer Systems:** Microprocessor Architecture and its operation – Memory – Input and output devices – Example of a microcomputer system

**UNIT – II**

**8085 Microprocessor Architecture**: The 8085 MPU - The 8085 Microprocessor, Microprocessor communication and bus timings, Demultiplexing the bus AD7-AD0, Generating control signals and A detailed look at the 8085 MPU and its architecture– Instruction, Data format and Data Storage – Overview of the 8085 Instruction set .

**UNIT – III**
**The 8051 Architecture:** Introduction – 8051 microcontroller hardware – Input/output pins, ports and circuits – External memory – Counters and timers – Serial data input/output - Interrupts

**UNIT – IV**
**Programming the 8051:** Addressing modes - Moving data – Logical operations – Arithmetic operations – Jump and call instructions

**UNIT – V**
**Applications:** Introduction – Keyboards – Displays – D/A and A/D Conversion - Multiple interrupts

**TEXT BOOKS**
1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organization,* McGraw Hill Eductaion Pvt. Ltd, 5th Edition, 2017.
2. Ramesh Gaonkar, *Microprocessor Architecture, programming and applications with the 8085,* Penram International Publications Pvt Ltd. 6th Edition, 2015.
3. Kenneth J Ayala, *The 8051 microcontroller,* Penram International Publications Pvt Ltd, 2nd Edition, 1997.

**REFERENCES**
1. Ray Bhurchandi, *Advanced Microprocessors & Peripheral interfacing*, MC graw hill Publications, 3rd edition, 2012.
2. N.Senthil Kumar, M.Saravanan, S.Jeevanathan, *Microprocessor and Microcontrollers,* Oxford Publishers. 1st Edition, 2015.

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## (19CS0504) COMPUTER ORGANIZATION & ARCHITECTURE

**COURSE OBJECTIVES**

The objectives of this course:

1.  *Explain the fundamentals of computer organization and its relevance to classical and Modern problems of computer design*
2.  *Make the students understand the structure and behaviour of various functional modules of a computer.*
3.  *Understand the techniques that computers use to communicate with I/O devices.*
4.  *Illustrate the concepts of pipelining and the way it can speed up processing.*
5.  *Understand the basic characteristics of multiprocessors*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1.  *Understand the CPU design and computer arithmetic*
2.  *Understand the design of control unit*
3.  *Understand the memory hierarchy and its impact of cost and performance.*
4.  *Discuss hardware requirements for cache memory and virtual memory.*
5.  *Design algorithms to exploit pipelining and multiprocessors*
6.  *Use memory and I/O devices effectively*

**UNIT- I**
**Basic Structure of Computers:** Functional Units, Basic Operational Concepts, Basic I/O Operations, Bus Structures, Instruction Cycle, Data Transfer, Data Manipulation and Program Control**,** Addressing Modes.

**UNIT- II**
**Data Representation:** Signed number representation, fixed and floating point representations, Character representation.
**Computer Arithmetic**: Integer addition and subtraction, Multiplication – shift and add, Booth multiplication, Signed operand multiplication, Division, Floating point arithmetic.

**UNIT- III**
**Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers: Arithmetic Micro operations, Logic Micro operations, Shift Micro operations.
**CPU control unit design**: Hardwired control, Micro-programmed control, Address Sequencing.

**UNIT- IV**
**Memory Organization:** Concept of hierarchical memory organization, Semiconductor memory technologies, Cache memory, Virtual memory, Auxiliary memory, Direct Memory Access(DMA).

**UNIT- V**
**Pipelining**: Basic concepts of pipelining, Arithmetic pipeline, Instruction pipeline, Instruction Hazards.
**Parallel Processors**: Introduction to parallel processors, Multiprocessor, Interconnection structures and Cache coherency.

**TEXT BOOKS**
1. David A. Patterson and John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface,* Fifth Edition, 2014.
2. Carl Hamacher, Zvonko Vranesic, SafwatZaky and Naraig Manjikian, *Computer Organization and Embedded Systems,* Sixth Edition*,* McGraw Hill Education, 2012.

**REFERENCES**
1. Carl Hamacher, ZvonkoVranesic, and SafwatZaky, *Computer Organization*, Fifth Edition, McGraw Hill Education,2011.
2. John P. Hayes, *Computer Architecture and Organization*, Third Edition, McGraw Hill Education,2017.
3. M.Morris Manno, *Computer System Architecture*, Third Edition, Pearson,2017.

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(**19CS0505**) **C and DATA STRUCTURES**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Teach the syntax and semantics of a C Programming language*
2. *Demonstrate the use of Control structures of C Programming language*
3. *Illustrate the methodology for solving Computational problems*
4. *Explain the approach to algorithm analysis*
5. *Introduce different data structures for solving the problems*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Recognize the programming elements of C Programming language*
2. *Select the control structure for solving the problem*
3. *Apply modular approach for solving the problem*
4. *Solve mathematical problems using C Programming language*
5. *Develop the applications using stacks and queues*
6. *Construct the linked lists for various applications and perform sorting techniques*

**UNIT- I**

**Introduction to C Language** - C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Expressions, Precedence and Associativity, Operators , Type Conversions, Decision Statements ,Loop Control Statements, Other Related Statements .

**UNIT- II**

**Arrays** - Declaring and Referencing Arrays, Array Subscripts, Using Array Elements as Function Arguments, Arrays Arguments, Multidimensional Arrays.
**Functions** - Library Functions, Communications among Functions, Scope, Storage Classes, Type Qualifiers, Recursion , Preprocessor Commands.
**Strings** - String Basics, String Library Functions, Pointers and Strings.

**UNIT- III**

**Pointers** - Pointer Declaration, Pointers and Arrays,  Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Pointer to Functions.
**Structure and Union** –  Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structure, Structure and Functions, typedef, Bit Fields, Enumerated Data Type, Union, Union of Structures.

## UNIT- IV

**Data Structures** - Overview of Data Structure, Types of data structures, Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks. Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.

## UNIT- V

**Linked List** -Single linked list, Circular linked list, Double linked list, Circular Double linked list, Applications of linked lists.

**Searching & Sorting:**

Linear Search, Binary Search, Exchange Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort.

## TEXT BOOKS

1. J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, *Programming in C and Data Structures*, Pearson Education.
2. B.A.Forouzan and R.F. Gilberg, *C Programming & Data Structures*, Third Edition, Cengage Learning.

## REFERENCES

1. Stephen G. Kochan, *Programming in C*, III Edition, Pearson Education.
2. J.A. Jones & K. Harrow, *C Programming with problem solving*, Dreamtech Press.
3. Dr.N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand, *C and Data Structures, a snapshot oriented treatise with live engineering examples*.
4. E.Balaguruswamy, *C and Data Structures* , Tata Mc Graw Hill
5. A.M.Tanenbaum, Y.Langsam, and  M.J.Augenstein, *Data Structures using C,* Pearson Education / PHI, Eighth Edition.

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### (19CS0506)  DATABASE MANAGEMENT SYSTEMS

**COURSE OBJECTIVES**

The objectives of this course:

1. *Explain the different issues involved in the design and implementation of a database system.*
2. *Illustrate the physical and logical database designs, database modelling, relational, hierarchical, and network models*
3. *Explain data manipulation language to query, update, and manage a database*
4. *Build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Develop relational algebra expressions for queries and optimize them.*
2. *Design the databases using E_R method for a given specification of requirements.*
3. *Apply Normalization techniques on given database.*
4. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
5. *Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.*
6. *Understand Physical Storage Media and RAID concepts.*

**UNIT- I**

**Introduction:** Database System Applications, Purpose of Database Systems, View of Data, Data Abstraction, Data Independence, Data Models, Database Languages, Database Architecture, Database Users and Administrators.

**Introduction to Data base design:** ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets.

**UNIT- II**

**Relational Algebra and Calculus:** Relational Algebra - Selection and Projection, Set operations, Renaming, Joins.

**Form of Basic SQL Query** - Examples of Basic SQL Queries, Introduction to Nested queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values.

**UNIT- III**

**Introduction to Schema Refinement**- Problems Caused by redundancy, Functional Dependencies, Normal Forms - FIRST, SECOND, THIRD Normal forms – BCNF.

**Properties of Decompositions:** Lossless join Decomposition, Dependency preserving Decomposition - FOURTH Normal Form, FIFTH Normal form.

**UNIT- IV**

**Transaction and Concurrency:** Transaction Concepts – ACID Properties –Transactions and Schedules- Transaction States - Concurrent Execution, Serializability - Types of Failures.

**UNIT- V**

**Recoverability**: System Recovery – Media Recovery –Two Phase locking – Deadlock- Detection, Recovery and Prevention.

**Physical Storage and Database Concepts:** Overview of Physical Storage Media and RAID.

**TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, *Database System Concepts*, Sixth Edition, Tata McGraw Hill, 2011.

**REFERENCES**

1. RamezElmasri and Shamkant, B. Navathe, *Fundamentals of Database Systems*, Fifth Edition, Pearson Education, 2008.
2. Raghurama Krishnan, Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGrawHill Education, 2003.
3. J. D. Ullman, *Principles of Database and Knowledge – Base Systems*, Computer Science Press.
4. Peter Rob & Carlos Coronel, *Database Systems Concepts*, Cengage Learning2008.
5. C.J. Date, *Introduction to Database Systems*, Pearson Education.

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**(19CE0136) WATER TECHNOLOGY**
**(OPEN ELECTIVE-I)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To develop a student's skill in evaluating the performance of water treatment plants*
2. *Communicate the importance of conserving water*
3. *Outline the strategies for reducing water consumption*
4. *To minimize the risks of floods, droughts and landslides.*
5. *To develop rural areas in the region with clear plans for improving the economy of the regions.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Underline the importance of water and describe the mechanism of hydrological cycle*
2. *Describe various elements associate with public water supply*
3. *Describe water quality criteria and standards, and their relation to public health*
4. *Recognize the cause of water pollution and influence of climatic changes on water resources*
5. *Summarize various water conservation techniques in practice*
6. *Explain need for watershed management and implement various Plans for watershed management*

**UNIT-I**

**Water Demand and Sources of Water:** Water demand -Types of water demands- Percapita Demand- Factors affecting the percapita demand–Water cycle-Sources of water-Surface and subsurface sources-Factors governing the selection of source of water - Water deficiency-Water crisis

**Introduction to Water Supply**: Importance and Necessity of protected water supply systems-Objectives of protected water supply system- Flow chart of public water supply system.

**UNIT-II**

**Water Quality:** Requirement of water for domestic use-Impurities in water- Characteristics of water-Water quality standards – Flow chart of basic treatment process- Latest treatment process- Membrane filtration-Reverse process- Desalination process.

**UNIT-III**

**Water Pollution**: Surface water pollution – Causes - Remedial measures – Ground water pollution – Causes - Remedial measures

**Climatic Changes on Water Resources:** Impact of climatic changes on water resources-

Droughts- Extreme Precipitation- Melting Glaciers and Snow Drought- Greenhouse Gas emissions- Algal blooms

## UNIT-IV
**Water Conservation:** Definition – Rain-water harvesting– Advantages of implementing the rain-water harvesting–Components of roof top rain-Water harvesting-Techniques in rain water harvesting–Catchment harvesting-Check dams-Farmponds-Percolation tank-Ground water recharge- Ground water recharge structures

## UNIT-V
**Watershed Management:** Definition –Concept of Watershed Management-Need for watershed management- Objectives of watershed management-Characteristics of watershed – Planning of watershed management

## TEXTBOOKS
1. Modi, P.N., *Water Supply & Waste Water Engineering, Vol. I & II*, Standard Book House, New Delhi, 2010.
2. J.V.S.Murty.,*Watershed Management*, New Age International Publications, New Delhi,2017.

## REFERENCES
1. Garg, S.K., *Environmental Engineering Vol.I& II*, Khanna Publishers, New Delhi, 2015.
2. Madan Mohan Das, Mimi Das Saikia, *Watershed Management*, PHI Learning Pvt. Ltd., Delhi, 2012.
3. Ghanshyam Das, *Hydrology and Soil Conservation Engineering: Including Watershed Management*, PHI Learning Pvt. Ltd., Delhi.
4. https://theberkey.com/pages/a-guide-to-water-conservation
   https://blog.mygov.in/water-conservation-rainwater-harvesting/
   https://theconstructor.org/water-resources/methods-rainwater-harvesting/5420/
5. Links for "Climatic Changes on Water Resources"
   https://ascelibrary.org/doi/10.1061/%28ASCE%29EE.1943-7870.0001394
   https://www.watercalculator.org/footprint/climate-change-water-resources/
   https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-water-resources.html

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## (19EE0238) GENERATION OF ENERGY THROUGH WASTE
### (OPEN ELECTIVE-I)

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand different types of waste as fuel*
2. *To introduce Pyrolysis methods and conversion processes*
3. *To understand gasification methods for biomass*
4. *To learn concepts of biomass resources, combustion types and biogas plant technology*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Analyse agro based, forest residue and industrial waste conversion processes.*
2. *Manufacture of Pyrolytic oils and gases*
3. *Manufacture of charcoal, yields and applications*
4. *Understand various types of gasifiers operation*
5. *Understand inclined and fluidized bed combustors operation*
6. *Understand types of biogas plants and biomass energy programme in India*

**UNIT- I**

**Introduction to Energy from waste:** Classification of waste as fuel –Agro based- Forest residue- Industrial waste- MSW- conversion devices- Incinerators- Gasifiers - Digestors.

**UNIT- II**

**Bio-mass Pyrolysis:** Pyrolysis- Types- Slow-Fast- Manufacture of Charcoal- methods- yields and application. Manufacture of Pyrolytic oils and gases – yields and applications.

**UNIT- III**

**Biomass Gasification:** Gasifiers- Fixed bed system- Downdraft and Updraft gasifiers- Fluidized bed gasifiers - construction and operation- Gasifier burner arrangement for thermal heating.

**UNIT- IV**

**Biomass Combustion:** Biomass stoves- Types- Inclined combustors- Fluidized bed combustors- construction and operation of above biomass combustors.

**UNIT- V**

**Properties of Biogas:** Biogas plant Technology and status – Biomass resources and their classification- Biomass conversion processes- thermo chemical conversion – Direct

Combustion- Biomass gasification- Pyrolysis and liquefaction – bio-chemical conversion- anaerobic digestion- Types of biogas plants- applications-Biomass Energy Programme in India.

**TEXT BOOKS**
1. Desai Ashok V, *Non-Conventional Energy*, Wiley Eastern Ltd 1990.
2. Khandelwal K.C. and Mahdi SS, *Biogas Technology – A Practical Hand Book* , Vol I & II, Tata Mc Graw Hill Publishing Co Ltd.,1983.

**REFERENCES**
1. Challal D.S., *Food, Feed and Fuel from Biomass,* IBH Publishing Co Pvt Ltd.,1991.
2. GD Roy, *Non-conventional Energy Sources*, Khanna Publishers, 6th Edition
3. Khahid Rehman Hekeem, Mohammad Jawald., Umar Rashid, *Biomass & Bioenergy*, Springer International Publishing Ltd.

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**(19ME0349) FUNDAMENTALS OF MECHANICAL ENGINEERING**
**(OPEN ELECTIVE-I)**

**COURSE OBJECTIVES**

Objective of this course is to:

1. *Impart knowledge on Engineering materials, alloying and Heat treatment.*
2. *Familiarize student with IC Engines and Air compressors.*
3. *Make the student learn about a Refrigeration& Air conditioning systems and working of various Power plants*
4. *Enable the student to know about Modern Machining processes.*
5. *Make the student understand about Robotics and computer aided drafting, manufacturing, quality control.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *List the types of Engineering materials and also describe alloying, Heat treatment Processes.*
2. *Recognize the importance of IC Engines in automobiles and the classification of air compressors*
3. *Distinguish various types of air conditioning systems for house and Industrial applications*
4. *Explicate the working of various Power plants like nuclear, Hydro & thermal power plants*
5. *Classify various types modern machining processes and determine the best suitable process to machine a component.*
6. *Apply the working principles of CAD, CAM and CIM in the operation of Robotic manufacturing and quality control systems*

**UNIT-I**

**Engineering Materials**: Classification of Materials - Engineering properties of Materials, Necessity of alloying – Applications.

**Heat Treatment of Alloys**: Annealing - Normalizing – Hardening- Tempering- Surface hardening methods

**UNIT-II**

**I.C. Engines-** Definition of Engine and Heat Engine, I.C Engine Classification –Parts of an IC Engine, Working of Two Stroke & Four Stroke Engines.

**Air Compressors:** Reciprocating & Rotary Compressor - Types –Working.

**UNIT-III**
**Refrigeration:** Introduction to Refrigeration- Classifications of Refrigeration systems- Vapour compression and Vapour absorption systems.
**Air conditioning:** Introduction to Air conditioning - Classifications of Air conditioning systems-window air conditioning system, split conditioning system, Central air conditioning system.

**UNIT-IV**
**Modern Machining:** Traditional machining versus modern machining methods- Need of modern machining process – Classifications - Process selection, Materials, and applications, Ultrasonic Machining, Water Jet Machining, Abrasive Water Jet Machining.

**UNIT-V**
**CAD/CAM**: Role of computers in manufacturing– CAD, CAM, CIM, Computer aided quality control- Inspection Methods-Advantages & Applications.
**Robotics**: Robot-Necessity of Robot in manufacturing environment-Classification-Principle components-Degrees of freedom-End effectors-Advantages.

**TEXT BOOKS**
1. R. K. Rajput, *Engineering Materials and Metallurgy*, S. Chand Publishers, 3$^{rd}$ Edition, 2008.
2. C.P. Arora & Domkundwar, *Refrigeration and Air conditioning*, McGraw Hill, 3$^{rd}$ Edition, 2010.
3. M.P. Groover, *Industrial Robotics*, Tata McGraw Hill Publications, 2017.

**REFERENCES**
1. Dr. Kodgire V.D, *A Text Book of Material Science and Metallurgy for Engineers*, Everest Publishing House, 12$^{th}$ Edition, 2007.
2. Hassan Abdel, *Advanced Machining Processes*, McGraw-Hill, 2005.
3. A Zimmers & P.Groover, *CAD/CAM,* PE Publishing, 5$^{th}$ Edition, 2008.
4. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 6$^{th}$ Edition, New Delhi, 2010.

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**(19EC0448) INTRODUCTION TO COMMUNICATION SYSTEMS**
**(OPEN ELECTIVE-I)**

**COURSE OBJECTIVES**

The objectives of this course:
1. *To study the fundamental concepts of the analog communication system.*
2. *To analyze various analog modulation and demodulation techniques.*
3. *The students to be able to understand, analyze, and design fundamental digital communication systems.*
4. *The course focuses on developing digital communication systems*
5. *To understand basics of various Communication.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to
1. *Demonstrate knowledge in elements of Analog Digital and Wireless Communication Systems.*
2. *Analyze the analog modulated and demodulated systems.*
3. *Understand the principle involved in different modulation techniques*
4. *Understand the basic principles of baseband and pass band digital modulation schemes*
5. *Analyze probability of error performance of digital systems and are able to design digital communications.*
6. *Implement various Keying and accessing techniques in real time wireless communication systems*

**UNIT- I**

**Communication :**Introduction, Elements of communication systems, wired Communications systems, Wireless Communications systems, Modulation, Need of modulation, modulation Methods, difference between Analog and Digital communication

**Amplitude Modulation & Demodulation**: DSB-FC(AM)modulation& its demodulation, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Single sideband (SSB) transmission, Comparison of various amplitude modulation techniques.

**UNIT- II**

**Angle Modulation & Demodulation**: Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Phase modulation(PM).

**UNIT- III**

**Noise in Communication Systems**: Types of noise, Noise figure.

**Analog pulse modulation schemes**: Pulse amplitude modulation (PAM), Pulse Width modulation(PWM) and Pulse Position modulations (PPM)

**UNIT IV**

**Digital Communication:** Introduction-Elements of digital communication systems, sampling process, quantization, quantization noise.

**Source Coding Systems:** Pulse-Code Modulation (PCM), Differential PCM (DPCM), Delta modulation (DM), Comparison of PCM, DPCM, DM.

**Pass band Data Transmission:** Introduction, Amplitude shift keying(ASK), binary phase shift keying (BPSK), Binary Frequency shift keying (BFSK) Comparison of ASK, PSK, FSK.

**UNIT V**

**Introduction to Wireless Communication Systems:** Evolution of Mobile Radio Communication Systems, Examples of wireless communication Systems – Paging Systems, Cordless Telephone, Cellular Telephone Systems, Overview of generation of cellular systems.

**Multiple Access Techniques for Wireless Communications:** Introduction to Multiple Access, FDMA, TDMA, CDMA, SDMA.

**TEXT BOOKS**
1. Simon Haykin, *Communication Systems,* Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, *Modern Digital & Analog Communication Systems*, Oxford University Press, International 4th edition, 2010.

**REFERENCES**
1. Sam Shanmugam, *Digital and Analog Communication Systems*, John Wiley, 2005.
2. Bruce Carlson, & Paul B. Crilly, *Communication Systems – An Introduction to Signals & Noise in Electrical Communication*, McGraw-Hill, 5th Edition, 2010
3. Bernard Sklar, *Digital Communications*, Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub& Donald L Schilling, *Principles of Communication Systems*, Tata McGraw-Hill, 3rd Edition, 2009.
5. J.G.Proakis, M Salehi, Gerhard Bauch, Modern *Communication Systems Using* MATLAB, CENGAGE, 3rd Edition, 2013

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**(19HS0813) MANAGEMENT SCIENCE**
**(OPEN ELECTIVE-I)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the basic concepts, principles and processes of management*
2. *To help the students gain an understanding of the functions, responsibilities of managers*
3. *To get an awareness about the latest developments and contemporary issues in the field of management*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Utilize appropriate theoretical frameworks to real life business and managerial problems*
2. *Identify appropriate operational risks and develop appropriate responses to them*
3. *Apply human resource principles to recruit, select and manage employees to achieve organizational goals*
4. *Enact strategy, including contingent plans for the effective management of the organization*
5. *Identify, plan, and implement the projects and evaluate the performance of the projects*
6. *Analyze effective application of latest developments to diagnose and solve organizational problems*

**UNIT I**
**INTRODUCTION TO MANAGEMENT:**

Management - Concept and meaning – Nature – Functions - Management as a science and art and both. Schools of management thought - Taylor's scientific theory - Henry Fayol's principles - Weber's Ideal Bureaucracy - Eltan Mayo's Human relations - Systems theory - Situational or Contingency theory - Social responsibilities of management.
**Organizational structure and design:** Features of organizational structure - work specialization - Departmentation - Span of control-Centralization and Decentralization.
**Organisational designs** - Line organization-Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of organization.

**UNIT II**
**OPERATIONS MANAGEMENT:**

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study - Statistical Quality Control: C chart, P chart, (simple Problems)

Deming's contribution to quality. Material Management: Objectives - Inventory - Functions, types, inventory classification techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management. Marketing Management: Concept - Meaning – Nature - Functions of Marketing - Marketing Mix - Channels of distribution - Advertisement and sales promotion - Marketing Strategies based on Product Life Cycle.

## UNIT III
## HUMAN RESOURCES MANAGEMENT (HRM):

HRM - Definition and meaning – nature-Managerial and Operative functions -Evolution of HRM - Human Resource Planning(HRP) - Employee Recruitment - sources of recruitment-employee selection - process and tests in employee selection - Employee training and development - On-the- job and Off-the-job training methods - Performance Appraisal systems – Concept – Methods of Performance Appraisal – Placement – Employee Induction-Wage and Salary Administration – Objectives - Essentials of Wage and Salary Administration - Job Analysis - Process - Job Evaluation - Employee Grievances - techniques of handling Grievances.

## UNIT IV
## STRATEGIC MANAGEMENT:

Definition& meaning-Setting of Vision- Mission- Goals- Corporate Planning Process-Environmental Scanning-Steps in Strategy Formulation and Implementation - SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

## UNIT V
## CONTEMPORARY ISSUES IN MANAGEMENT:

The concept of MIS – Materials Requirement Planning(MRP) – Just-In-Time (JIT) System - Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management-Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

**TEXT BOOKS**
1. A.R Aryasri: *Management Science*, TMH,2013
2. Stoner, Freeman, Gilbert, *Management*, Pearson Education, New Delhi,2012.

**REFERENCES**
1. Kotler Philip & Keller Kevin Lane: *Marketing Management*, PHI, 2013.
2. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH,2005.
3. Thomas N.Duening & John M.Ivancevich *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, *Personnel Management*, Himalaya, 25/e,2005

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## (19EC0424) MICROCONTROLLER AND APPLICATIONS LAB

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the structure of assembly language and wiring programming.*
2. *Develop programs using various instructions and addressing modes of 8051 microcontroller*
3. *Design and simulate the interfacing of peripherals to microcontroller board.*

**COURSE OUTCOMES (COs)**

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

1. *Familiar with keil programming environment*
2. *Demonstrate arithmetic, logical and string operations using assembly language programming.*
3. *Develop embedded C language programs for various applications using 8051 microcontroller.*
4. *Explore the provided example code and online resources for extending knowledge about the capabilities of the 8051 microcontrollers*
5. *Test, debug, and deploy the 8051 microcontroller-based systems*
6. *Design and develop own microprocessor/microcontroller-based solutions for the real-world problems*

**Note**: Minimum **Ten** Experiments to be conducted (9 from Part A and one from Part B)

### Part A: 8051 Microcontroller Programming

1. a) 8-bit addition operations
   b) 8-bit subtraction operations
2. a) 8-bit Multiplication operations
   b) 8-bit Division operations
3. Logical operations on an 8-bit number
4. a) String copy
   b) String concatenation
5. Interfacing LED
6. Interfacing Push button
7. Interfacing 7 segment display
8. Interfacing ADC
9. Interfacing Sensors
10. Interfacing Actuators

**Part B: Mini projects**

1. 4-way Traffic light control system.
2. Three floor elevator system.
3. Automatic streetlight control system.
4. Intruder alert system.
5. Automatic Tollgate system.
6. Water level control system.
7. Digital alarm clock.
8. Electronic code lock.
9. Automatic gardening system.
10. Self-developed project

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## (19CS0507) C and DATA STRUCTURES LAB

### COURSE OBJECTIVES
The objectives of this course:

1. *Explain basic constructs of C language*
2. *Explain problem solving techniques*
3. *Develop applications in C using strings, pointers, functions, structures*
4. *Explain the different operations that can be performed on data structures*
5. *Introduce the different search and sorting algorithms*

### COURSE OUTCOMES (COs)
On Successful completion of this course, the student will be able to

1. *Read, understand and trace the execution of programs written in C language*
2. *Develop C programs for simple applications making use of basic constructs, arrays and strings*
3. *Develop C programs involving functions, recursion, pointers, and structures*
4. *Select the data structure appropriate for solving the problem*
5. *Illustrate the working of stack and queue*
6. *Implement searching and sorting algorithms*

### Laboratory Experiments:

1. a) Write a C program to find the sum of individual digits of a positive integer.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
2. a) Write a C program to calculate the following Sum:
   Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
   b) Write a C program to find the roots of a quadratic equation.
3. Write C programs that use both recursive and non-recursive functions
   i) To find the factorial of a given integer.
   ii) To find the GCD (greatest common divisor)of two given integers.
   iii) To solve Towers of Hanoi problem.
4. a) Write a C program to determine if the given string is a palindrome or not
   b) Write a C program to determine whether the given number is Armstrong number or not.
5. Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)
6. a) Write a C program to generate Pascal's triangle.
   b) Write a C program to construct a pyramid of numbers.

7. a) Write a C program to find both the larges and smallest number in a list of integers.
   b) Write a C program that uses functions to perform the following:
   i) Addition of Two Matrices
   ii) Multiplication of Two Matrices
8. Write a C program to swap(exchange) values of two integer variables using pointers
9. Write a C program that uses functions to perform the following operations:
   a) To insert a sub-string in to given main string from a given position.
   b) To delete n Characters from a given position in a given string.
10. a) Write a C program to check whether the entered string is palindrome or not.
    b) Write a C program to read student roll no, name and marks in six subjects for n number of students and give class of each student.
11. Write a C program that uses functions to perform the following operations on singly linked list.
    i) Creation     ii) Insertion     iii) Deletion    iv) Traversal
12. Write a C program that uses functions to perform the following operations on doubly linked list:
    i) Creation     ii) Insertion     iii) Deletion    iv) Traversal in both ways
13. Write a C programs that implement stack (its operations) using Arrays
14. Write a C programs that implement queue (its operations) using Arrays

**TEXT BOOKS**
1. P. Padmanabham, *C programming and Data Structures,* Third Edition, BS Publications
2. E Balaguruswamy, *C and Data Structures,* TMH publications.

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### (19CS0508) DATA BASE MANAGEMENT SYSTEMS LAB

**COURSE OBJECTIVES**

The objectives of this course:

1. *Illustrate the different issues involved in the design and implementation of a database system.*
2. *Use data manipulation language to query, update, and manage a database.*
3. *Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Develop relational algebra expressions for queries and optimize them.*
2. *Design the databases using E_R method for a given specification of requirements.*
3. *Apply Normalization techniques on given database.*
4. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
5. *Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.*
6. *Execute DDL, DML, DCL commands.*

**LIST OF EXPERIMENTS:**

1. Practice session: Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, and use PL/SQL features like cursors on sample database. Students should be permitted to practice appropriate User interface creation tool and Report generation tool.
2. DDL Commands – Table Creation, Altering the table structures, truncating a table and dropping a table.
3. DML Commands – Insert, Select Commands, update & delete Commands.
4. Create relationship between the databases – Nested Queries & Join Queries
5. Create a database and to set various possible constraints.
6. Views – Create a Virtual table based on the result set of an SQL statement.
7. Create PL/SQL functions to implement the stored procedures in SQL (Function and Procedures).
8. Write a PL/SQL program using For loop to insert ten rows into a database table.
9. Write Relational algebra queries for a given set relations.
10. Write a PL/SQL program to execute a number of queries in one block using single command.

**TEXT BOOK**

1. Raghu Ramakrishnan, Johannes Gehrke, Jeff Derstadt, Scott Selikoff and Lin Zhu, *Database Management Systems solutions manual*, third Edition, 2013.

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## (19HS0816) INDIAN CONSTITUTION
## (NON-CREDIT COURSE)

**COURSE OBJECTIVES**

The objectives of this course:

1. *To know the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
2. *To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional role.*
3. *To address entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.*
4. *To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.*
5. *To acquire knowledge for various competitive examinations.*

**COURSE OUTCOMES (COs)**

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

1. *Explain the key concepts of political economy.*
2. *Analyse the significant developments in the political ideologies.*
3. *Describe the salient features of the constitution of India interpret, integrate and critically.*
4. *Analyse the political economy of Indian international relations and gain knowledge in Judiciary system.*
5. *Apply their knowledge and skills acquired to write various competitive examinations.*
6. *Analyse the constitutional rights in relating to Practical life.*

**UNIT-I**

Introduction to the Constitution

**UNIT-II**

Historical Perspective of the Constitution of India- Salient features and characteristics of the Constitution of India

**UNIT-III**

Scheme of the fundamental rights-The scheme of the Fundamental Duties and its legal status-The Directive Principles of State Policy – Its importance and implementation

**UNIT-IV**

Parliamentary Form of Government in India – Powers and Functions-The President of India – Status and Powers -The historical perspectives of the constitutional amendments in India-Judiciary system - Powers and  Functions

**UNIT-V**

Local Self Government – Constitutional Scheme in India -    Election Commission: Role and Functions

**TEXT BOOKS**
1. Government of India Ministry of Law and Justice (Legislative Department) *The Constitution of India, 1950 (Bare Act)* Government Publication, 2015
2. Dr. S. N. Busi *Dr. B. R. Ambedkar framing of Indian Constitution*, 1st Edition, Government Publication 2015.

**REFERENCES**
1. M. P.Jain  *Indian Constitution Law* Lexis Nexis 7th Edn., 2014.
2. D.D. Basu  *Introduction to the Constitution of India* Lexis Nexis, 2015
3. P.M.Bakshi *Constitution of India* Universal Law Publishing.15th Edition,2018

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**(19HS0836) DISCRETE MATHEMATICS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To train the students thoroughly in Mathematical concepts of Mathematical logic, Relations, Algebraic structures, Recurrence Relation, Graph Theory.*
2. *To prepare students for lifelong learning and successful careers using Mathematical Concepts of Mathematical logic, Relations, Algebraic structures, Recurrence Relation, Graph Theory.*
3. *To develop the skill pertinent to the practice of the Mathematical concepts including The students' abilities to formulate and modeling the problems, to think creatively and to synthesize information.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Write an argument using logical notation and determine if the argument is or is not valid.*
2. *Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.*
3. *Understand the basic principles of sets and operations in sets.*
4. *Demonstrate an understanding of relations and functions and be able to determine their properties.*
5. *Determine when a function is 1-1 and "onto".*
6. *Demonstrate different traversal methods for trees and graphs.*
7. *Model problems in Computer Science using graphs and trees.*

**UNIT-I**

**Mathematical Logic**:

Statements and notations, Connectives, Truth Tables, Well-formed formulae, tautology, equivalence implication, Rules of inference, Consistency, proof of Contradiction, Normal forms.

**Predicates:** Predicative logic, Free & Bound variables, Quantifiers, Rules of inference, Automatic Theorem Proving.

**UNIT-II**

**Relations:**

Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations.

**Functions:** Inverse Function, Composition of functions, recursive Functions.

**Algebraic structures:**

Algebraic systems examples and general properties, Semi groups and monoids, groups, sub groups, homomorphism, Isomorphism.

## UNIT-III
### Elementary Combinatorics:

Basis of counting, Enumerating Combination & Permutation with repetition, Constrained repetitions, Binomial & Multinomial theorems (without proof), Binomial Coefficients, The principle of Inclusion & Exclusion - Pigeon hole principle and its application.

## UNIT-IV
### Recurrence Relation:

Generating Functions & Sequences, Calculating Coefficient of generating function, Recurrence relations, Solving Recurrence relation by substitution and Characteristic roots, solution of Inhomogeneous Recurrence Relation. Solving Recurrence relation by Generating function.

## UNIT-V
### Graph Theory:

Representation of Graphs, Sub graphs, Multi graphs, Graph Theory Applications: Basic Concepts Isomorphism. Euler circuits, planar Graphs, Hamiltonian graphs, Chromatic Numbers, Spanning Trees, DFS, BFS.

## TEXT BOOKS

1. Thomas Koshy, *Discrete Mathematics with Applications*, Elsevier, 2004.

2. Chandra Sekharaiah D.S, *Mathematical Foundations of computer Science (Discrete Structures),* Prism, 2012.

## REFERENCES

1. Liu C.L & Mohapatra D.P, *Elements of Discrete Mathematics-* A Computer Oriented Approach, 3rd edition, McGraw Hill Education, 2012.
2. Mott J.L, Kandel A & Baker T.P, *Discrete Mathematics for Computer Scientists & Mathematicians*, 2nd edition, Prentice Hall of India , 2008.
3. Tremblay J.P and Manohar R, *Discrete Mathematical Structures with Application to Computer Science*, McGraw Hill Publication, 2017.
4. Satyanarayana Bh & Syam Prasad K, *Discrete Mathematics and Graph Theory*, Printice Hall of India, New Delhi, April 2014, ISBN: 978-81-203-4948-3.
5. Satyanarayana Bh, Venkata Pradeep Kumar T & Mohiddin Shaw S, *Mathematical Foundation of Computer Science*, BS Publications (A unit of BSP Books Pvt. Ltd.), Hyderabad, India, 2016, ISBN: 978-93-83635-81-8.

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## (19CS0509) FORMAL LANGUAGES AND AUTOMATA THEORY

**COURSE OBJECTIVES**

The objectives of this course:

1. *Explain formal definitions of machine models.*
2. *Classify machines by their power to recognize languages and understanding of formal grammars, analysis.*
3. *Illustrate hierarchical organization of problems depending on their complexity.*
4. *Explain logical limits to computational capacity.*
5. *Describe decidable and un-decidable problems.*

**COURSE OUTCOMES (COs)**

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

1. *Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions.*
2. *Contrast and create finite Automats for various problems.*
3. *Design automata, regular expressions and context-free grammar accepting and generating a certain language, design of new grammar and languages.*
4. *Define Push down Automata performing simple tasks and equivalence of PDA and CFGs.*
5. *Infer solutions to the problems using Turing machines.*
6. *Distinguish between computability, decidability and un-decidability problems.*

**UNIT – I**

**Introduction:** Basics of set theory, Relations on sets, Alphabet, Strings, languages and grammars, Chomsky hierarchy of languages.

**Finite Automata:** History of Automata theory, Characteristics of Automata, Graphical notation of FA, DFA and NFA, Conversion of an NFA to DFA, NFA with $\epsilon$(null)Move, Equivalence of DFA and NFA,  Finite Automata with Output, Conversion  from  Moore  to Mealy and Mealy to Moore  Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Applications and Limitations FA.

**UNIT-II**

**Regular Languages:** Basics of Regular Expressions, Identities of Regular Expression, The Arden's Theorem, Construct RE from FA, Equivalence of Two FAs, Construct FA from RE, Equivalence of Two REs, Regular grammars and equivalence of two  finite automata, Pumping Lemma for RLs, Applications of Pumping Lemma, Closure properties of Regular Sets, Applications of Regular Expressions.

**UNIT-III**

**Context Free Grammar:** Context-free grammars (CFG) , Derivation trees, Ambiguity in CFG , Left recursion and Left factoring, Simplification of CFGs, Chomsky Normal form and Greibach Normal form, Pumping lemma for Context-free languages, closure properties of CFLs.

**UNIT-IV**

**Push Down Automata (PDA):** The Formal Definition, Graphical notation, Instantaneous description, The Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic Push Down Automata, Non-Deterministic Push Down Automata.

**UNIT-V**

**Turing Machines and Undecidability:** The basic model of Turing machines (TM), Instantaneous Description, Variants of Turing Machines, Conversion from RE to TM, LBA, Universal Turing Machine, Recursive and Recursively Enumerable Languages.

**TEXT BOOKS**
1. Shyamalendu Kandar, *Introduction to Automata Theory, Formal Languages and Computation*, Pearson.
2. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, *Introduction to Automata Theory, Languages, and Computation*, Pearson Education Asia.

**REFERENCES**
1. Harry R. Lewis and Christos H. Papadimitriou, *Elements of the Theory of Computation*, Pearson Education Asia.
2. Dexter C. Kozen, *Automata and Computability, Undergraduate Texts in Computer Science*, Springer.
3. Michael Sipser, *Introduction to the Theory of Computation*, PWS Publishing.
4. John Martin, *Introduction to Languages and The Theory of Computation*, Tata McGraw Hill.

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## (19CS0510) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

**COURSE OBJECTIVES**

The objectives of this course:

1. *Introduce standard tools and techniques for software development.*
2. *Describe object oriented approach for automated software build process.*
3. *Explain the concepts of AWT framework.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Illustrate simple abstract data types and design implementations using abstraction functions.*
2. *Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.*
3. *Implement Exception handling with synchronization.*
4. *Execute programs on Multithreading and String handling concepts.*
5. *Design applications with an event-driven graphical user interface.*
6. *Analyze implementation of Application Programming Interfaces.*

**UNIT- I**

**The Java Language -**Importance of Java -Programming Paradigms -The History and Evolution of Java -Java Byte Code -The Java Buzzwords.
**Introduction of OOP**-Abstraction, Encapsulation, Inheritance, Polymorphism-Understanding static -Varargs -Data Types -Type Casting -Java Tokens - Java Statements - Arrays -Command line arguments.

**UNIT- II**

**Introducing Classes** –Class Fundamentals -Declaring Objects -Introducing Methods Introduction to Constructors, Constructor Overloading- Garbage Collection -Introducing final -Inheritance -Using Super- Method Overloading, Method Overriding -abstract classes - Packages and Interfaces.

**UNIT- III**

**Exception Handling** - Exception Fundamentals - Exception Types -Uncaught Exceptions - Using try and catch - Nested try Statements -throw -throws –finally.
**Multithreaded Programming** - The Java Thread Model -Thread Priorities -The Thread Class and the Runnable Interface - Creating Multiple Threads -Using isAlive( ) and join( ) – Thread Priorities -Synchronization-String Handling.

**UNIT- IV**

**Generics-**A simple Generic Example-General form of Generic class-Generic Interfaces Collections overview, Collection class, Collection interfaces.

**Introducing File Handling** –File handling in java –Stream –Java File Method –File Operation in Java-Create file –Write to a file –Read from a file.

**UNIT- V**

**Introducing the AWT -**Using AWT Controls-Introducing Swing -Exploring Swing.

**Introducing Java8 Features –**Lambda Expression –Method references –Functional interface –Default method -Static method –forEach() method -Method and Constructor reference by double colon(::) operator - Stream API –Date & Time API.

**TEXT BOOKS**

1. Herbert Schildt , *The Complete Reference Java,* Eighth Edition,McGrawHill.
2. Cay S. Horstmann*, Java SE 8 for the Really Impatient*, Addison-Wesley 2014.

**REFERENCES**

1. P.J. Deitel and H.M. Deitel, *Java for Programmers*, Pearson Education.
2*.* Bruce Eckel *,Thinking in Java,* Pearson Education.

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### (19CS0511) OPERATING SYSTEMS

**COURSE OBJECTIVES**

The objectives of this course:

1. *Explain main components of an OS & their functions.*
2. *Describe the process management and scheduling.*
3. *Discuss various issues in Inter Process Communication (IPC) and the role of OS in IPC.*
4. *Illustrate the concepts and implementation of Memory management policies and virtual memory*
5. *Explain working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.*

**COURSE OUTCOMES (COs)**

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

1. *Describe the important computer system resources and the role of operating system in their management policies and algorithms.*
2. *Understand the process management policies and scheduling of processes by CPU.*
3. *Analyze the requirement for process synchronization and coordination handled by operating system.*
4. *Describe and analyze the memory management and its allocation policies.*
5. *Categorize the storage management policies with respect to different storage management technologies*
6. *Criticize the need for special purpose operating system with the advent of new emerging technologies.*

**UNIT - I**

**Operating Systems Overview:** What is an operating system-History of operating systems-Operating system functions- Operating systems Operations-Types of Operating Systems and Computing Environments.

**System Structures:** Operating System Services-User and Operating-System Interface-systems calls- Types of System Calls- system programs- Structure of an OS - Layered Monolithic- Microkernel Operating Systems and Concept of Virtual Machine.

**UNIT - II**

**Processes:** Process, Process state, Process Scheduling,-Schedulers- Inter process Communication synchronization--Scheduling Algorithms: FCFS-SJF-Priority-RR-Message Passing

**Threads:** Definition, Multithreading-Advantages-ULTs,-KLTs-Thread Libraries- Difference between ULTs and KLTs.

## UNIT - III
**Process Synchronization:** Critical Section- Mutual Exclusion- Semaphores- Monitors. Classical Problems of Synchronization: The Producer- Consumer Problem -Dinning Philosopher Problem- Reader's & Writer Problem
**Deadlocks:** Definition- Deadlock Characteristics- Deadlock Prevention and Deadlock Avoidance: Banker's algorithm- Deadlock detection and Recovery.

## UNIT - IV
**Memory Management:** Main Memory-Swapping-Contiguous Memory allocation Paging-Segmentation.
**Virtual memory:** Basics of Virtual Memory- Demand paging-Page-replacement- Page Replacement algorithms-Thrashing.
**Disk scheduling**: FCFS- SSTF- SCAN- C-SCAN- Disk Management.

## UNIT - V
**File Management:** Concept of File- Access methods-File types-File operation-Directory structure-File System structure- Allocation methods (contiguous, linked, indexed)- Free-space management (bit vector, linked list, grouping)
**Protection & Security:** Protection Mechanisms- Protection matrix- Authentication Techniques- Threats-intruders-Basics of Cryptography-Secret key-public key- One-Way Function-Digital Signature.

## TEXT BOOKS
1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley,  Eight Edition.
2. Andrew S Tanenbaum, *Modern Operating Systems*, Pearson Education International, 3rd Edition.

## REFERENCES
1. Charles Crowley, *Operating System: A Design-oriented Approach*, Irwin Publishing, 1st Edition.
2. Gary J. Nutt, *Operating Systems: A Modern Perspective*, Wesley, 2nd Edition.
3. Maurice Bach, *Design of the Unix Operating Systems*, Prentice-Hall of India, 8th Edition.

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**(19CE0143) FUNDAMENTALS OF URBAN PLANNING**
**(OPEN ELECTIVE-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other*
2. *To provide sustainable buildings by considering the environmental, social and economic conditions.*
3. *To create awareness about the traffic management within the town*

**COURSE OUTCOMES (COs)**

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

1. *Recognize issues related to town planning and discuss the objectives, necessity and stages of town planning*
2. *Summarize importance of zoning, can classify various town planning practices and can conduct surveys for town planning*
3. *Classify the residential building, list the agencies involved in improving house and review the problems associated with residential housing*
4. *Discuss the issues associated with slums and recognize the methods to improve condition of slums*
5. *Interpret norms laid down for public and industrial building and can summarize building bye-laws*
6. *List and discuss various urban roads and the concepts of traffic management in a town*

**UNIT – I**

**Introduction to Town Planning:** Objects of town planning - Necessity of town planning - Principles of town planning - Stages of Town Planning - Origin and growth of towns - Development of towns - Modern town planning in India - Socio - Economic aspects of town planning - Selection of site for an ideal town – Cost of town planning.

**UNIT – II**

**Surveys & Planning:** Various types of surveys to be conducted for town planning project - Data to be collected in different types of town planning survey - Types of planning - A brief note on urban, rural and regional planning.

**Zoning:** Definition - Objects and principles of zoning - Advantages of zoning - Special Economic Zone (SEZ) - Maps for zoning.

**UNIT – III**

**Housing:** Classification of residential building as per HUDCO norms - Low Cost Housing - Housing policy - Different types of housing agencies involved in housing - Investment in Housing - Housing Problems in India.

**Slums:** Causes - growth - Characteristics - Effects - Slum clearance and re-housing - Prevention of slum formation - Financial assistance for slum clearance.

**UNIT – IV**

**Public Buildings & Industries:** Classification - Location - Design Principles of public building - Grouping of public buildings - Effects of Industries on towns and cities - Classification of industries – Requirements of an industry - Regulation of their location.

**Building Bye-Laws:** Objectives of bye-laws - Importance of bye-laws - Function of local authority - Responsibility of owner - Applicability of bye-laws - Principles underlying building bye-laws.

**UNIT – V**

**Urban Roads:** Objectives – Requirements - Classification - Types of street systems - Through and bypass roads - Outer and inner ring roads - Expressways - Freeways.

**Traffic Management**: Objectives - Traffic surveys - Traffic congestion - Traffic control - Parking - Road accidents - Traffic capacity of roads - Road intersections - Traffic islands - Roundabouts - Traffic signals - Road signs - Road markings - Street lighting in a town.

**TEXT BOOKS**

1. Rangwala, *Town Planning, Charotar Publishing*, 30th edition, 2018.
2. G K Hiraskar, *Fundamentals of Town Planning*, Dhanpat Rai Publications, New Delhi, 17th edition, 2018.

**REFERENCES**

1. Abir bandyopadhyay, *Text book of Town Planning*, Books & Allied (P) Ltd, 2000.
2. Peter Hall and Mark Tewdwr-Jones, *Urban and Regional Planning*, Routledge Publications, 5th edition, 2010.
3. Catanese A J, *Urban Planning*, McGraw Hill Publications, 2nd edition, 2014.

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**(19EE0233) INDUSTRIAL INSTRUMENTATION**
**(OPEN ELECTIVE-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To Analyse the Common errors that occur in measurement systems, and their classification.*
2. *To understand the characteristics of signals, their representation, and signal modulation techniques.*
3. *To learn the Methods of Data Transmission, Telemetry, and Data acquisition.*
4. *To study working principles of different Signal Analyzers and Digital meters.*
5. *To learn about several types of transducers and their use for measurement of non-electrical quantities.*

**COURSE OUTCOMES (COs)**

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

1. *Identify and explain the types of errors occurring in measurement systems.*
2. *Differentiate among the types of data transmission and modulation techniques.*
3. *Apply digital techniques to measure voltage, frequency and speed.*
4. *Analyse the working principles of different Signal Analyzers and Digital meters.*
5. *Understand the operation of several types of transducers.*
6. *Choose suitable Transducers for the measurement of non-electrical quantities.*

**UNIT-I**

**Characteristics Of Signals And Their Representation:** Measuring Systems, Performance Characteristics, Static Characteristics, Dynamic Characteristics; Errors in Measurement Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

**UNIT-II**

**Data Transmission, Telemetry And Das:** Methods of Data Transmission – General Telemetry System .Frequency Modulation (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM)Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data Acquisition Systems –Components of Analog DAS–Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing –Digital DAS–Block Diagram—Modern Digital DAS (Block Diagram)

**UNIT-III**

**Signal Analyzers, Digital Meters:** Wave Analysers - Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers-Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, QMeter. Peak Reading and RMS Voltmeters, Digital Voltmeters-Successive Approximation, Ramp and Integrating Type- Digital Frequency Meter- Digital Multimeter- Digital Tachometer

**UNIT-IV**

**Transducers:** Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezo electric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

**UNIT-V**

**Measurement Of Non-Electrical Quantities:** Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

**TEXT BOOKS**
1. A.K.Sawhney, *A course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Co., 2012.
2. D.V.S. Murty, *Transducers and Instrumentation*, Prentice Hall of India, 2ndEdition, 2004.

**REFERENCES**
1. A.Dhelfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement technique,* Pearson/Prentice Hall of India., 1990.
2. H.S. Kalsi, *Electronic Instrumentation,* Tata MCGraw-Hill Edition, 2010.
3. T.R.Padmanabhan, *Industrial Instrumentation–Principles and Design*, Springer.

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## (19ME0350) MECHANICAL MEASUREMENTS & CONTROL SYSTEMS
## (OPEN ELECTIVE-II)

**COURSE OBJECTIVES**

Objective of this course is to:

1. *Impart brief knowledge on basic principles and performance characteristics of measurement.*
2. *Familiarize student with basic principles to measure the temperature, pressure with the help of Thermocouple and different pressure gauges.*
3. *Make the student learn measurement of Speed, Acceleration and Vibration with the help of various instruments.*
4. *Enable the student to understand the measurement of Fuel level, measurement of Flow and Humidity, parameters like Force, Torque, Power and also learn about the basic principles, and applications of various control systems.*
5. *Make the student to Select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *State the basic principles of measurement systems and explain its performance characteristics*
2. *Distinguish the types of various temperature and pressure measurement instruments and finds the best one for the industrial applications*
3. *Explicate the principle of measurement of Speed, Acceleration and Vibration instruments and describe its working*
4. *Illustrate the operation of Fuel level, measurement of Flow and Humidity Measurement instruments and also state the applications of various control systems*
5. *Identify the appropriate device for the measurement of temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.*
6. *Classify the various types of control systems for the measurement of temperature, speed and position*

**UNIT-I**

**Definition** - Basic principles of Measurement systems, configuration and functional descriptions of measuring instruments. Sources of error, Classification and elimination of error.

**Measurement of Displacement**: Types & Working - Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

**UNIT-II**

**Measurement of Temperature**: Classification of temperature measuring instruments, Principles - Types - Expansion, Electrical Resistance - Thermistor - Thermocouple - Pyrometers - Temperature Indicators.

**Measurement of Pressure**: Classification of pressure measuring devices – Principles - Manometers, Bourdon pressure gauges, Bellows - Diaphragm gauges. Low pressure measurement – Thermal Conductivity gauges - ionization pressure gauges, Mcleod pressure gauge.

**UNIT - III**

**Measurement of Speed, Acceleration and Vibration:** Tachometers, Seismic instruments - Vibrometer and accelerometer.

**Stress & Strain Measurements:** Electrical strain gauge, Resistance strain gauge , compressive and tensile strains, Strain gauge Rosettes.

**UNIT -IV**

**Measurement of Level:** Direct method - Indirect methods - capacitative, ultrasonic, magnetic, cryogenic fuel level indicators - Bubler level indicators.

**Flow Measurement**: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot - wire anemometer Laser Doppler Anemometer (LDA).

**UNIT - V**

**Measurement of Force, Torque and Power**- Elastic force meters, load cells, Torsion meters, Dynamometers.

**Elements of Control Systems**: Classification - Open and closed systems Servo mechanisms- Temperature, speed & position control systems

**TEXT BOOKS**

1. D.S.Kumar, *Mechanical Measurements & Control*, Metropolitan Book Co Pvt. Ltd, 5th Revised Edition,2012.
2. Thomas G.Beckwith, Roy D.Marangoni & John H.Lienhard, *Mechanical Measurements*, Pearson Publishers,6th Edition.

**REFERENCES**

1. B.C.Nakra & KKChaudhry, *Instrumentation, measurement & analysis*, TMH Publishers, 3rd Edition.
2. R.K. Jain, *Mechanical and Industrial Measurements,* Khanna Publishers,11th Edition.
3. AK. Tayal, *Instrumentation & mech. Measurements*, Galgotia Publication, 2nd Edition.

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**(19EC0449) ELEMENTS OF EMBEDDED SYSYTEMS**
**(OPEN ELECTIVE-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Able to understand the fundamental concepts of embedded systems.*
2. *Able to learn the core of embedded systems.*
3. *Able to learn to program the open source electronics.*
4. *Able to understand the principles of Internet of Things (IoT).*
5. *Able to understand the concepts of Internet of Things (IoT).*

**COURSE OUTCOMES (COs)**

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

1. *Differentiate between general computing system and the embedded system, also recognize the classification of embedded systems.*
2. *Enumerate and describe the components of an embedded system.*
3. *Learn about open source electronics platform.*
4. *Program an embedded system by interfacing sensors & actuators.*
5. *Identify the basic building blocks of Internet of Things and characteristics.*
6. *Implement their own ideas in various application areas of Embedded systems and IoT.*

**UNIT – I**

**Introduction to Embedded Systems:** Definition –Embedded systems vs General computing systems – History – Classification – Purpose - Major application areas – Characteristics – Architecture of embedded system – CPU, RAM & ROM, timers, clocks, address bus & data bus – overview of design process of embedded systems – programming languages and tools for embedded design.

**UNIT – II**

**Typical Embedded System:** Core of the embedded system– RISC vs CISC design philosophy– Memory – Harvard and Von-Neuman architecture–sensors and actuators– Other system components – reset, brownout protection, oscillator, RTC, Watch dog timer. Embedded firmware.

**UNIT – III**

**Communication:** Communication Interfaces – Onboard (I2C, SPI, UART, 1-wire interface, parallel interface), External (RS-232 & RS-485, USB, IEEE 1394, IrDA, Bluetooth, Wi-Fi, ZigBee, GPRS.

**UNIT – IV**

**Designing of Embedded Systems With Arduino Microcontrollers**: Introduction to Arduino platform– Overview of Arduino UNO board–ATMega328/P Block diagram–Pin functions–Introduction to Arduino programming –Interfacing & programming sensors – Interfacing & programming actuators Interfacing & programming serial communication devices.

**UNIT – V**

**Introduction to IoT:** Introduction to Internet of Things– reference architecture of IoT– Internet principles – IPaddresses, MAC addresses, TCP and UDP ports– Application layer protocols– Data protocols– MQTT, XMPP, CoAP– challenges of IoT, Case studies demonstrating IoT – Home automation, cities, Environment, Agriculture.

**TEXT BOOKS**
1. Shibu K V, *Introduction to Embedded systems*, Tata McGraw-Hill Education, 1st Edition, 2009.
2. Raj Kamal, *Embedded systems*, Tata McGraw-HillEducation, 2ndEdition, 2011.
3. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press/Orient Black Swan Pvt. Ltd, 1st Edition, 2015.

**REFERENCES**
1. https://store.arduino.cc/arduino-uno-rev3
2. https://www.arduino.cc/reference/en/
3. https://wso2.com/whitepapers/a-reference-architecture-for-the-internet-of-things/
4. Adrian McEwen & Hakim Cassimally, *Designing of Internet of Things,* John Wiley and sons Ltd, 1st Edition, 2014,

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## (19HS0814) INTELLECTUAL PROPERTY RIGHTS
### (OPEN ELECTIVE-II)

**COURSE OBJECTIVES**

The objectives of this course:

1. *To provide an understanding of the concept and significance of intellectual property rights*
2. *To understand the concept of trademarks, copy rights, patents and the need for their protection*
3. *To comprehend the concept of competition, unfair competition and the latest developments in the laws pertaining to intellectual property rights*

**COURSE OUTCOMES (COs)**

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

1. *Become aware of intellectual property rights, concepts, treaties, agencies and international organizations involved in sanctioning IP rights*
2. *Identify different types of intellectual properties, ownership rights and the scope of the protection*
3. *Get an adequate knowledge on patents, trademarks, copy rights and to get property rights for their intellectual work*
4. *Able to identify, apply, and assess ownership rights, registration processes for IP rights*
5. *To discern the approaches for intellectual property management and intellectual property audits*
6. *Demonstrate knowledge and understanding on unfair competition and latest developments in IP rights at international level*

## UNIT – I

**INTRODUCTION TO INTELLECTUAL PROPERTY:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

## UNIT-II

**TRADE MARKS:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

## UNIT-III

**LAW OF COPY RIGHTS:** Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**LAW OF PATENTS:** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT-IV**
**TRADE SECRETS:** Trade secrete law, determination of trade secretes status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
**UNFAIR COMPETITION:** Misappropriation right of publicity, False advertising.

**UNIT-V**
**NEW DEVELOPMENT OF INTELLECTUAL PROPERTY:** new developments in trademark law; copyright law, patent law, intellectual property audits.
International overview on intellectual property, international - trade mark law, copyright law, international patent law, international development in trade secrets law.

**TEXT BOOKS**
1. Deborah, E. Bouchoux, *Intellectual property right*, cengage learning
2. Nityananda KV*, Intellectual property rights: Protection and Management.* India, Cengage Learning India Private Limited.

**REFERENCES**
1. Prabuddha ganguli*, Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing CompanyLtd.
2. Ahuja VK, *Law relating to Intellectual Property rights* India IN- Lexis Nexis.
3. Neeraj P &Khushdeep D, *Intellectual Property Rights,* India. PHI learning pvt limited.

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**(19CS0512) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Illustrate software design, implementation, and testing using Java.*
2. *Introduce object-oriented design techniques and problem solving.*
3. *Emphasize development of secure, well-designed software projects that solve practical real-world problems.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs*
2. *Read and make elementary modifications to Java programs that solve real-world problems*
3. *Validate input in a Java program*
4. *Identify and fix defects and common security issues in code.*
5. *Execute a Java program using Javadoc*
6. *Execute a Java program using Java Swings*

**LIST OF PROGRAMS**

1. Write a java program to read and write different types of data through keyboard and display them on console.
2. a) Write a java program to find Factorial of given number.
   b) Write a java program to find Fibonacci series of given number.
3. a) Write a java program to display prime number series up to N.
   b) Write a java program to find the maximum and minimum of N array elements.
4. a) Create a user defined package and import it into a java program.
   b) Write a java program to implement an interface using your own example.
5. Write a Java program that prints all real and imaginary solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula.
6. Write a java program to illustrate Constructor Overloading.
7. Write a Java program that creates three threads. First thread displays ―Good Morning, every one second, the second thread displays Hello, every two seconds and the third thread displays Welcome every three seconds.
8. Write a java program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given text.
9. Write a java program to create your own exception subclass and how to handle it.
10. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

11. Write a java program to show multiple type parameters in Java Generics.
12. Write a java program to use swings to create frame and buttons.

**TEXT BOOKS**
1. H.M.Dietel and P.J.Dietel, *Java How to Program*, Sixth Edition, Pearson Education/PHI.
2. Herbert Schildt, *Java-The Complete Reference*, TMH, 8th Edition.

**REFERENCES**
1. Y.Daniel Liang, *Introduction to Java programming*, Pearson Education, Sixth Edition.
2. Cay Horstmann, *Big Java*, Wiley Student Edition, Wiley India Private Limited, 2nd Edition.
3. J.Dean & R.Dean, *Introduction to Programming with Java*, McGraw Hill.

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### (19CS0513) OPERATING SYSTEMS LAB

**COURSE OBJECTIVES**

The objectives of this course:

1. B*uild 'C' program for process and file system management using system calls*
2. *Analyze the best CPU scheduling algorithm for a given problem instance*
3. *Analyze the performance of various page replacement algorithms*
4. D*evelop algorithm for deadlock avoidance, detection and file allocation strategies*
5. S*imulate frame allocation to process*

**COURSE OUTCOMES (COs)**

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

1. *Understand and implement basic services and functionalities of the operating system using system calls*
2. *Use modern operating system calls and synchronization libraries in software/ hardware interfaces*
3. *Understand the benefits of thread over process and implement synchronized programs using multithreading concepts*
4. *Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority*
5. *Implement memory management schemes and page replacement schemes*
6. *Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.*

**LIST OF EXPERIMENTS:**

1. Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
   a) FCFS　　　　b) SJF　　　　c) Round Robin (pre-emptive)　　　　d) Priority
2. Write a C program to simulate producer-consumer problem
3. Write a C program to simulate the concept of Dining-Philosophers problem.
4. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
5. Write a C program to simulate Bankers algorithm for the purpose of deadlock prevention.
6. Write a C program to simulate the MVT and MFT memory management techniques
7. Write a C program to simulate paging technique of memory management.
8. Write a C program to simulate the following file allocation strategies.
   a) Sequential　　b) Indexed　　c) Linked
9. Write a C program to simulate the following file organization techniques
   a) Single level directory　　b) Two level directory　　c) Hierarchical
10. Write a C program to simulate page replacement algorithms
   a) FIFO　　　　b) LRU　　　　c) LFU

11. Simulate how operating system allocates frame to process.

**TEXT BOOKS**
1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley, Eighth Edition.
2. Andrew S Tanenbaum, *Modern Operating Systems*, Pearson Education International, 3<sup>rd</sup> Edition.

**REFERENCES**
1. Charles Crowley, *Operating System: A Design-oriented Approach*, Irwin Publishing, 1st Edition.
2. Gary J. Nutt, *Operating Systems: A Modern Perspective*, Wesley, 2nd Edition.
3. Maurice Bach, *Design of the Unix Operating Systems*, Prentice-Hall of India, 8th Edition.

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**(19CS0514) OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

**COURSE OBJECTIVES**

The Objectives of this Course:

1. *Illustrate the requirements specification for an intended software system*
2. *Demonstrate the UML diagrams for the given specification*
3. *Map the design properly to the code*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation*
2. *Describe the importance of systems analysis and design in solving complex problems*
3. *Explain how the object-oriented approach differs from the traditional approach to systems analysis and design*
4. *Understand the role and function of each UML model in developing object oriented software*
5. *Exhibit software development process*
6. *Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.*

**List of Experiments:**

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the use case diagram
9. Improve the re usability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios

**OOAD Problems that may be considered are**

1. College information system
2. Hostel management
3. ATM system
4. Library management system
5. Passport Automation System
6. Political Administration System.

**TEXT BOOKS**

1. Grady Booch, James Rumbaugh, Ivar Jacobson, *The Unified Modeling Language, User Guide,* 2nd edition, Pearson Education, 2005.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, *UML 2 Toolkit,* WILEY-Dreamtech India Pvt. Ltd, 2009.

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## (19HS0805) ENVIRONMENTAL SCIENCE
## (NON-CREDIT COURSE)

**COURSE OBJECTIVES**

The Objectives of this Course:

1. *Identify environmental problems arising due to engineering and technological activities and the science behind those problems.*
2. *To identify the importance of interlinking of food chains.*
3. *Learn about various attributes of pollution management and waste management practices.*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Recognize the physical,chemical and biological components of the earth's systems and show how they function.*
2. *Characterize and analyze human impacts on the environment.*
3. *Integrate facts,concepts and methods from multiple disciplines and apply to environmental Problems.*
4. *Create informed opinions about how to interact with the environment on both a personal and a social level.*
5. *Perform independent research on human interactions with the environment.*
6. *Recognize the ecological basis for regional and global environmental issues*

## UNIT – I
**INTRODUCTION:**

Definition, Scope and Importance of environmental science, Need for Public Awareness
**NATURAL RESOURCES:**

Forest resources: Use and over-exploitation, deforestation,Mining, dams and their effects on forests and tribal people.

Water resources : Use and over utilization of surface and ground water. Floods, drought, conflicts over water, dams benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral

Energy resources: Renewable and Non- Renewable sources of energy. Solar energy, Hydro electrical energy, Wind energy, Nuclear energy .

## UNIT-II
**ECOSYSTEMS:**

Concept of an ecosystem,structure and function of an ecosystem. Producers, Consumers and Decomposers. Biogeochemical cycles, Ecological succession,energy flow in an ecosystem,Food chains, food webs and ecological pyramids.Types of ecosystems (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem.

**UNIT-III**
**BIODIVERSITY AND ITS CONSERVATION:**
Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega diversity Nation, Hot spots of biodiversity, Value of biodiversity, Threats to biodiversity, Endemic, Endangered and Extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

**UNIT-IV**
**ENVIRONMENTAL POLLUTION AND GLOBAL ENVIRONMENTAL ISSUES:**
Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake.
Pollution episodes: Air pollution,Water pollution,Land pollution,Noise pollution,Automobile, Nuclear pollution.Global warming, Acid rain,Ozone layer depletion and controlling measures.
Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment.
**Solid Waste Management**: causes, effects and control measures of Municipal solid wastes.
 E-waste and management, Role of an individual in prevention of pollution .

**UNIT-V**
**ENVIRONMENTAL LEGISLATIONS, LAWS, POLICIES FOR SUSTAINABLE DEVELOPMENT:**
 Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water  Act. Wildlife protection Act, Forest conservation Act. Municipal Solid Waste management. International conventions/Protocols Earth summit, Kyoto protocol and Montreal Protocol. Unsustainable to sustainable development, Role of NGO's for Sustainable development. Role of IT in Environment, GIS methods for Sustainable development.
**Field work**- visit to a local area to document environmental assets, river, forest, grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture). study simple ecosystems.

**TEXT BOOKS**
1. A.Kaushik and C.P.Kaushik*, Environmental Sciences, 5th edition,* New age international publishers, 2015.
2. M.Anji Reddy, *Text Book of Environmental Science and Technology*, BS Publications, 2016.

**REFERENCES**
1. Anil Kumar and Arnab Kumar De, *Environmental Studies*, New Age International Publishers, New Delhi, 3rd Edition 2015.
2. R.K. Trivedi, *"Handbook of Environmental Laws, Rules, Guidelines, Compliances andStandards"*, Vol.I and II, Enviro Media, 2016.
3. Rajagopalan.R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

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## (19CS0515) COMPILER DESIGN

**COURSE OBJECTIVES**

The objectives of this course:

1. *Realize that computing science theory can be used as the basis for real applications*
2. *Introduce the major concept areas of language translation and compiler design.*
3. *Learn how a compiler works*
4. *Know about the powerful compiler generation tools and techniques, which are useful to the other non-compiler applications*
5. *Know the importance of optimization and learn how to write programs that execute faster*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Specify and analyze the lexical, syntactic and semantic structures of advanced language features*
2. *Classify the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation*
3. *Write a scanner, parser, and semantic analyzer without the aid of automatic generators*
4. *Interpret fully processed source code for a novel language into machine code for a novel computer*
5. *Implement techniques for intermediate code and machine code optimization*
6. *Design the structures and support required for compiling advanced language features.*

**UNIT- I**
**Introduction:** Language processors, Phases of a Compiler, Bootstrapping, applications of compiler technology, Compiler Construction Tools.
**Lexical Analysis**: The Role of the lexical analyzer, Input Buffering, Specification of tokens, Recognition of tokens, Lexical Analyzer generator - LEX

**UNIT- II**
**Syntax Analysis**: Role of the parser, Context Free Grammars - Definition, Derivations, Parse trees, Ambiguity, Eliminating ambiguity, Left recursion, Left factoring.
**Top Down Parsing:** Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars, Error recovery in predictive parsing.

**UNIT- III**
**Bottom Up Parsing:** Handle pruning, Shift-Reduce parsing, SLR Parsing, Canonical LR(1) parsers, LALR parsers, YACC tool.

**Semantic Analysis**: Syntax Directed Definition, SDT, Evaluation order of SDD, Type Checking.

**UNIT- IV**
**Intermediate Code Generation:** Types of Intermediate code, three address code- Quadruples, Triples, Indirect Triples, control flow statements
**Run Time Environment:** Storage organization- Static, Stack, Heap management, Activation Records, Symbol Table organization- Entries, operations.

**UNIT- V**
**Code Optimization**: Principle sources of optimization, function preserving transformations, loop optimization, Basic Blocks and flow graphs, optimization on basic blocks, global data flow analysis, machine dependent optimization.
**Code Generation:** Issues in the design of a code generator, The Target Machine, simple code generator, Register allocation and Register assignment.

**TEXT BOOKS**
1. Alfred V. Aho, Monica, S.Lam, RaviSethi, Jeffrey D. Ullman, *Compilers Principles*, Techniques and Tools, Second Edition, Pearson.
2. K. Muneeswaran, *Compiler Design*, Oxford University Press, 2012.

**REFERENCES**
1. K. Muneeswaran, *Compiler Design,*Oxford University Press, 2012
2. Keith D. Cooper & Linda Torczon., K Morgan - Kaufmann, *Engineering A Compiler,* Second Edition - ELSEVIER
3. Parag H. Dave, Himanshu B. Dave, *Compilers Principles and Practice‖,* PEARSON
4. Sandeep Saxena, Rajkumar Singh Rathore., *Compiler Design,* S.Chand publications
5. Santanu Chattopadhyay., *Compiler Design,* PHI

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**(19CS0516) DESIGN AND ANALYSIS OF ALGORITHMS**

**COURSE OBJECTIVES**

The objectives of this course is to

1. *Demonstrate the importance of algorithms in computing.*
2. *Explain the analysis of algorithms*
3. *Illustrate the method of finding the complexity of algorithms*
4. *Describe the advanced algorithm design and analysis techniques*
5. *Introduce special classes of algorithms NP completeness and the classes P &NP*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Determine the time complexity of an algorithm by solving the corresponding Recurrence equation*
2. *Apply the Divide and Conquer strategy to solve searching, sorting and matrix multiplication problems.*
3. *Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.*
4. *Illustrate Backtracking technique for solving constraint satisfaction problems.*
5. *Differentiate the LC and FIFO branch and bound solutions for optimization problems, and compare the time complexities with Dynamic Programming techniques.*
6. *Define and Classify deterministic and Non-deterministic algorithms; P, NP, NP –hard and NP-complete classes of problems.*

**UNIT- I**
**Introduction:** Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Order of growth, Asymptotic Notation-Big oh (O) notation, Omega notation, Theta notation and Little oh (o) notation. Recurrences - Towers of Hanoi. Disjoint Sets -disjoint set operations, union and find algorithms.

**UNIT- II**
**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees.
**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication**.**

**UNIT- III**
**Greedy method:** General method, applications-Job sequencing with dead-lines, knapsack problem, Minimum-cost spanning trees, Single source shortest path.
**Dynamic Programming:** General method, applications-Optimal binary search trees, 0/1 knapsack, All pairs shortest path, The Travelling sales person problem.

**UNIT- IV**

**Backtracking:** General method, applications-8-queen problem, sum of subsets, graph coloring, Hamiltonian cycles.

**Branch and Bound:** General method, Applications -Travelling sales person, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**UNIT- V**

**NP-Hard and NP-Complete problems:** Basic concepts, nondeterministic algorithms, The classes-NP-Hard and NP Complete, Cook's theorem, Reduction Source Problems, Reductions: Reductions for some known problems.

**TEXT BOOKS**
1. Ellis Horowitz, S. Satraj Sahni and Rajasekharam, "*Fundamentals of Computer Algorithms*", Galgotia Publications Pvt. Ltd., 4th Edition, 1998.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, "*Design and Analysis Algorithms* "-  Pearson Education India, 2007.

**REFERENCES**
1. Anany Levitin, "*Introduction to the Design and Analysis of Algorithms*", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "*Introduction to Algorithms*", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, *"Data Structures and Algorithms",* Pearson Education, Reprint 2006.
4. Donald E. Knuth, *"The Art of Computer Programming",* Volumes 1& 3 Pearson Education, 2009.
5. Steven S. Skiena, Second Edition, *"The Algorithm Design Manual"*, Springer, 2008.

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## (19CS0517) DATA WAREHOUSING AND DATA MINING

**COURCE OBJECTIVES**

The objectives of this course:

1. *Know the basic concepts and principles of data warehousing and data mining*
2. *Learn pre-processing techniques and data mining functionalities.*
3. *Learn and create multidimensional models for data warehousing*
4. *Study and evaluate performance of Frequent Item sets and Association Rules.*
5. *Understand and Compare different types of classification and clustering algorithms*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to

1. *Understand the basic concepts of data warehouse and data mining*
2. *Apply pre-processing techniques for data cleansing*
3. *Evaluate and Analyze performance of algorithms for Association Rules*
4. *Analyze Classification and Clustering algorithms*
5. *Developing practical work of Data Mining techniques and design hypotheses based on the analysis to conceptualize a Data Mining Solution to practical problem*
6. *Utilizing Data mining algorithms to build analytical applications.*

**UNIT - I**
**Introduction:**
Motivation to Data Mining, Importance, Kinds of Data that can be mined, Data Mining Functionalities, Classification of Data mining Systems, Data Mining Task Primitives, Major Issues in Data Mining.
**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

**UNIT - II**
**Data Warehouse and OLAP Technology: An Overview**
Data Warehouse fundamentals - A Multidimensional Data Model: From Tables and Spreadsheets to Data Cubes, Stars, Snowflakes, and Fact Constellations, Measures: Their Categorization and Computation, Concept Hierarchies, OLAP Operations in Multidimensional Data Model, A Starnet Query Model for Querying Multidimensional Databases - Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehouse to Data Mining, Attribute Oriented Induction.

**UNIT -- III**

**Mining Frequent Patterns, Associations and Correlations:**
Basic Concepts and a Road Map, Efficient and Scalable Frequent Item Set Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint based Association Mining.

**UNIT - IV**

**Classification and Prediction:**
Classification and Prediction fundamentals, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation.
**Prediction:** Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

**UNIT - V**

**Cluster Analysis:**
Basics of Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis, Data mining applications.

**TEXT BOOKS**
1. Jiawei Han and Micheline Kamber, *"Data Mining: Concepts and Techniques"*, Elsevier, Second Edition,2010.
2. Prabhu C.S.R., *"Data Ware housing: Concepts, Techniques, Products and Applications"*, Prentice Hall of India, 2011

**REFERENCES**
1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, *Introduction to Data Mining*, Pearson Education.
2. Arun K Pujari, *Data Mining Techniques*, University Press, 2001.
3. Sam Aanhory & Dennis Murray,*Data Warehousing in the Real World*, Pearson EdnAsia
4. K.P.Soman, S.Diwakar,V.Ajay, *Insight into Data Mining*, PHI,2008.

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## (19CS0518) SOFTWARE ENGINEERING

**COURSE OBJECTIVES**

The objectives of this course is to

1. *Illustrate the Software Development Models*
2. *Explain Software Requirements Engineering Process and SRS document*
3. *Illustrate the importance of modeling and modeling languages*
4. *Explain importance of Design Interface*
5. *Explain various testing methodologies*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Define and develop a software project from requirement gathering to implementation*
2. *Ability to code and test the software*
3. *Illustrate the plan, estimate and maintain software systems*
4. *Understand the basic testing procedures*
5. *Classify the generation of test cases and test suites.*
6. *Test the applications manually by applying different testing methods and automation tools.*

**UNIT – I**

**INTRODUCTION:** Introduction to Software Engineering , Software Process, Software Myths, A generic view of process, A layered Technology, A Process Framework, Software Process Models., Unified process

**INTRODUCTION TO AGILITY:** Agility, Agile Process, Extreme Programming, Other Agile Process Models.

**UNIT – II**

**REQUIREMENTS ANALYSIS AND SPECIFICATION:** Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Modeling Scenarios, Information and Analysis Classes: Requirements Analysis, Scenario-BasedModeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Behavioral Models

**UNIT – III**

**DESIGN CONCEPTS**:  The Design Process, Design Concepts, Design Model.

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

**UNIT – IV**
**USER INTERFACE DESIGN**: The Golden Rules, User Interface Analysis and Design, Interface        Analysis, Interface Design Steps.
**WEB APP DESIGN:** Introduction, Web App Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design

**UNIT – V**
**TESTING:** A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation Testing, System Testing, The Art of Debugging.
**TESTING CONVENTIONAL APPLICATIONS:** Software Testing Fundamentals, White-Box Testing, Black-Box Testing, Testing for Specialized Environments, Architectures and Applications, Object-Oriented Testing Strategies, Object-Oriented Testing Methods, Testing Methods Applicable at the Class level, Interclass Test-Case Design.

**TEXT BOOK**
1. Roger S.Pressman, *Software engineering- A practitioner's Approach*, McGraw-Hill International Edition, seventh edition, 2001.

**REFERENCES**
1. Ian Sommerville, *Software Engineering*, 8th Edition, Pearson Education, 2008.
2. Richard Fairley, *Software Engineering Concepts* , McGraw Hill, 2004.

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**(19CE0129) ELEMENTS OF ROAD TRAFFIC SAFETY**
**OPEN ELECTIVE - III**

**COURSE OBJECTIVES**

The objectives of this course is to

1. *To understand the accident statistics globally and in India specifically, its causes and measures to overcome the situation.*
2. *The traffic regulation, parking problems, understanding of road signs, signals and marking are also taught; so that the student is well informed about all safety measures that a traffic engineer need to understand*
3. *To understand the various aspects of street lighting*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Identify the causes for road accidents and can implement measures to prevent road accidents*
2. *Describe traffic regulations and implement parking methods*
3. *Classify different traffic signal and can design traffic signal system*
4. *List and illustrate various traffic signs*
5. *List and discuss various road markings*
6. *Discuss importance of street lighting and classify various street lighting system*

**UNIT – I**

**Road Accidents – Causes & Prevention:** Road Accidents & Traffic Engineering – Accident Situation in India – International Comparison of Road Accidents – Road & its Effects on Accidents – The Vehicle – The Driven – Skidding – Speed in Relation of Safety – Weather & its Effects on Accidents – Pedestrian Safety -Cyclists – Motor Cycle & Scooter Rider – Parking & Its Influence on Accident – Legislation, Enforcement, Education & Propaganda – Cost of Road Accidents

**UNIT – II**

**Regulations of Traffic:** Basic Principals of Regulation – Regulation of Speed – Regulation of Vehicles – Regulations Concerning the Driver – Regulations Concerning Traffic – Parking Regulations – Enforcement of Regulations.

**Parking:** Traffic & Parking Problems – Ill-Effects of Parking – Zoning & Parking Space Requirement Standards – Design Standards for On-Street Parking Facilities – Traffic Regulatory Measures for On-Street Parking – Off-Street Parking Facilities – Peripheral Parking Schemes – Loading & Unloading Facilities – Truck Terminals – Long Distance Bus Terminals

## UNIT – III

**Traffic Signs:** Importance of Traffic Signs – Need for International Standardization – The Situation in India – General Principals of Traffic Signing – Types of Traffic Signs – Danger Signs (Warning Signs or Cautionary Signs) – Prohibitory Signs – Mandatory Signs – Informatory Sings – Indication Signs – Direction Signs, Advance Direction Signs & Place Identification Signs – Overhead Sings – Route Marker Sings – Location, Height & Maintenance of Traffic Sings

## UNIT – IV

**Traffic Signals:** Advantages & Disadvantages of Traffic Signals – Signal Indications – Signal Face – Illustration of the Signals – Number & Location of Signals Faces – Amber Period, Red/Amber Period & Inter Green Period – Fixed Time Signals & Vehicle Actuated Signals – Determination of Optimum Cycle Length & Signal Settings for an Intersection with Fixed Time Signals – Warrants for Signals – Co-ordinated Control of Signals – Signal Approach Dimensions – Area Traffic Control – Delay at Signalized Intersection

## UNIT – V

**Road Markings:** Function – Types of Road Marking – General Principals of Longitudinal Pavement Markings – Material & Colour – Centre Lines – Traffic Lane Lines – No Overtaking Zone Markings – Pavement Edge Lines – Carriageway Width Reduction Transition Marking – Obstruction Approach Markings – Stop Lines – Pedestrian Crossings – Cyclist Crossings – Route Direction Arrows – Word Messages – Markings at Approaches to Intersections – Parking Space Limits – Object Markings

**Street Lighting:** Need for Street Lighting – Definition of Common Terms – Some Laws of Illumination – Mounting Height – Spacing – Lantern Arrangements – Type of Lamps – Lamp Installation of T' Junctions & Cross Roads – Illumination of Traffic Rotaries – Lighting of Bends – Lighting of Dual Carriageways – Lighting of Roads Carrying Only Local Traffic – Lighting Bridges – Tunnel Lighting – Maintenance of Lighting Installation

## TEXTBOOKS

1. L.R.Kadiyali and Lal, *Traffic Engineering and Transportation Planning*, Khanna Publications, 9th edition, 1999
2. S.K.Khanna & C.E.G.Justo, *Highway Engineering,* Published by Nemchand & Bros,10th edition, 2012

## REFERENCES

1. L.R.Kadiyali and Lal, *Principles and Practice of Highway Engineering Design*, Khanna Publications, 7th edition, 2013
2. R.Srinivasa Kumar, *Text book of Highway Engineering*, Universities Press
3. James H Banks, *Introduction to Transportation Engineering*, Tata McGraw hill Publications, 2nd edition

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**(19EE0239)  SOLAR PHOTOVOLTAIC SYSTEMS**
**OPEN ELECTIVE - III**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To develop a comprehensive technological understanding in solar PV system components*
2. *To provide in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant*
3. *To pertain knowledge about planning, project implementation and operation of solar PV power generation*

**COURSE OUTCOMES (COs)**

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

1. *Understand of renewable and non-renewable sources of energy*
2. *Gain knowledge about working principle of various solar energy systems*
3. *Analyse the solar power PV power generation*
4. *Applying the knowledge on to installation and integration of PV modules for different applications*
5. *Understand the operation of different solar collectors in the market*
6. *Understand the solar thermal energy storage systems*

**UNIT-I**
**Introduction**

Sources of renewable energy; global potential for solar electrical energy systems. Solar radiation. Extra terrestrial and terrestrial solar spectrum; clear sky direct-beam radiation; total clear sky insulation on a collecting surface; radiation on the collector in tracking systems; calculation of average monthly insolation from measured data

**UNIT-II**
**PV cells and modules**

Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters

**UNIT-III**
**Solar Photovoltaic Module Array**

Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module.

**UNIT-IV**

**Solar PV System Design and Integration**

Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant.

**UNIT-V**

**Solar collectors and Solar energy storage**

Different types of solar collectors, Flat plate and concentrated type collectors, Fundamental Terminologies of thermal storage, Sensible heat storage materials, Latent heat storage materials, Solar thermo-chemical energy storage systems, Advantages and disadvantages of solar thermal storage, application of thermal storage

**TEXT BOOKS**
1. Chetansingh, solanki *Solar Photovoltaic* PHI, Learning private ltd., New dehli- 2018
2. G.D Rai, *Non-conventional Sources of Energ,y* Khanna Publishers, Delhi, 2012

**REFERENCES**
1. Chetan Singh Solanki, *Renewable Energy Technologies; A Practical Guide for Beginners,* PHI School Books (2008)
2. Kothari D.P. and Signal K.C, *Renewable Energy Sources and Emerging Technologies*, New Arrivals –PHI; 2 Edition (2011)

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**(19ME0313)  NON-CONVENTIONAL ENERGY RESOURCES**
**OPEN ELECTIVE - III**

**COURSE OBJECTIVES**
The objective of the course is to
1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of Solar energy, its harnessing technologies & its applications*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation*
4. *Explain the concept of bio energy and its conversion devices*
5. *Differentiate various renewable energies such as tidal energy, geothermal energy, fuel cells etc.*

**COURSE OUTCOMES (COs)**
On successful completion of the course, the student will be able to
1. *State various sources of Energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the Wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the Biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC, Fuel cell, etc. for effective construction of Hybrid systems.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies*

**UNIT-I**
**Introduction**: Energy- World Energy use – Classification of Energy's - Reserves of Energy Resources– Environmental Aspects of Energy Utilization
**Renewable energy**: Need Of Renewable Energy – Renewable Energy Scenario in Andhra Pradesh, India and Around the World.

**UNIT-II**
**Solar thermal conversion:** Flat Plate and Concentrating Collectors – Solar direct Thermal Applications– Solar thermal Power Generation

**Photo voltaic Conversion:** Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications, Solar Radiation Measurements

## UNIT-III
**Wind Energy**: Wind Formation  - Site Selection For Wind Turbine - Working Principle of Wind Turbine

**Wind Energy System**: Types of Wind Energy Systems – Performance – Details of Wind Turbine – Wind Energy Measurement, Safety and Environmental Aspects.

## UNIT-IV
**Bio – Energy**:  Biomass direct combustion – Biomass gasifiers – Biogas plants

**Bio Fuel:** Ethanol production – Biodiesel – Cogeneration - Biomass Applications

## UNIT-V
**Other Sources of Energy**: Tidal energy – Wave Energy – Open and Closed OTEC Cycles, Geothermal Energy

**Hydrogen Fuel:**  Hydrogen production and Storage - Fuel Cell Systems – Hybrid Systems.

## TEXT BOOKS
1. R.K.Rajput , *Non-conventional Energy Sources and Utilization,* S. Chand Publishers, 2nd Edition, 2014.
2. G. D Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 1st Edition, 2010.
3. Nicholas Jenkins & Janaka Ekanayake, *Renewable Energy Engineering*, Cambridge University Press; 1st Edition, 2017.

## REFERENCES
1. Dr. R K Singal, *Non-Conventional Energy Resources*, S.K Kataria & Sons, 4th Edition, 2014.
2. John Twidell & Tony Weir, *Renewable Energy Sources*, Routledge publisher, 3rd Edition, 2015.
3. Sukhatme. S.P, *Solar Energy, Principles of Thermal Collection and Storage,* Tata
4. McGraw Hill Publishing Company Limited, 6thEdition, 1990.

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**(19EC0450) INTRODUCTION TO IOT**
**OPEN ELECTIVE - III**

**COURSE OBJECTIVES**

The objective of the course is to

1. *To provide an overview on the ICT ecosystem and enabling environment to foster Internet of Things (including technology, standards, system management and applications) deployments.*
2. *Define the infrastructure for supporting IoT deployments.*
3. *To provide an understanding of the technologies and the standards relating to the Internet of Things.*
4. *Understand various case studies related to IoT domain.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to

1. *Understand the technology and standards relating to IoTs.*
2. *Understand where the IoT concept fits within the broader ICT industry and possible future trends.*
3. *Understand the key components that make up an IoT system.*
4. *Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.*
5. *Configure Raspberry Pi, Understand Sensors, Actuators & get started with python on Raspberry Pi.*
6. *Apply the knowledge and skills acquired during the course to design, build and test a complete, working IoT system involving prototyping, programming and data analysis.*

**UNIT – I**

**IOT INTRODUCTION & CONCEPTS:** Introduction to Internet of Things - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates.

**UNIT – II**

**DOMAIN SPECIFIC IOTs:** Home Automation – Cities – Environment – Energy – Retail – Logistics - Agriculture – Industry - Health & Lifestyle.

**UNIT – III**

**IOT AND M2M:** Introduction – M2M – Difference between IoT an M2M - Software Defined Networking - Network Function Virtualization for IoT.
**DEVELOPING INTERNET OF THINGS:** IoT Design Methodology – Motivation for using Python

**UNIT – IV**

**IOT PHYSICAL DEVICES & ENDPOINTS:** IoT Device – Raspberry Pi Board - Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming raspberry Pi with Python – Other IoT devices.

**UNIT – V**

**CASE STUDIES ILLUSTRATING IOT DESIGN:** Home Automation – Cities – Environment – Agriculture – Productivity applications.

**TEXT BOOKS**
1. Vijay Madisetti – Arshdeep Bahga*, Internet of Things a Hands-on Approach*,1ˢᵗ Edition,  2014.
2. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases,* CRC Press,1ˢᵗEdition,  2014.

**REFERENCES**
1. Raj Kamal*, Embedded Systems*, Tata McGraw-Hill Education, 2ⁿᵈEdition, 2011.
2. Adrian McEwen & Hakim Cassimally*, Designing of Internet of Things,* John Wiley and sons Ltd, 1ˢᵗ Edition, 2014,
3. Daniel Kellmereit - Daniel Obodovski, *The Silent Intelligence: The Internet of Things,DnD Ventures*, 1ˢᵗ Edition,2013.

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**(19HS0861)   BUSINESS ETHICS**
**OPEN ELECTIVE - III**

**COURSE OBJECTIVES**

The objective of the course is to

1. *To provide basic knowledge of business ethics, personal ethics and values in modern context*
2. *To learn and develop best ethical practices in management disciplines to become good managers*
3. *To make them learn role of corporate culture and corporate governance*

**COURSE OUTCOMES (COs)**

After the completion of course Students will be able to:

1. *Apply various ethical principles in business and corporate social responsibility practices*
2. *Recognize how personal ethics can influence behavior and apply in decision making*
3. *Explain the ethical challenges facing the various functional departments*
4. *Identify the organizational and cultural variables that impact ethical judgment*
5. *Analyze various ethical codes in corporate governance*
6. *Identify  organizational policies and systems that employ ethical conduct*

**UNIT - I**

**BUSINESS ETHICS:** Introduction – Meaning - Scope – Types of Ethics – Characteristics – Factors influencing Business Ethics – Importance of Business Ethics - Arguments for and against business ethics- Basics of business ethics - Corporate Social Responsibility – Issues of Management – Crisis Management

**UNIT - II**

**PERSONAL ETHICS:** Introduction – Meaning – Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind.

**UNIT - III**

**ETHICS IN MANAGEMENT – I:** Introduction – Ethics in HRM – Ethics in HRM: Selection, Training and Development – Ethics at work place – Ethics in performance appraisal - Marketing Ethics –Technology Ethics and Professional ethics.

**UNIT - IV**

**ETHICS IN MANAGEMENT – II:** Ethics in Finance: Insider trading - ethical investment - Ethical issues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cyber crime

**UNIT – V**

**ROLE OF CORPORATE CULTURE IN BUSINESS:** Meaning – Functions – Impact of corporate culture – cross cultural issues in ethics - Modern Ethical Models for Decision Making, Ethics for manager, ethics in business competition

**TEXT BOOKS**
1. Murthy CSV: *Business Ethics and Corporate Governance*, HPH, 2007
2. Dr. K. Nirmala, Karunakara Readdy : *Business Ethics and Corporate Governance*, HPH

**REFERENCES**
1. M.G. Velasquez, *Business Ethics*, Prentice Hall India Limited, New Delhi, 7TH Edition,2012
2. Dr. K. Nirmala, Karunakara Readdy : *Business Ethics and Corporate Governance*, HPH
3. K. Venkataramana, *Corporate Governance*, SHBP, 2018

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**(19CS0519) ANALYSIS OF ALGORITHMS LAB**

## COURSE OBJECTIVES

The objectives of this course is to

1. *Analyze the asymptotic performance of algorithms.*
2. *Write rigorous correctness proofs for algorithms.*
3. *Demonstrate a familiarity with major algorithms and data structures.*
4. *Apply important algorithmic design paradigms and methods of analysis.*
5. *Synthesize efficient algorithms in common engineering design situations.*

## COURSE OUTCOMES (COs)

On successful completion of the course, the students will be able to

1. U*nderstand the techniques of proof by contradiction, mathematical induction and recurrence relation, and apply them to prove the correctness and to analyze the running time   of  algorithms.*
2. *Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime   and memory demands.*
3. *Interpret an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate) .*
4. *Relate the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.*
5. *Infer the basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.*
6. *Analyze NP-Completeness , NP-complete problems and synthesize efficient algorithms in   common engineering design situations.*

## LIST OF EXPERIMENTS:

1. To obtain the Topological ordering of vertices in a given digraph.
2. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements.
3. Sort a given set of elements using the Merge sort method and determine the time required to sort the elements.
4. Check whether a given graph is connected or not using DFS method.
5. Print all the nodes reachable from a given starting node in a directed graph using BFS method
6. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.And Implement 0/1 Knapsack problem using Dynamic Programming.

8. Write a program to implement Travelling Sales Person problem using Dynamic programming.
9. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's   algorithm.
10. Design and implement the presence of Hamiltonian Cycle in an undirected Graph G of n vertices.

**TEXT BOOKS**

1. Ellis Horowitz, S.Satraj Sahni and Rajasekharam, *Fundamentals of Computer Algorithms,* Galgotia Publications Pvt. Ltd., 4th Edition, 1998.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave*, Design and Analysis Algorithms,* Pearson Education India, 2007.

**REFERENCES**

1. Anany Levitin, *"Introduction to the Design and Analysis of Algorithms",* Third Edition,Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms",* Third Edition, PHI Learning Private Limited, 2012*.*
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D.Ullman, *"Data Structures and Algorithms",* Pearson Education.

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**(19CS0520) DATA MINING LAB**

## COURSE OBJECTIVES
The objectives of the course:
1. *Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA),*
2. *Explain the data sets and data preprocessing*
3. *Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression*
4. *Exercise the data mining techniques with varied input values for different parameters*

## COURSE OUTCOMES (COs)
On successful completion of this course, student will be able to
1. *Explore WEKA tool*
2. *Perform data preprocessing tasks*
3. *Demonstrate association rule mining on datasets*
4. *Implement classification techniques on datasets*
5. *Illustrate clustering and regression techniques on datasets*
6. *Design and implement data mining algorithms*

## LIST OF EXPERIMENTS:
**1. Credit Risk Assessment**
**Description:** The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to makes many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient. To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.
   a) Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
   b) Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
   c) Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
   d) Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

## 2. The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data (Down load from web). In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset

- DM stands for Deutsche Mark, the unit of currency, worth about 90cents Canadian (but looks and acts like a quarter).
- Owns telephone. German phone rates are much higher than in Canada so fewer people own telephones.
- Foreign worker. There are millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.
- There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad.

**Sub tasks : (Turn in your answers to the following tasks)**

a) List all the categorical (or nominal) attributes and the real-valued attributes separately.

b) What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.

c) One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

d) Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly ? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy ?

e) Is testing on the training set as you did above a good idea ? Why or Why not ?

f) One approach for solving the problem encountered in the previous question is using cross validation ? Describe what is cross validation briefly. Train a Decision Tree again using cross validation and report your results. Does your accuracy increase/decrease ?Why ?

g) Check to see if the data shows a bias against "foreign workers"(attribute 20),or "personal-status" (attribute 9). One way to do this(perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.

h) Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the raff data file  to get all the attributes initially before you start selecting the ones you want.) Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might

i) be higher than accepting an applicant who has bad credit (case 2). Instead of counting them is classifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?

j) Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees How does the complexity of a Decision Tree relate to the bias of the model ?

k) You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain ? Also, report your accuracy using the pruned model. Does your accuracy increase?

l) (Extra Credit): How can you convert a Decision Trees into "if-then else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? One R classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

**Task Resources:**

Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)

- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)

Weka resources:

1. Introduction to Weka (html version) (download ppt version)
2. Download Weka
3. Weka Tutorial
4. ARFF format

**TEXT BOOKS**

1. Jiawei Han and Micheline Kamber, Elsevier, *Data Mining: Concepts and Techniques,* Second Edition,2010.
2. Prabhu C.S.R.,*Data Ware housing: Concepts, Techniques, Products and applications*, Prentice Hall of India, 2011

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### (19CS0521) LINUX PROGRAMMMING LAB

## COURSE OBJECTIVES
The objective of the course is to
1. *To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.*
2. *To evaluate the concept of shell scripting programs.*
3. *To create the directory, how to change and remove the directory.*
4. *Use the following Bourne Shell constructs: test, if then, if then else, if then elif, for, while, until, and case.*
5. *Demonstrate how to use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod etc.,*
6. *Make a Shell script executable.*

## COURSE OUTCOMES (COs)
On successful completion of the course, the students will be able to
1. *Recognize, understand and make use of various LINUX commands*
2. *Create file systems and directories and operate them*
3. *Relate the LINUX commands and shell programs*
4. *Understand the inner workings of LINUX-like operating systems.*
5. *Write Regular expressions for pattern matching and apply them to various filters for a specific task*
6. *Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem*

## LIST OF EXPERIMENTS:
1. Demonstrate  the following commands
   i.  Date Command
   ii. Calendar Command
   iii.Basic Calculator Commands
   iv.Print Command
   v.  Script Command
   vi.Manual Command
2.
   i. Use the appropriate command to determine your login shell
   ii. Use the /etc/passwd file to verify the result of step i.
   iii.Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
   iv.Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

3. Demonstrate the following Commands
    i. To create directory
    ii. To change directory permission
    iii. To create sub directory
    iv. To delete directory
    v. To list the files and directories
4.
    i. Use vi editor to create a file called myfile.txt
    ii. open the file created
    iii. Add some text
    iv. Change some text
    v. Delete some text
    vi. Apply Cursor move commands
    vii. Save the Changes

5.
    i. Use the cat command to create a file containing the following data. Call it student_data
       use tabs to separate the fields.
       101    Ravi    15.65
       102    Ramu    26.27
       103    Sita    36.15
       104    Raju    21.86
    ii. Use the cat command to display the file, student_data.
    iii. Use the vi command to correct any errors in the file, student_data
    iv. Use the sort command to sort the file student_data according to the first field. Call the
        sorted   file my table
    v. Print the file student_data
    vi. Use the cut and paste commands to swap fields 2 and 3 of student_data. Call it my table
        (same name)
    vii.  Print the new file, student_data.
6.
    i. Write a shell script that takes a command –line argument and reports on whether it is
       directory, a file, or something else.
    ii. Write a shell script that accepts one or more file name as arguments and converts all
        of them to uppercase, provided they exist in the current directory.
7.
    i. Write a shell script that accepts a file name starting and ending line numbers as
       arguments and displays all the lines between the given line numbers.
    ii. Write a shell script that deletes all lines containing a specified word in one or more
        files supplied as arguments to it.
8. i. Write a shell script that computes the gross salary of a employee according to the
   following rules:
   a) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
   b) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic

The basic salary is entered interactively through the key board.

ii. Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

**TEXT BOOKS**
1. N.Matthew,R.Stones, Wrox *Beginning Linux Programming*, Wily India, 4 th Edition,
2. N.B.Venkateswarlu *Advanced Unix Programming*, BS Publications.

**REFERENCE**
1. M.G.Venkatesh Murthy *Unix & Shell Programming*,Pearson Education Unix shells by example,4th Edition Ellie Quigley, Pearson Education.

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### (19HS0858) HUMAN VALUES & PROFESSIONAL ETHICS

**COURSE OBJECTIVES**

The Objective of the course is to

1. *Create awareness on Human Values.*
2. *Impart knowledge on an Engineering Ethics*
3. *Instill morality, accountability in an engineering experimentation*
4. *Create awareness on an assessment of safety, risk and rights*
5. *Develop knowledge on global issues*
6. *Create an awareness on Human Values and Engineering Ethics, Engineers social responsibility in an experimentation, appreciate the rights of others and ethics in global issues.*

**COURSE OUTCOMES (COs)**

Online completion of the course the student will be able to

1. *Identify and analyze human values in their relevant field*
2. *Assess their own engineering ethics and have the social consciousness*
3. *Get knowledge on codes of ethics and on an utilitarian thinking*
4. *Identify safety, risks and an ethical concern in research and intellectual contexts*
5. *know necessity of computer and an environmental ethics, give a picture on weapons development*
6. *Upon completion of the course, the student should be able to apply the ethics in society, discuss an ethical issues related to engineering and realize the responsibilities and rights in the society*

.

**UNIT I**

**Human Values -** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Necessity of Yoga and meditation for professional excellence and stress management.

**UNIT II**

**Engineering Ethics -** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

**UNIT III**

**Engineering As Social Experimentation**- Engineering as Experimentation--Engineering Projects VS. Standard Experiments, Engineers as responsible Experimenters– Conscientiousness- Comprehensive Perspective - Moral Autonomy - Accountability, Industrial Standards, Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV**

**Safety, Responsibilities And Rights**- Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk, Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

**UNIT V**

**Global Issues**-Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

**TEXTBOOKS**
1. R S Nagarajan, *Professional Ethics and Human Values*, New Age International (P) Limited Publishers,3rd Edition,2006
2. M.Govindarajan, S.Natarajananad, V.S.SenthilKumar,*Engineering Ethics includes Human Values* -PHI Learning Pvt. Ltd- 2nd Edition,2009

**REFERENCES**
1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, *Engineering Ethics – Concepts and Cases,* Cengage Learning, 2nd Edition, 2009
2. John R Boatright, *Ethics and the Conduct of Business*, Pearson Education, New Delhi, 1st Edition,2003
3. Edmund G Seebauer and Robert L Barry, *Fundamentals of Ethics for Scientists and Engineers*, Oxford University Press, Oxford, 4th Edition,2001
4. PSR Murthy, *Indian Culture, Values and Professional Ethics*, BS Publication, 2nd Edition, 2013

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**(19CS0522) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the various characteristics of Intelligent agents*
2. *To learn the different search strategies in AI*
3. *To investigate various Supervised Learning models of machine learning*
4. *To investigate various Unsupervised Learning models of machine learning*
5. *To investigate various Reinforcement Learning models of machine learning*
6. *To expose students to the Dimensionality Reduction*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Understand the basic concepts and characteristics of Artificial Intelligence*
2. *Explain the problem solving methods and searching algorithms*
3. *Summarize supervised learning and classification techniques*
4. *Apply the concept of unsupervised learning and Clustering for applications*
5. *Illustrate the concept of dimensionality reduction to solve problems*
6. *Infer theoretical and practical aspects of reinforcement learning*

**UNIT-I**

**INTRODUCTION:** Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

**UNIT-II**

**PROBLEM SOLVING METHODS:** Problem solving Methods – Search Strategies-Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

**UNIT-III**

**INTRODUCTION:** What is machine learning?-Examples of machine learning applications-Types of machine learning.
**SUPERVISED LEARNING:** Classification ,Decision Trees – Univariate Tree – Multivariate Tree – Pruning, Bayesian Decision Theory , Parametric Methods-Maximum Likelihood Estimation -Evaluating an Estimator Bias and Variance -The Bayes' Estimator , Linear Discrimination- Gradient Descent- Logistic Discrimination-Discrimination by Regression, Multilayer Perceptron-Perceptron-Multilayer Perceptrons - Back Propagation Algorithm

**UNIT-IV**

**UNSUPERVISED LEARNING:** clustering- Introduction- Mixture Densities- k-Means Clustering- Expectation-Maximization Algorithm- Mixtures of Latent Variable Models- Supervised Learning after Clustering- Hierarchical Clustering

**DIMENSIONALITY REDUCTION**-Subset Selection-Principal Components Analysis-Factor Analysis-Multidimensional Scaling-Linear Discriminant Analysis

**UNIT-V**

**NONPARAMETRIC METHODS**- Nonparametric Density Estimation- k-Nearest Neighbor Estimator- Nonparametric Classification- Condensed Nearest Neighbor

**REINFORCEMENT LEARNING:** Introduction- Single State Case:K-Armed Bandit-Elements of Reinforcement Learning- Model-Based Learning- Temporal Difference Learning- Generalization- Partially Observable States

**TEXT BOOKS**
1. Ethem Alpaydin, *Introduction to Machine Learning*,MIT Press, Second Edition,2010.
2. Tom Markiewicz& Josh Zheng, *Getting started with Artificial Intelligence*, O'Reilly Media, 2017.

**REFERENCES**
1. Tom M Mitchell, *Machine Learning*, First Edition, McGraw Hill Education, 2013
2. Richard S. Sutton and Andrew G. Barto: *Reinforcement Learning: An Introduction*. MIT Press
3. Jiawei Han and Micheline Kamber, *Data Mining Concepts and Techniques*, Third Edition, Elsevier, 2012.

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**(19CS0523) BIG DATA ANALYTICS**

**COURSE OBJECTIVES**
The objectives of this course:
1. *Understand the Big Data Platform and its Use cases*
2. *Provide an overview of Apache Hadoop*
3. *Provide HDFS Concepts and Interfacing with HDFS*
4. *Understand Map Reduce Jobs*
5. *Provide hands on Hodoop Eco System*

**COURSE OUTCOMES (COs)**
On successful completion of course, the students can able to:
1. *Identify Big Data and its Business Implications.*
2. *List the components of Hadoop and Hadoop Eco-System*
3. *Access and Process Data on Distributed File System*
4. *Manage Job Execution in Hadoop Environment*
5. *Develop Big Data Solutions using Hadoop Eco System*
6. *Analyze Infosphere BigInsights Big Data Recommendations.*

**UNIT -I**
**INTRODUCTION TO BIG DATA AND HADOOP**
Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

**UNIT - II**
**HDFS(Hadoop Distributed File System)**
The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

**UNIT - III**
**MAP REDUCE**
Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

**UNIT - IV**
**HADOOP ECO SYSTEM**
**Pig :** Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

**UNIT V**
**HIVE :** Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.
**Hbase :** HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.
**Big SQL** : Introduction

**TEXT BOOKS**
1. Tom White *" Hadoop: The Definitive Guide"* Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, *"Big Data Analytics"* Wiley 2015.

**REFERENCES**
1. Michael Berthold, David J. Hand, *"Intelligent Data Analysis",* Springer, 2007.
2. Jay Liebowitz, *"Big Data and Business Analytics"* Auerbach Publications, CRC press (2013)
3. Anand Rajaraman and Jef rey David Ulman, *"Mining of Massive Datasets",* Cambridge University Press, 2012.
4. Bill Franks, *"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics",* John Wiley & sons, 2012.
5. Michael Mineli, Michele Chambers, Ambiga Dhiraj*, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses",* Wiley Publications, 2013.
6. ArvindSathi, *"BigDataAnalytics: Disruptive Technologies for Changing the Game",* MC Press, 2012
7. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , *"Harness the Power of Big Data The IBM Big Data Platform ",* Tata McGraw Hill Publications, 2012.

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**(19CS0524) COMPUTER NETWORKS**

**COURSE OBJECTIVES**
The objectives of this course:
1. *Build an understanding of the fundamental concepts of computer networking.*
2. *Understand how errors detected and corrected that occur in transmission*
3. *How collisions to be handled when many stations share a single channel*
4. *Know about routing mechanisms and different routing protocols*
5. *Understand transport layer functions*
6. *Know about different application layer protocols*

**COURSE OUTCOMES (COs)**
On successful completion of this course, the student will be able to:
1. *Explain the terminology and concepts of OSI and TCP/IP Reference models and identify different physical media used for data transmission*
2. *Implement the services of Data link layer*
3. *Describe the principles of network layer and implement routing algorithms used for data transmission*
4. *Interpret the essential services of transport layer*
5. *Distinguish the functioning of various protocols of Application layer*
6. *Understand the principles of networking*

**UNIT - I**
**Introduction:** Networks, Network criteria, Physical structures - Reference Models: The OSI Reference Model, The TCP/IP Reference Model- Introduction to physical layer: Data and Signals, Data rate limits, Performance.
**Transmission Media:** Introduction,-Guided Media, -Unguided Media.

**UNIT - II**
**Introduction to Data Link Layer:** Introduction, Link layer addressing- Error detection and Correction: Cyclic codes, Checksum, Data link control: DLC Services- Data link layer protocols, HDLC, Point to Point Protocol- Media Access control:-Random Access - Controlled Access- Channelization

**UNIT - III**
**The Network Layer:** Network layer design issues- Routing algorithms - Congestion control algorithms - Quality of service- Internetworking- The network layer in the Internet: IPV4 - IPV6, Internet Control protocols- OSPF- BGP.

**UNIT – IV**
**The Transport Layer:** The Transport Service- Elements of Transport Protocols- Congestion Control- The internet transport protocols: UDP, TCP- Performance problems in computer networks

**UNIT -V**
**Introduction to Application Layer:** Introduction, WWW and HTTP – FTP - E-mail- TELNET - Secure Shell - Domain Name System - SNMP.

**TEXT BOOKS**
1. Behrouz A. Forouzan, TMH *,"Data communications and networking"* 5th edition, 2012.
2. Andrew S. Tanenbaum, Wetherall*, "Computer Networks",* 5th edition, 2010, Pearson.

**REFERENCES**
1. Bhushan Trivedi, *Data Communication and Networks,* Oxford
2. Douglas E.Comer,*Internetworking with TCP/IP – Principles, protocols, and architecture,*Volume 1,5th edition, PHI
3. Davie, Elsevier *,Computer Networks‖,*5E, Peterson.
4. Chawan- Hwa Wu, Irwin,*Introduction to Computer Networks and Cyber Security,*CRC Publications.
5. Comer ,*Computer Networks and Internets with Internet Applications.*

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**(19CS0525) WEB TECHNOLOGIES**

**COURSE OBJECTIVES**

The objectives of this course is to

1. *Introduce the basic web concepts and Internet Protocols*
2. *Explain client side scripting with Javascript and DHTML*
3. *Introduce server side programming with Java servlets, JSP and PHP*
4. *Implement web services through XML.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Create dynamic and interactive web sites using HTML*
2. *Identify and implement client side scripting using java sript and DHTML*
3. *Design and develop CSS*
4. *Demonstrate understanding of what is XML and how to parse and use XML data*
5. *Implement server side programming with Java Servelets, JSP and  PHP*
6. *Prepare client presentation using AJAX*

**UNIT-I**
**Markup Languages:** An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.
**Style Sheets: CSS-**Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-CSS3.0.

**UNIT-II**
**Client-Side Programming:** The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

**UNIT-III**
**Host Objects:** Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling.
**Server-Side Programming:** Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities

**UNIT-IV**
**Introduction to PHP:** PHP- Using PHP- Variables- Program control-Built-in functions – Using Cookies-Regular Expressions.

**Representing Web Data:** XML-Documents and Vocabularies-Versions and Declaration-Namespaces- DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data.

## UNIT-V
**AJAX:** Ajax Client Server Architecture-XML Http Request Object-Call Back Methods, web services Writing a Java Web Service-Writing a Java Web Service Client-Describing.

## TEXT BOOKS
1. Jeffrey C. Jackson, *Web Technologies–A Computer Science Perspective*, Pearson Education,    2006
2. Jason Gilmore, *Beginning PHP and MySQ*L, 3rd Edition, Apress Publications (Dream tech.).

## REFERENCES
1. Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens, *PHP 5 Recipes A problem  Solution Approach*, Apress publisher, 1st Edition 2005.
2. Deitel and Deitel and Nieto, Prentice Hall, *Internet and World Wide Web - How to Program*, 5th Edition, 2011.
3. Herbert Schildt, *Java-The Complete Reference*, Eighth Edition, Mc Graw Hill Professional, 2011.

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**(19CE0147) PROJECT PLANNING AND CONTROL**
**OPEN ELECTIVE - IV**

**COURSE OBJECTIVES**
1. *To describe various elements of an engineering project and to draw the network*
2. *To perform PERT & CPM calculations and to identify the critical path*
3. *To perform various operations on the network*

**COURSE OUTCOMES (COs)**
*After the successful completion of the course the student able to*
1. *Differentiate various tools for planning and controlling the project*
2. *Construct the network for a project*
3. *Perform PERT computations and evaluate the critical path*
4. *Perform CPM computations and identify the critical path*
5. *Optimize time and cost for a project*
6. *Work with network during the progress of a project by updating the network and allocating the resource*

**UNIT – I**
**Project Management:** Project planning – Project scheduling – Project controlling – Project monitoring and control – Project monitoring and information cell – Decision making in project management – Project life cycle
**Basic Techniques of Project Management:** Bar charts – Steps for the construction of a bar chart – Limitations of bar charts – Milestone charts – Velocity diagrams – Development of Network – CPM/PERT Networks – Advantages of network over milestone chart

**UNIT – II**
**Elements of Network:** Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles
**Development of Network:** Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure – Hierarchies

**UNIT – III**
**PERT: Time Estimates:** Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time
**PERT: Time Computations & Network Analysis**: Earliest expected time – Formulation for $T_E$ – Latest allowable occurrence time – Formulation for $T_L$ – Combined tabular computations for $T_E$ and $T_L$ – Slack – Critical path – Probability of meeting scheduled date

**UNIT – IV**

**CPM: Network Analysis:** CPM Process – CPM Network – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for $T_E$ and $T_L$ – Start and finish times of activity – Float – Critical activities and critical path

**UNIT – V**

**CPM: Cost Model:** Project cost – Indirect project cost – Direct project cost – Slope of direct cost curve – Total project cost and optimum duration – Contracting the network for cost optimization – Steps in time cost optimization

**CPM: Updating:** Updating process – Data required for updating – Steps in the process updating – When to update

**Resources Allocation:** Resources usage profiles: histograms – Resources smoothing – Resources levelling

**TEXT BOOKS**
1. Dr.B.C. Punmia, K.K. Khandelwal, *Project Planning and Control with PERT AND CPM,* Laxmi Publications (P) Ltd., 4<sup>th</sup> Edition, Reprint 2006
2. Dr.P.N. Modi, Sanjeev Modi and Rajeev Modi, *Program Evolution and Review Technique and Critical Path Method*, Standard Book House, 5<sup>th</sup> Edition, 2012

**REFERENCES**
1. L.S. Srinath, *PERT and CPM Principles and Applications,* Affiliated East-West Press (Pvt.) Ltd.
2. S.K. Bhattacharjee, *Fundamentals of PERT/CPM and Project Management*, Khanna Publishers
3. Kumar Neeraj Jha, *Construction Project Management: Theory and Practice,* Pearson, 2 edition, 2015

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### (19EE0231) NEURAL NETWORKS & FUZZY LOGIC
### OPEN ELECTIVE - IV

**COURSE OBJECTIVES**

Students undergoing this course are expected to

1. *To introduce the basics of Neural Networks and essentials of Artificial Neural*
2. *Networks with Single Layer and Multilayer Feed Forward Networks.*
3. *To have knowledge on Associate Memories, Fuzzy sets and Fuzzy Logic system components.*
4. *To know Neural Network and Fuzzy Network system application to Electrical Engineering*
5. *The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Understand the basic concept of artificial neural networks*
2. *Understand different learning mechanism in artificial neural networks*
3. *Create Neural Network models for electrical engineering.*
4. *Understand the basic concepts of fuzzy sets.*
5. *Understand the basic concepts of fuzzy logic.*
6. *Create Fuzzy models for electrical engineering*

**UNIT - I**
**FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS**

Neural networks-introduction, Organization of human brain, Biological neuron, artificial neuron, McCulloch-Pitts neuron model, Characteristics and Applications of artificial neural networks Architectures of artificial neural networks – activation functions, important terminologies of ANN, learning strategies- supervised, unsupervised, reinforced learning.

**UNIT - II**
**SUPERVISED NETWORKS**

Perceptron networks-Perceptron learning, Limitations of Perceptron, back propagation networks-architecture, Computations in each layer, Error calculation in Back propagation networks, Gradient descent method in learning, back propagation algorithm, learning factors - initial weights, leaning constant, momentum coefficient, Applications of Neural Networks to Electrical Engineering.

**UNIT - III**
**ASSOCIATIVE MEMORIES**

Introduction, Associative Memories- Auto associative Memory,  Bidirectional Associative

Memory (BAM), Architectures, Storage and Recall Phases, Recognition of noisy patterns, Hamming distance and Energy functions. Discrete Hopfield network architecture and storage and recall algorithm.

## UNIT - IV
## CLASSICAL AND FUZZY SETS

Introduction to classical sets-properties–Fuzzy scrsip Fuzzy sets , Membership functions, basic fuzzy set operation, properties of fuzzysets- Fuzzy relations–Fuzzy Cartesian product, operations on fuzzy relations.

## UNIT -V
## FUZZY LOGIC SYSTEMS

Fuzzification–Fuzzy quantifiers, fuzzy inference, fuzzy rule based system-development of rule base and decision making system - Defuzzification to crisp sets-Fuzzification and Defuzzification methods. Applications of Fuzzy logic systems in Electrical Engineering.

## TEXT BOOKS

1. S. Rajasekaran, G.A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications*, PHI, 2012
2. S.N. Sivanandam, S.N. Deepa, *Principles of Soft computing*, Wiley India private Ltd., 2nd edition, 2013.

## REFERENCES

1. Timothy J Ross, *Fuzzy Logic with Engineering Application*, McGraw HillInc.1997.
2. Jacek M. Zurada,  *Introduction to Artificial Neural Networks*, Jaico Publishing House.
3. Simon Haykin, *Neural Networks - A Comprehensive Foundation*, Prentice- Hall Inc, 1999.

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### (19ME0353) COMPUTER AIDED PROCESS PLANNING
### OPEN ELECTIVE - IV

**COURSE OBJECTIVES**

*The objectives of this course is to*

1. *Provide the student with an understanding of the importance of process planning role in manufacturing.*
2. *Classify the various methods of CAPP*
3. *Understand the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Understands about NC, CNC and DNC systems.*
5. *Know about capacity Planning, Adaptive control machining systems, FMS and MRP's*

**COURSE OUTCOMES**

*On successful completion of this course, the student will be able to*

1. *Know the importance of process planning role in manufacturing*
2. *Describe the various methods of CAPP*
3. *Recognize the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Gain the knowledge about NC, CNC and DNC systems.*
5. *Identify about capacity Planning, Adaptive control machining systems*
6. *Familiar in FMS and MRP I and MRP II*

**UNIT- I**

**Introduction to Process Planning:** Role of process planning in the manufacturing cycle-Information requirement for process planning system - Merits of conventional process planning over CAPP - Structure of automated process planning system, features recognition, methods.

**UNIT- II**

**Generative CAPP System:** Importance - Generative CAPP system - Automation of logical decisions - Knowledge based systems - Inference Engine, implementation, benefits.

**Retrieval CAPP System:** Significance - Retrieval CAPP system, structure, relative advantages and disadvantages- implementation and applications.

**UNIT- III**

**Implementation Techniques for CAPP:** MIPLAN system - The Bottom-up approach - The Top-Down approach - Computer programming languages for CAPP- Criteria for selecting a CAPP system - Benefits of CAPP - MRP - I, MRP - II and benefits.

**UNIT- IV**

**Computer Integrated Production Planning:** Capacity planning- shop floor control- MRP-I, MRP-II- CIMS benefits.

**Computer Integrated Manufacturing System (CIMS):** Introduction to CIMS, Automation strategies, Automation and CAD/CAM, Scope of CIM- Computer controls in NC- NC, CNC and DNC systems, components, block diagram, applications- Part programming- Group technology, benefits.

**UNIT- V**

**Flexible Manufacturing systems (FMS):** Components of FMS, workstation, Material handling system and computer control system, FMS Layout configurations and benefits of FMS.

**Adaptive control machining systems**: Introduction to adaptive control machining systems, application- approaches, adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring and computer process control.

**TEXT BOOKS**

1. Mikel P.Groover *Automation, Production systems and Computer Integrated Manufacturing Systems,* Pearson Higher Education, Inc., 4th Edition, 2015.
2. Dr. Sadhu Singh, *Computer Aided Design and Manufacturing*, Khanna Publishers, 2009.

**REFERENCES**

1. Gideon Halevi and Roland D. Weill, "Principles of Process Planning", A logical approach, Chapman & Hall, 1995.
2. Chang T C and Richard A Wysk, "An Introduction to automated process planning systems", Prentice Hall, 1985.
3. H.P. Wang and J.K. Li, "Computer Aided Process Planning", Elsevier Science and Technology Publishers, 1st edition, 1991.

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**(19EC0451) MAT LAB PROGRAMMING**
**OPEN ELECTIVE - IV**

## COURSE OBJECTIVES

The objectives of this course:

1. *Understand the MATLAB Desktop, Command window and the Graph Window.*
2. *Be able to do simple and complex calculation using MATLAB*
2. *Understand the mathematical concepts upon which numerical methods*
3. *Understand the tools that are essential in solving engineering problems*

## COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to

1. *Analyze and visualize data effectively by using MATLAB.*
2. *Apply numeric techniques and computer simulations to solve engineering-related problems.*
3. *Apply a top-down, modular, and systematic approach to design, write, test, and debug*

   *sequential MATLAB programs to achieve computational objectives.*
4. *Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.*
5. *Demonstrate understanding and use of fundamental data structures (classes).*
6. *Create and control simple plot and user-interface graphics objects in MATLAB.*

## UNIT-I

**INTRODUCTION TO MATLAB**: MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB.

## UNIT-II

**ARRAYS:** Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

## UNIT-III

**FUNCTIONS & FILES:** Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

## UNIT-IV

**PROGRAMMING TECHNIQUES:** Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging MATLAB Programs.

**PLOTTING:** XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

**UNIT-V**
**LINEAR ALGEBRAIC EQUATIONS**: Elementary Solution Methods, Matrix Methods for Linear Equations, Cramer Method, Undetermined Systems, Order Systems.

**TEXT BOOKS**
1. G. H. Golub and C. F. Van Loan, *Matrix Computations*, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, *Numerical Linear Algebra and Applications*, Brooks/Cole, 1994 (out of print)

**REFERENCES**
1. William J Palm, *Introduction to MATLAB for Engineers*, 3rd edition, Mc GRAW HIL.
2. L. Elden, *Matrix Methods in Data Mining and Pattern Recognition*, SIAM Press,2007.
3. Amos Gilat, *MATLAB: An Introduction with Applications*,4th edition, WILEY.

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**(19HS0862) STRATEGIC MANAGEMENT**
**OPEN ELECTIVE - IV**

## COURSE OBJECTIVES
The objectives of this course:
1. *To introduce the basic knowledge of concepts underlying in strategic management, its process*
2. *To provide an insight to the tools and techniques used in analyzing and choosing strategies*
3. *To make them learn the principles of strategy formulation, implementation, evaluation and control of strategy*

## COURSE OUTCOMES (COs)
After the completion of course Students will be able to:
1. *Describe major theoretical concepts, background work and research output in the field of strategic management.*
2. *Develop an understanding of the strategic management process and the functional strategies*
3. *Conduct analysis using various tools and frameworks to make strategic decisions*
4. *Explain the basic concepts, principles and practices associated with strategy formulation and implementation*
5. *Analyze various strategies and explore appropriate strategic implementation at business and corporate levels*
6. *Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective*

## UNIT I
**Introduction to Strategic Management** – Definition, significance and components-Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies, Environmental Scanning

## UNIT II
**Strategic Analysis and Choice**: Tools and techniques- Porter's Five Forces Model -BCG Matrix, GE Model, TOWS Matrix, Mc Kinsey 7'S framework - Organisation Analysis – VRIO frame work, Value Chain Analysis.

## UNIT III
**Strategy Formulation**: - Formulation of strategy at corporate and business level - Strategy Alternatives-Stability Strategy, Growth Strategy, Retrenchment Strategy, and Combination Strategy.

**UNIT IV**

**Strategy Implementation**: Types of Strategies: Offensive strategy, Defensive strategy, vertical integration, horizontal strategy- Strategy and Leadership - Organization Structure - Resource Allocation as a vital part of strategy - Management of Change

**UNIT V**

**Strategy Evaluation and control**: Establishing strategic controls - Role of the strategist - benchmarking to evaluate performance - strategic information systems – Guidelines for proper control- -strategic audit - Strategy and Corporate Evaluation and feedback in the Indian context.

**TEXT BOOKS**

1. P. SubbaRao, *Strategic Management*, Himalaya,2010
2. Azar Kazmi, *Strategic Management and Business Policy*, Tata McGraw Hill Education, 2009

**REFERENCES**

1. V.S.P. Rao, *Strategic Management – Text and Cases*, Excel books,2009
2. Fred R. David, *Strategic Management A competitive approach Concepts and Cases*, Pearson, 16th edition,2019
3. R. Srinivasan, *Strategic Management: the Indian context*, 5th edition, PHI,2014
4. N.Chandrasekharan. PS Ananthanarayanan, *Strategic Management*, Oxford publications, 2011
5. Charles L Hill, *Strategic Management an Integrated approach*, Cengage learning, 10th edition,2007

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### (19CS0526) MACHINE LEARNING LAB

**COURSE OBJECTIVES**

The objectives of this course:
1. *Make use of Data sets in implementing the machine learning algorithms*
2. *Implement the machine learning concepts and algorithms in any suitable language of choice.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to
1. *Understand the implementation procedures for the machine learning algorithms.*
2. *Design Java/Python programs for various Learning algorithms.*
3. *Apply appropriate data sets to the Machine Learning algorithms.*
4. *Identify Machine Learning algorithms to solve real world problems.*
5. *Write Machine Learning algorithms to solve real world problems.*
6. *Implement different machine learning algorithms*

**LIST OF EXPERIMENTS:**

1. Write a program to demonstrate the working of the decision tree algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
2. Write a program for implementing the Back propagation algorithm and test the same using appropriate data sets.
3. Write a program for implementing the classification using Multilayer perceptron.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. 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. You can add Java/Python ML library classes/API in the program.
8. Write a program to implement Principle Component Analysis for Dimensionality Reduction.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

**TEXT BOOK**

1. Ethem Alpaydin, *Introduction to Machine Learning,* MIT Press, Second Edition,2010

**REFERENCES**

1. Tom M Mitchell, *Machine Learning*, First Edition, McGraw Hill Education, 2013
2. Richard S. Sutton and Andrew G. *Barto: Reinforcement Learning: An Introduction*. MIT Press
3. Jiawei Han and Micheline Kamber, *Data Mining Concepts and Techniques*, Third Edition, Elsevier, 2012.

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### (19CS0527) BIG DATA ANALYTICS LAB

**COURSE OBJECTIVES**
The objectives of this course:
1. *Demonstrate the knowledge of big data analytics and implement different file Management task in Hadoop*
2. *Understand Map Reduce Paradigm and develop data applications using variety of systems.*
3. *Analyze and perform different operations on data using Pig Latin scripts.*
4. *Illustrate and apply different operations on relations and databases using Hive.*
5. *Perform Map-Reduce Analytics using Hadoop and related tool.*

**COURSE OUTCOMES (COs)**
On successful completion of course, the students can able to:
1. *Demonstrate the knowledge of Big Data Analytics*
2. *Implement different file management task in Hadoop.*
3. *Understand Map Reduce Paradigm*
4. *Illustrate data applications using variety of Systems.*
5. *Analyze and perform different operations on data using Pig Latin Scripts*
6. *Illustrate and apply different operations on relations and databases using Hive.*

**LIST OF EXPERIMENTS:**
1. Perform setting up and Installing Hadoop in its three operating modes:
   a) Standalone b) Pseudo distributed c) Fully distributed.
2. Implement the following file management tasks in Hadoop:
   • Adding files and directories
   • Retrieving files
   • Deleting files (Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities. )
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
4. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. Implement Matrix Multiplication with Hadoop Map Reduce.
6. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data
7. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
8. Solve some real life big data problems.

**TEXT BOOKS**
1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, *"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses",* Wiley, 2013.
2. Tom White, *"Hadoop: The Definitive Guide",* Third Edition, O'Reilley, 2012.

**REFERENCES**
1. Eric Sammer, *"Hadoop Operations"*, O'Reilley, 2012.
2. P. J. Sadalage and M. Fowler, *"No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence"*, Addison-Wesley Professional, 2012.
3. E. Capriolo, D. Wampler, and J. Rutherglen, *"Programming Hive",* O'Reilley, 2012. Lars George, "HBase: The Definitive Guide", O'Reilley

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**(19CS0528) WEB TECHNOLOGIES LAB**

## COURSE OBJECTIVES

The objectives of this course is to
1. *Create web pages using HTML,DHTML and CSS.*
2. *Develop a servelet program using Java servelets*
3. *Develop online application using PHP*
4. *Implement simple web service using XML*

## COURSE OUTCOMES (COs)

On successful completion of the course, the students will be able to
1. *Create dynamic and interactive web sites using HTML*
2. *Design client side scripting using java sript and DHTML.*
3. *Implement servelet program using java servelets*
4. *Illustrate simple online application using servelets*
5. *Analyze JDBC concepts*
6. *Infer client program using AJAX*

## LIST OF EXPERIMENTS:

1. Create a table to show your class time table.
2. Create a simple Job Registration Form.
3. Create a simple webpage using HTML5 Semantic and Structural Elements.
4. Create a webpage using HTML5 Media Elements.
5. Add a Cascading Style sheet for designing the web page.
6. Write a Java Servlet Program to display the Current time on the server.
7. To write html and servlet to demonstrate invoking a servlet from a html.
8. Write a Java servlet program to change the Background color of the page by the color selected by the user from the list box.
9. Write a Java servlet to get the personal details about the user(Like name, Address, City, Age, Email id) and check whether the user is Eligible to vote or not.
10. Write a java servlet program to display the various client information like Connection, Host, Accept-Encoding, and User Agent.
11. Write a simple calculator program in PHP using switch case.
12. Write an XML file which will display the Book information which includes the following:
    Title of the book
    Author Name
    ISBN number
    Publisher name
    Edition, Price

**TEXT BOOKS**

1. Uttam K Roy, *Web Technologies*,Oxford University Press
2. Steven Holzner, *The Complete Reference PHP,*–Tata McGraw-Hill

**REFERENCES**

1. Chris Bates, Wiley Dreamtech, *Web Programming, building internet applications*, 2nd edition.
2. Nathan A Good,Frank ,*A problem Solution Approach*,Lee Babin, PHP 5 Recipes
3. M.Kromann and Jon Stephens, Apress publisher, 1st Edition 2005.
4. Deitel and Deitel and  Nieto *Internet and World Wide Web - How to Program*, Prentice Hall, 5th Edition, 2011.

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**(19HS0859) ENGLISH FOR CORPORATE COMMUNICATION SKILLS LAB**

**COURSE OBJECTIVES**
The objectives of this course is to
1. *To improve the students' fluency in English, through a well-developed vocabulary*
2. *To enable them listening spoken English at normal conversational speed by English speakers*
3. *To respond appropriately in different social-cultural and professional contexts*
4. *To develop drafting skills among the students.*
5. *To develop Inter-personal and Intra-personal Skills*

**COURSE OUTCOMES (COs)**
On successful completion of the course, the students will be able to
1. *Use fluency in English for all kinds of professional communication*
2. *Enhancing job required skills for getting success in their professions*
3. *Improving Effective Speaking Abilities for their business or professional correspondence*
4. *prepare effective Interview techniques to get job in the present scenario*
5. *Using the appropriate skills in all kinds of professional activities*
6. *Use effective communicative approaches by preparing job application, report and other kinds of spoken and written correspondences.*

**UNIT I**
**COMMUNICATIVE COMPETENCY**
   1. Functional English
   2. Reading Comprehension
   3. Vocabulary for competitive purpose
   4. Spotting Errors

**UNIT II**
**TECHNICAL WRITING**
   5. Cover Letter
   6. Curriculum vitae
   7. Report writing

**UNIT III**
**PRESENTATIONAL SKILLS**
   8. Impromptu Speech
   9. Oral presentation
   10. Power point presentation
   11. Poster presentation

**UNIT IV**
**CORPORATE SKILLS**
    12. Problem Solving
    13. Team Work
    14. Leadership Skills

**UNIT V**
**GETTING READY FOR JOB**
    15. Group Discussion
    16. Interview skills

**Minimum requirements for English for Corporate Communication Skills Lab**

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.

2. English for Corporate Communication Skills Lab with movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

**System Requirement (Hardware component):**
    Computer network, LAN with minimum 60 multimedia systems with the following

**Specifications**
    i)    a)  Intel(R) core (TM) i3
            b)  Speed 3.10 GHZ
            c)  RAM – 4 GB
            d)  Hard Disk – 320 GB
    ii)    Headphones with High quality

  **Software**
    Walden Info Tech Software

**REFERENCES**
1. Rizvi,*Effective Tech Communication*, Tata McGraw – Hill Education, 2007.
2. Sanjay Kumar &Pushpalatha,*Communication skills*, Oxford University Press, 2012.
3. *'Writing Tutor. Advanced English Learners' Dictionary*, 9th Edition, Oxford University Press, 2015.
4. AnjanaAgarwal,*Powerful Vocabulary Builder* ,New Age International Publishers, 2011.
5. Miles Craven, *Listening Extra*, Cambridge University Press, 2008.

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**IV B. Tech – I Sem.**

## (19HS0815) ENTREPRENEURSHIP DEVELOPMENT

**COURSE OBJECTIVES**

The objectives of this course:

1. *To acquire necessary skills and knowledge required for organizing and carrying out entrepreneurial activities,*
2. *To develop the ability of analyzing and understanding business situations in which entrepreneurs act*
3. *To develop the ability of analyzing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *The ability to discern distinct entrepreneurial traits and identify the successful elements of successful entrepreneurial ventures*
2. *Consider the legal and financial conditions for starting a venture and to assess the opportunities and constraints for new ventures*
3. *Design strategies for the successful implementation of ideas*
4. *To comprehend the evaluation of business opportunity from the prospective of an investor*
5. *Identify the most suitable sources of finance for start-ups*
6. *To write and execute their own business plan*

**UNIT-I**

**Introduction to Entrepreneurship -** Concept of Entrepreneur's, Enterprise and Entrepreneurship; Characteristics, Qualities, Functions of entrepreneur and Advantages of Entrepreneurship; Role of entrepreneurship in Economic development, Challenges faced by entrepreneurs, Entrepreneurial scenario in India and Abroad; Elements of Social Entrepreneurship, Types of Entrepreneurs, Entrepreneurship vs. Intrapreneurship.

**UNIT-II**

**Small Business and its Importance -** Introduction, Need, Classification of Micro, Small andMediumEnterprises(MSMEs),RoleofMSMEs,ProblemsofMSMEs,StepsforStarting MSMEs, The role of government in supporting MSMEs in India.

**Forms of Business Organization:** Evaluation of Form of Business organization: Sole Proprietorship, Partnership, Joint Hindu Family, Joint Stock Company and Co-operative Society. Special forms of business ownership: Licensing, Franchising and Leasing.

**UNIT-III**

**Innovation and Idea Generation in Entrepreneurship -** Concept of Invention and Innovation, types of innovation, Sources of Innovation, Importance of Innovation in Entrepreneurship. Sources of new ideas, Methods of generating ideas and Opportunity recognition and idea generation in entrepreneurship. Intellectual Property Rights (IPRs): Patents, trademarks, copyrights, and trade secrets. E-commerce and Business Start-ups, Sources of information for Start-up Entrepreneurs in India. Problems of Start-ups without IPRs.

**UNIT-IV**

**Entrepreneurial Motivation** - Concept of Motivation and Factors influencing the entrepreneurs; Motivational Theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory. Entrepreneurship Development Programs (EDPs) - Need and Role of EDPs. Opportunities for entrepreneurship in present scenario. Successful entrepreneurs

**Financing of Enterprises -** Source of financing - Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing. Role of consultancy organizations.

**UNIT-V**

**Project Planning and Feasibility Study -** Meaning of Project, Project Life Cycle, and Stages of Planning Process. Project Planning and Feasibility, Project proposal and report preparation.

**TEXT BOOKS**

1. *Entrepreneurship*, 8/e, Robert D Hisrich, Mathew J.Manimala, Michael PPeters, Dean A.Shepherd, McGraw HillEducation.
2. *The Dynamics of Entrepreneurial Development and Management*, VasanthDesai, Himalaya Publishing House,Mumbai.

**REFERENCES**

1. *Entrepreneurial Development*, S.S. Khanka, S. Chand and CompanyLimited.,
2. *Fundamentals of Entrepreneurship*, H. Nandan,PHI.
3. *Entrepreneurship Management* – text and cases, Bholanath Dutta, ExcelBooks.
4. *Entrepreneurship* – New venture Creation, Holt, andPHI.
5. *Entrepreneurial Development*, Ramachandran, Tata McGraw Hill, NewDelhi.

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**IV B. Tech – I Sem.**

**(19CS0529) CLOUD COMPUTING**

**COURSE OBJECTIVES**

The objectives of this course:
1. *This course provides an insight into what is cloud computing and the various services cloud is capable.*
2. *To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.*
3. *To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to
1. *Understanding the systems, protocols and mechanisms to support cloud computing.*
2. *Illustrate different models in the cloud environment.*
3. *Apply suitable virtualization concept*
4. *Develop applications for cloud computing.*
5. *Summarize the knowledge of mobile cloud computing.*
6. *Design and implement a novel cloud computing applications*

**UNIT –I**

**Introduction:** Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers – Overview of Grid Architecture –service oriented architecture – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures

**UNIT – II**

**Service Delivery and Deployment Models:** Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Pros and Cons of cloud computing - Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management

**UNIT –III**

**Virtualization as Foundation of Cloud**: Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management - Virtualization for data center automation - Migrating Application to Cloud, Phases of Cloud Migration

**UNIT –IV**

**Cloud Infrastructure Security:** Authentication and Authorization methods -network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

**UNIT – V**

**Mobile Cloud Computing:** Definition of Mobile Cloud Computing, Architecture of Mobile Cloud Computing, Benefits of Mobile Cloud Computing, Mobile Cloud Computing Challenges

**TEXT BOOKS**
1. Rajkumar Buyya, James Broberg and AndzejM. Goseinski, *Cloud Computing: Principles and Paradigms,* 2011 , Wiley.
2. Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, *Distributed and Cloud Computing*, 2012, Elsevier.
3. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah,*Cloud Computing Black Book Dreamtech* Publication, Kogent Learning Solutions

**REFERENCES**
1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, *Cloud Computing : A Practical Approach*, Tata McGraw Hill, rp2011.
2. GautamShroff,*Enterprise Cloud Computing*, Cambridge, University Press, 2010.
3. John W.Rittinghouse, James F.Ransome,*Cloud Computing: Implementation, Management and Security,* CRC Press, rp2012.
4. George Reese, *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud*, O'Reilly, SPD, rp2011.
5. Tim Mather, SubraKumaraswamy, ShahedLatif, *Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance*, O'Reilly, SPD, rp2011.

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**IV B. Tech – I Sem.**

**(19CS0530) CYBER SECURITY**

## COURSE OBJECTIVES

The objectives of this course:

1. *To understand the fundamentals of cybercrime and the cyber offenses.*
2. *To learn the concepts of cyber threats and cyber security.*
3. *To familiarize various cyber threats, attacks, vulnerabilities, defensive mechanisms, security policies and practices.*

## COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to:

1. *Identify the fundamentals of cybercrimes.*
2. *Analyze the cyber offenses.*
3. *Infer the cyber threats, attacks, vulnerabilities and its defensive mechanism.*
4. *Understand the Tools and Methods Used in Cybercrime.*
5. *Design suitable security policies for the given requirements.*
6. *Survey the industry practices and tools to be on par with the recent trends.*

## UNIT- I

**Introduction to Cybercrime**: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

## UNIT - II

**Cyber Offenses**: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes,
**Botnets:** The Fuel for Cybercrime, Attack Vector, Cloud Computing.

## UNIT - III

**Cybercrime:** Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security,
**Attacks on Mobile/Cell Phones, Mobile Devices**: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

## UNIT - IV

**Tools and Methods Used in Cybercrime**: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse

and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.
**Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft)

**UNIT - V**
**Cyber Security**: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications,
**Social media marketing:** Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**TEXT BOOK**
1. Nina Godbole and Sunil Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley INDIA.

**REFERENCES**
1. James Graham, Richard Howard and Ryan Otson, *Cyber Security Essentials,* CRC Press.
2. Chwan-Hwa(john) Wu,J.David Irwin, *Introduction to Cyber Security* , CRC Press T&F Group

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**IV B. Tech – I Sem.**

**(19CS0536) DEEP LEARNING**
**(Professional Elective Course – I)**

**COURSE OBJECTIVES**

The objectives of this course:

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

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Demonstrate the basic concepts fundamental learning techniques and layers.*
2. *Discuss the Neural Network training, various random models.*
3. *Explain different types of deep learning network models.*
4. *Classify the Probabilistic Neural Networks.*
5. *Implement tools on Deep Learning techniques*
6. *Understand the various deep learning applications*

**UNIT- I**

**Introduction:** Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.
**Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network

**UNIT- II**

**Training Neural Network:** Risk minimization, loss function, back propagation, regularization, model selection, and optimization.
**Deep Neural Networks:** Difficulty of training deep neural networks, Greedy layer wise training.

**UNIT- III**

**Deep Learning:** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

**UNIT- IV**

**Probabilistic Neural Network:** Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders

**UNIT- V**

**Applications:** Object recognition, sparse coding, computer vision, natural language processing.

**Introduction to Deep Learning Tools:** Tensor Flow, Caffe, Theano, Torch

**TEXT BOOKS**
1. Goodfellow, I., Bengio,Y., and Courville, A., *Deep Learning*, MIT Press, 2016
2. Bishop, C. ,M., *Pattern Recognition and Machine Learning*, Springer, 2006.

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

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**IV B. Tech – I Sem.**

### (19CS0537) SOFTWARE PROJECT MANAGEMENT
### (Professional Elective Course – I)

**COURSE OBJECTIVES**

The objectives of this course:

1. *Identify main elements of software project*
2. *Explain the purpose of a project's planning documents*
3. *Construct the scope statement and the work breakdown structure*
4. *Demonstrate RUP, Microsoft project 2007 & open source software project management tools*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Understands what is involved in quality assurance, planning and control on projects*
2. *Demonstrate knowledge of project management terms and techniques*
3. *Explain the approaches for the project activity planning in an organized step-by-step manner considering risk management*
4. *Construct project network diagrams and use critical path analysis*
5. *Implement successfully manage and control a software development project by applying project management concepts*
6. *Effectively do software cost estimation and activity planning.*

**UNIT - I**

**Project Evaluation And Project Planning:** Importance Of Software Project Management – Activities Methodologies – Categorization Of Software Projects – Setting Objectives – Management Principles – Management Control – Project Portfolio Management – Cost-Benefit Evaluation Technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning.

**UNIT - II**

**Project Life Cycle And Effort Estimation:** Software Process And Process Models – Choice Of Process Models – Mental Delivery – Rapid Application Development – Agile Methods – Extreme Programming – Scrum – Managing Interactive Processes – Basics Of Software Estimation – Effort And Cost Estimation Techniques Cosmic Full Function Points – Staffing Pattern.

**UNIT - III**

**Activity Planning And Risk Management:** Objectives Of Activity Planning – Project Schedules – Activities – Sequencing And Scheduling Network Planning Models – Forward Pass & Backward Pass Techniques – Critical Path (Crm) Method – Risk Identification – Assessment – Monitoring – Pert Technique – Resource Allocation – Creation Of Critical Patterns – Cost Schedules.

**UNIT - IV**

**Project Management And Control:** Framework For Management And Control – Collection Of Data Project Termination – Visualizing Progress – Cost Monitoring – Earned Value Analysis- Project Tracking – Change Control- Software Configuration Management – Contract Management.

**UNIT - V**

**Staffing In Software Projects:** Managing People – Organizational Behavior – Best Methods of staff selection – Motivation - Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

**TEXT BOOKS**

1. Bob Hughes, Mike Cotterell and Rajib Mall, *Software Project Management,* Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

**REFERENCES**

1. Ramesh, Gopalaswamy,  *Managing Global Projects*, Tata McGraw Hill, 2001.
2. Royce, *Software Project Management,*  Pearson Education, 1999.
3. Jalote, *Software Project Management in Practice* , Pearson Education, 2002.

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**IV B. Tech – I Sem.**

**(19CS0538) INFORMATION RETRIEVAL SYSTEMS**
**(Professional Elective Course – I)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To learn the different models for information storage and retrieval*
2. *To learn about the various retrieval utilities*
3. *To understand indexing and querying in information retrieval systems*
4. *To expose the students to the notions of structured and semi structured data*

**COURSE OUTCOMES (COs)**

On successful completion of this course, the student will be able to

1. *Identify appropriate models to store and retrieve textual documents*
2. *Describe the various retrieval utilities for improving search*
3. *Understanding of indexing and compressing documents to improve space and time efficiency*
4. *Possess the skill to formulate SQL like queries for unstructured data*
5. *Apply indexing and querying in information retrieval systems*
6. *Discovers the web search*

**UNIT -I**
**Retrieval Strategies**: Definition, Motivation, Information Retrieval vs Data Retrieval, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, Vector space model,
**Probabilistic retrieval strategies**: Simple term weights, Non binary independence model, Language Models.

**UNIT- II**
**Retrieval Utilities:** Relevance feedback, Clustering, N-grams, Regression analysis, Thesauri

**UNIT - III**
**Retrieval Utilities**: Semantic networks, Parsing.
**Cross-Language Information Retrieval**: Introduction, Crossing the language barrier.

**UNIT- IV**
**Efficiency**: Inverted index, Query processing, Signature files, Duplicate document detection

**UNIT -V**
**Integrating Structured Data and Text**: A Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.
**Distributed Information Retrieval**: A Theoretical model of distributed retrieval, Web search.

**TEXT BOOKS**

1. David A. Grossman, Ophir Frieder, *Information Retrieval – Algorithms and Heuristics*, 2nd Edition, 2012, Springer, (Distributed by Universities Press)
2. Kowalski, Gerald, Mark T Maybury: *Information Retrieval Systems: Theory and Implementation*, Kluwer Academic Press, 1997.

**REFERENCES**

1. Yates,*Modern Information Retrieval Systems*, Pearson Education
2. Gerald J Kowalski, Mark T Maybury, *Information Storage and Retrieval Systems,* Springer, 2000
3. Soumen Chakrabarti , *Mining the Web : Discovering Knowledge from Hypertext Data*, Morgan-Kaufmann Publishers, 2002
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, *An Introduction to Information Retrieval*, Cambridge University Press, Cambridge, England, 2009

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**IV B. Tech – I Sem.**

**(19CS0539) HUMAN COMPUTER INTERACTION**
**(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface Design*
2. *Become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans*
3. *Be able to apply models from cognitive psychology to predicting user performance in various human computer interaction tasks and recognize the limits of human performance as they apply to computer operation*
4. *Be familiar with a variety of both conventional and non-traditional user interface Paradigms*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to:

1. *Prioritize innovative ways of interacting with computers*
2. *Illustrate the disabled by designing non-traditional ways of interacting*
3. *Use cognitive psychology in the design of devices for interaction*
4. *Apply conventional and non-traditional user interface Paradigms*
5. *Describe how testing is applied in computer interaction*
6. *Understand different software tools used in computer interaction*

**UNIT - I**

**Introduction: Importance of user Interface:** Definition, Importance of Good Design, Benefits of Good Design, A Brief History of Screen Design.
**The Graphical User Interface:** Popularity of Graphics, the Concept of Direct Manipulation, Graphical System, Characteristics.
**Web User** – Interface Popularity, Characteristics- Principles of User Interface

**UNIT - II**

**Design process** – Understanding how people interact with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.
**Screen Designing**: Design goals – Screen meaning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design

## UNIT - III

**System menus**: Structures of Menus, Functions of Menus, Content of Menus, Kinds of Graphical menus

**Windows:** Window characteristics, Components of a window, Window presentation styles, Types of windows, Windom management

**Controls:** Characteristics of device based controls, Selecting the proper device based controls, Operable controls, Text Entry/Read-only controls, Selection controls, Combination Entry/selection controls, Selecting the proper controls

## UNIT - IV

**Graphics:** Icons, Multimedia, Color-what is it, Color uses, Color and Human vision, Choosing colors

**Testing:** The purpose and importance of usability testing, Scope of testing, Prototypes, Kinds of Tests, Developing and conducting the test.

## UNIT - V

**Software tools** – Specification methods, interface – Building Tools.

**Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

## TEXT BOOK

1. Wilbert O Galitz, *The essential guide to user interface design,* 2nd edition, 2013, Wiley.

## REFERENCES

1. Ben Shneidermann, *Designing the user interface,* 3rd Edition, Pearson Education Asia.
2. D.R.Olsen, *Human –Computer Interaction,* Cengage Learning.
3. I.Scott Mackenzie, *Human – Computer Interaction,* Elsevier Publishers.
4. Prece, Rogers, Sharps, *Interaction Design*, Wiley Dreamtech.
5. SorenLauesen,*User Interface Design,* Pearson Education.
6. Smith - Atakan, *Human –Computer Interaction,* Cengage Learning
7. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, *Human – Computer Interaction.*, Pearson.

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**IV B. Tech – I Sem.**

**(19CS0540) INFORMATION SECURITY**
**(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Extensive, thorough and significant understanding of the concepts, issues, principles and theories of computer network security*
2. *Identifying the suitable points for applying security features for network traffic*
3. *Understanding the various cryptographic algorithms and implementation of the same at software level*
4. *Understanding the various attacks, security mechanisms and services*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to:

1. *Demonstrate the protection of the network from both internal and external attacks*
2. *Understand the different public key cryptography algorithms.*
3. *Know how key management and distribution is implemented*
4. *Apply cryptographic algorithms and implementation of the same at software level*
5. *Design of new security approaches*
6. *Choose the appropriate security algorithm based on the requirements.*

**UNIT-I**

**Introduction:** Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security.

**Classical Encryption Techniques**- symmetric cipher model, substitution ciphers, transposition ciphers.

**Modern Block Ciphers:** Block ciphers principles, Data encryption standard (DES), block cipher modes of operations, AES.

**UNIT-II**

**Introduction to Number Theory** – Integer Arithmetic, Modular Arithmetic, Matrices, Algebraic Structures, Primes, Primality Testing, Factorization, Chinese remainder Theorem, Exponentiation and Logarithm.

**Public-key Cryptography** - Principles of public-key cryptography, RSA Algorithm, Diffie Hellman Key Exchange

**UNIT-III**

**Cryptographic Hash Functions:** Applications of Cryptographic Hash functions, Hash functions based on Cipher Block Chaining, Secure All Hash Algorithm (SHA)

**Message Authentication Codes:** Message authentication Requirements, Message authentication functions, HMAC, MACs based on Block Ciphers, Authenticated Encryption, Digital Signatures-RSA with SHA & DSS

## UNIT-IV

**Key Management and Distribution:** Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using Asymmetric, Distribution of Public keys, X.509 Certificates.

**User Authentication:** Remote user Authentication Principles, Remote user Authentication using Symmetric Encryption, Remote user Authentication using Asymmetric Encryption, Electronic mail security: Pretty Good Privacy (PGP), S/MIME.

## UNIT-V

**Security at the Transport Layer(SSL and TLS) :** SSL Architecture,  SSL Message Formats, Transport Layer Security, HTTPS, SSH

**Security at the Network Llayer (IPSec):** Two modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

**System Security:** Description of the system, users, Trust and Trusted Systems, Malicious Programs, worms, viruses, Intrusion Detection System(IDS), Firewalls

## TEXT BOOKS

1. Behrouz A. Frouzan and Debdeep Mukhopadhyay, *Cryptography and Network Security*, Mc Graw Hill Education, 2nd edition, 2013.
2. William Stallings, *Cryptography and Network Security: Principals and Practice*, Pearson Education , Fifth Edition, 2013.

## REFERENCES

1. Bernard Menezes , *Network Security and Cryptography*, Cengage Learning.
2. C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, *Cryptography and Security*, Wiley-India.
3. Bruce Schiener, *Applied Cryptography*, 2nd edition, John Wiley & Sons.

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**IV B. Tech – I Sem.**

**(19CS0541) MOBILE APPLICATION DEVELOPMENT**
**(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To introduce the Android technology and its application.*
2. *Design & program real working education based mobile application projects.*
3. *Become familiar with common mobile application technologies and platforms; open files, save files, create and program original material, integrate separate files into a mobile application project, create and edit audio sound effects & music.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to:

1. *Understand Android platform and it's environment*
2. *Know and apply the components of the screen*
3. *Describe the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies*
4. *Correlate and apply the different types of application models/architectures used to develop mobile software applications*
5. *Illustrate the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT))*
6. *Identify how and when to apply the different components to develop a working system*

**UNIT - I**
**The Android Platform:** Introduction to the Android platform, Required tools, Setting up environment, creating Hello world Application; Understanding activities, Linking activities using Intents, Fragments.

**UNIT - II**
Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar.

**UNIT - III**
**Designing user interface with views**: Basic views, Picker Views, List views; Pictures and menus with views.

**UNIT - IV**

**Data Persistence**: Saving and loading user preferences, Persisting data to files, creating and using databases.

**Content providers:** Sharing Data in Android, Using a Content Provider, Creating Own Content Providers

**UNIT - V**

**Messaging:** Sending SMS Messages Programmatically, Getting Feedback after Sending a message, Sending SMS Messages Using Intent, Receiving SMS Messages, Caveats and Warnings.

**Developing and Publishing Android Applications:** Creating Your Own Services, Establishing Communication between a Service and an Activity, Binding Activities to Services, Understanding Threading**;** Preparing for Publishing, Deploying APK Files.

**TEXT BOOKS**

1. Wei-Meng Lee, *Beginning Android 4 Application Development ,* Wrox Publications.
2. J.F.Dimarzio, *Android Programming with Android Studio*, @p2p.wrox.com, 4th Edition

**REFERENCES**

1. Joseph Annuzzi Jr., Lauren Darcey, Shane Conder, *Introduction to android application development*, 4th edition, Addision Wesley.
2. Jerome Dimarzio, *Android: A programmer's guide*, McGrawHill

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**IV B. Tech – I Sem.**

**(19CS0542) DATA SCIENCE**
**(Professional Elective Course-III)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Understand the fundamentals of 'R' programming.*
2. *Learn how to carry out a range of commonly used statistical methods including regression. classification, clustering.*
3. *Explore data-sets to create testable hypotheses and identify appropriate statistical tests.*
4. *To introduce the tools, technologies & programming languages this is used in day to day analytics cycle.*
5. *To discuss models in time series and text analysis.*

**COURSE OUTCOMES (COs)**

On successful completion of this course, student will be able to:

1. *Import external data into R for data processing and statistical analysis*
2. *Illustrate appropriate statistical tests using R*
3. *Discuss in depth of association rules and their applicability to various problem domains*
4. *Classify Regression, Classification & clustering techniques and their applicability to various problem domains*
5. *Select from, and apply, data analysis, data visualization and data mining techniques to a practical case study*
6. *Demonstrate on different models in time series and text analysis*

**UNIT-I**
**Introduction to R**: Data Science, R Graphical User Interfaces, Data Import and Export, attribute and Data Types, Descriptive Statistics,
**Exploratory Data Analysis**: Visualization Before Analysis, Dirty Data, Visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

**UNIT-II**
**Statistical Methods for Evaluation**: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors, Power and Sample Size, ANOVA.
**Association Rules**: Overview, Apriori Algorithm, Evaluation of Candidate Rules - Applications of Association Rules ,An Example: Transactions in a Grocery Store, Validation and Testing, Diagnostics

**UNIT-III**

**Regression**: Linear Regression, Logistic Regression, Reasons to Choose and Cautions, Additional Regression Models

**Classification**: Decision Trees, Na'ive Bayes, Diagnostics of Classifiers, Additional Classification Methods

**UNIT-IV**

**Clustering:** Overview of Clustering, K-means, Additional Algorithms

**Time Series Analysis**: Overview of Time Series Analysis, ARIMA Model, Additional Methods

**UNIT-V**

**Text Analysis**: Text Analysis Steps, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments – Gaining Insights.

**TEXT BOOKS**

1. David Dietrich, Barry Heller & Beibei Yang, *Data Science and Big Data Analytics: Discovering, Analyzing.*

**REFERENCES**

1. Dr. Mark Gardener, *Beginning R the statistical programming language*, John Wiley &Sons, Inc. 2012.
2. Richard Cotton, *Learning R: A Step-by-Step Function Guide to Data Analysis*.
3. Peng, R. D., & Matsui. E, *The Art of Data Science. A Guide for Anyone Who Works with Data*, SkybrudeConsulting, 2015

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**IV B. Tech – I Sem.**

**(19CS0543) ADHOC WIRELESS NETWORKS**
**(Professional Elective Course-III)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Understand mobile ad hoc networks, design and implementation issues, and available solutions.*
2. *Acquire knowledge of Adhoc wireless networks and their characteristics.*
3. *To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.*

**COURSE OUTCOMES**

*On successful completion of the course, the students will be able to*

1. *Know the basics of Ad hoc networks and Wireless Networks.*
2. *Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement.*
3. *Apply the knowledge to identify appropriate physical and MAC layer protocols*
4. *Understand the transport layer in Ad hoc networks and Wireless Networks.*
5. *Acquire skills to design and implement a basic mobile ad hoc or wireless network via simulations.*
6. *Choose appropriate protocol for various applications.*

**UNIT-I: Wireless LANS and PANS:**

Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.

**Wireless Internet:** Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web over Wireless.

**UNIT-II: AD HOC Wireless Networks:**

Introduction, Issues in Ad Hoc Wireless Networks, AD Hoc Wireless Internet.

**MAC Protocols for Ad Hoc Wireless Networks:** Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols.

**UNIT -III: Routing Protocols:**

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

**UNIT -IV: Transport Layer and Security Protocols:**

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks.

**Security:** Issues and Challenges in Security Provisioning, Network Security Attacks.

**UNIT –V: Quality of Service:**

Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks.

**Energy Management:** Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes

**TEXT BOOKS**

1. C. Siva Ram Murthy and B.S.Manoj,"*Ad Hoc Wireless Networks: Architectures and Protocols"* ,PHI, 2004.
2. Jagannathan Sarangapani,*"Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control*", CRC Press.

**REFERENCES**

1. Subir Kumar sarkar, T G Basvaraju, C Puttamadappa, *"Ad hoc Mobile Wireless Networks",*Auerbach Publications,2012.
3. C. S. Raghavendra, Krishna M. Sivalingam,*"Wireless Sensor Networks",* 2004, Springer.
4. C.K. Toh, "*Ad- Hoc Mobile Wireless Networks: Protocols & Systems",* Pearson Education.

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**IV B. Tech – I Sem.**

**(19CS0544) SOFT COMPUTING**
**(Professional Elective Course-III)**

**COURSE OBJECTIVES**
The objectives of this course:
1. *To learn the basic concepts of Soft Computing*
2. *To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems*
3. *To apply soft computing techniques to solve problems*

**COURSE OUTCOMES (COs)**
On successful completion of this course, student will be able to:
1. *Apply suitable soft computing techniques for various applications*
2. *Integrate various soft computing techniques for complex problems*
3. *Analyze a given computational task to solve it through neural network*
4. *Demonstrate different Genetic Algorithm operations for solving a computational task*
5. *Design and implement a soft computing system to achieve a computational solution*
6. *Understand the usage of hybrid systems.*

**UNIT- I**
**INTRODUCTION TO SOFT COMPUTING**
Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta-Perceptron Network-Adaline Network-Madaline Network.

**UNIT- II**
**ARTIFICIAL NEURAL NETWORKS**
Back propagation Neural Networks -Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network -Hopfield Neural Network-Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks-Support Vector Machines -Spike Neuron Models.

**UNIT- III**
**FUZZY SYSTEMS**
Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets -Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification -Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning -Introduction to Fuzzy Decision Making.

## UNIT -IV
### GENETIC ALGORITHMS

Basic Concepts-Working Principles -Encoding-Fitness Function -Reproduction -Inheritance Operators -Cross Over -Inversion and Deletion -Mutation Operator -Bit-wise Operators - Convergence of Genetic Algorithm.

## UNIT- V
### HYBRID SYSTEMS

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination -LR-Type Fuzzy Numbers -Fuzzy Neuron -Fuzzy BP Architecture -Learning in Fuzzy BP-Inference by Fuzzy BP -Fuzzy ArtMap: A Brief Introduction -Soft Computing Tools -GA in Fuzzy Logic Controller Design -Fuzzy Logic Controller

## TEXT BOOKS

1. 1.N.P.Padhy, S.P.Simon, *Soft Computing with MATLAB Programming*, Oxford University Press, 2015.
2. 2.S.N.Sivanandam , S.N.Deepa, *Principles of Soft Computing*, Wiley India Pvt. Ltd., 2nd Edition, 2011.
3. 3.S.Rajasekaran, G.A.Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications*, PHI Learning Pvt. Ltd., 2017.

## REFERENCES

2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, *Neuro-Fuzzy and Soft Computing*, Prentice-Hall of India, 2002.
3. Kwang H.Lee, *First course on Fuzzy Theory and Applications*, Springer, 2005.
4. George J. Klir and Bo Yuan, *Fuzzy Sets and Fuzzy Logic-Theory and Applications*, Prentice Hall, 1996.
5. James A. Freeman and David M. Skapura, *Neural Networks Algorithms, Applications, and Programming Techniques*, Addison Wesley, 2003.

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**IV B. Tech – I Sem.**

**(19CS0531) INTERNSHIP (60 HOURS)**

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**IV B. Tech – I Sem.**

**(19CS0532) PROJECT PHASE-I**

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**IV B. Tech – II Sem.**

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**IV B. Tech – II Sem.**

**(19CS0533) SEMINAR**

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**IV B. Tech – II Sem.**

**(19CS0534) COMPREHENSIVE VIVA VOCE**

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**IV B. Tech – II Sem.**

**(19CS0535) PROJECT PHASE-II**

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