

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS  
(Choice Based Credit System)**

**R19**

**Information Technology**

**For**  
**B.TECH. FOUR YEAR DEGREE COURSE**  
(Applicable for batches admitted from 2019-2020)



**SWARNANDHRA**  
**COLLEGE OF ENGINEERING & TECHNOLOGY**  
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

### **Institute Vision**

To produce global competent, ethical and dynamic professionals by creating Centre of Excellence in Technical Education for societal empowerment.

### **Institute Mission**

- M1:** To provide quality education with knowledge and skills for rural and urban students.
- M2:** To collaborate the industries with academia for empowering the students to meet global standards.
- M3:** To induce highly ethical entrepreneurship in young minds with good leadership quality for the society.
- M4:** To enhance the institution in Research and Development by human intellectual capability.

### **Department Vision**

To be a premier center in Information Technology education, research and a source of qualitative, innovative, successful software professionals who cater the needs of industry and society.

### **Department Mission**

- M1:** To provide outcome based education through well-designed curriculum, innovative teaching, collaborative learning and industry interaction.
- M2:** To promote state-of-the-art research facilities and consultancy in the thrust areas of Information Technology.
- M3:** To impart the necessity of continuing education in order to grow proficiently in the focused areas.
- M4:** To inculcate professional behavior, leadership qualities and ethical values to serve the society.

### **Program Educational Objectives (PEOs)**

- PEO-1:** To pursue career in Information Technology and allied organizations.
- PEO-2:** To exhibit research temper for providing solutions to real time problems and continuing lifelong learning.
- PEO-3:** To showcase leadership skills with ethical values and social responsibilities.

### **Program Specific Outcomes (PSOs)**

- PSO-1:** Comprehend core knowledge using algorithms, mathematical foundation for modeling and analysis of software systems.
- PSO-2:** Design and develop software solutions using emerging technologies.

## ACADEMIC REGULATIONS

### 1. INTRODUCTION

Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

All Academic Programme rules and regulations are approved by the Academic Council, which is the highest Academic body of the Institute. It is applicable for all Bachelor of Technology (B. Tech) degree programme from academic year 2019-20 admission onwards.

### 2. ADMISSIONS

#### 2.1 Regular Admission

**(Join in first year B. Tech Programme)**

Admissions in the Institution are classified into **CATEGORY – A**, through convener, EAMCET and **CATEGORY- B** filled by the college management.

#### 2.2 Lateral Entry Admission

**(Join in the Second year/third semester of B. Tech Programme)**

Eligibility: B.Sc. Graduate & Diploma holders.

Based on the rank secured by the candidate at Engineering Common Entrance Test (ECET) conducted by the convener, ECET and Central counseling by Higher Education, Government of Andhra Pradesh.

#### 2.3 Advance standing Admission

**(Transfer from other Colleges/ Re-admission due to dis-continuation)**

These may arise in the following cases:

- a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
- b) When students of SCET get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.

In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at SCET will be governed by the transitory regulations.

### 3. UNDER GRADUATE PROGRAMMES OFFERED

Presently, the College is offering Under Graduate Programmes in the following disciplines:

- Computer Science and Engineering (CSE)
- Electronics and communication Engineering (ECE)
- Electrical and Electronics Engineering (EEE)
- Information Technology (IT)
- Mechanical Engineering (ME)
- Civil Engineering (CE)

### 3.1 Structure of the Programme:

#### i) Preamble:

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is adopted grading system in place of conventional system of marks and percentages.

Our CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The students can register any courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades, Foundation Courses (FC), Programme Core Course (PCC) and Elective Courses (EC) as given in the UGC guidelines are used the same definitions.

#### Each Programme of a Discipline or branch will consist of:

- i). Foundation courses in Basic Sciences, Engineering Sciences and Humanities.
- ii). Programme core courses to impart broad based knowledge needed in the concerned branch.
- iii). Elective courses from the discipline or interdisciplinary areas / industry related opted by the student based on their interest in specialization.
- iv). Open Elective courses from the interdisciplinary areas opted by the students based on their interest in specialization.

Each Programme designed to have 35-40 theory courses and 20-25 laboratory courses. The categories of courses are indicated in the following table.

**TABLE-1 CATEGORY OF COURSES**

Course Category
Foundation Courses – Basic Sciences & Humanities
Foundation Courses – Engineering Sciences
Programme Core Courses in the branch of study
Elective Courses
Open Elective

**Note:** All components prescribed in the curriculum will be conducted and evaluated.

- ii) **Contact hours:** Depending on the complexity and volume of the course the number of contact hours per week will be determined.

#### iii) Credits:

**TABLE-2 CREDITS BASED ON CONTACT HOURS**

Course type	No. of Contact Hours	No. of Credits
Theory	1	1
Laboratory	2	1

**TABLE-3 CREDITS FOR DIFFERENT COURSES**

Course type	Lecture method			Credits
	L	T	P	C
Theory /Elective	3	1	0	4
	2	1	0	3
	3	0	0	3
	2	0	2	3
	2	0	0	2
Laboratory	0	0	2	1
	0	0	3	1.5
	0	0	4	2

**3.2 Curriculum for each Programme:**

- The Four year curriculum of any B. Tech Programme of study in any branch of Engineering is formulated based on the guidelines mentioned in 3.1 and will be recommended by the concerned Board of Studies and is approved by the Academic Council.
- In case of students admitted under lateral entry, the respective regular curriculum contents from 3rd semester onwards are to be pursued by them.
- In case of students admitted under advanced standing, the equivalence will be prepared by the concerned Board of Studies and the Academic Council has to approve the same..

**4. DURATION OF THE PROGRAMME:**

The duration of the B. Tech. Programme is four academic years consisting of eight semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 4.1, will forfeit their admission in B. Tech course.

**4.1 Maximum duration of study.**

Maximum duration permitted for any student to successfully complete the four year B. Tech. Programme of study will be:

**Regular Admission:** Eight academic years in sequence from the year of admission for a student admitted into first year of any Programme.

**Lateral Entry Admission:** Six academic years in sequence from the year of admission for a student admitted into second year of any Programme.

**Advanced standing Admission:** The maximum time for completion of Programme of study, will be twice the period in terms of academic years in sequence, stipulated in the Programme curriculum defined at the time of admission.

**4.2 Cancellation of Admission :**

In case, any student fails to meet the above applicable/eligible conditions for the award of degree, his/her admission stands cancelled.

**TABLE- 4 MAXIMUM DURATION OF STUDY**

Admitted year of study	Maximum duration
First year	8 academic years in sequence
Second year (Lateral entry)	6 academic years in sequence
Advanced standing	Twice the period in terms of academic years in sequence

**5. MEDIUM OF INSTRUCTION :**

The medium of instruction and examinations are in English.

**6. MINIMUM INSTRUCTION DAYS:** Each semester will consist of 22 weeks duration with minimum of 110 working days which includes instruction days, internal tests and End examinations.

**7. TRANSITORY REGULATIONS:**

For those who admitted under advance standing, these transitory regulations will provide the modus operandi. At the time of such admission, based on the Programme pursued (case by case)

- Equivalent courses completed by the student are established by the BOS of concerned discipline.
- Marks/Credits are transferred for all such equivalent courses and treated as successfully completed in the Programme of study prescribed by SCET.
- A Programme chart of residual courses not completed will be derived and a Programme of study with duration specified will be prescribed for pursuit at SCET.
- Marks obtained in the previous system, as the case maybe, shall be converted to equivalent grades and CGPA.

All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom; such a candidate is merged with current regulations.

**8. DISTRIBUTION AND WEIGHTAGE OF MARKS:**

Each semester consists of 4/5/6 theory courses and 2/3/4 Laboratories. However, in the 8<sup>th</sup> semester there will be only 2 theory courses in addition to the project work.

**(a). Theory Courses:**

- Each course consists of five units.
- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- The internal evaluation of 30 marks consists of two cycles. Each cycle consists of descriptive test (internal test) for 20 marks and two class tests for 10 marks.
- Mid Examination: Each mid examination will be conducted for 20 marks with the duration of 75 Minutes. Internal test paper consists of three questions (8M+8M+4M) from two and half units and all are to be answered.
- Class tests for 10 marks calculation: There will be two class tests conducted in each cycle unit wise. **Best of two** will be considered.
- **Weighted average of two Cycles** performance will be considered, weightage of 80% for the best Cycle performance and 20% for second.
- The **end semester** examination will be conducted for 70 marks which covers full syllabus. In end examination pattern, **Part – A** consists of five short questions from all units (Brainstorming/Thought provoking/Case study) for 10 marks. **Part – B** has **5 questions** with internal choice from each unit and valued for 60 marks.

**(b). Practical Courses:**

- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- End practical examination will be conducted by the internal and external examiner appointed by COE.
- Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

**(c). Design or Engineering Drawing Marks Distribution:**

For the courses of design or drawing such as Engineering Graphics, etc., the distribution will

be 30 marks for internal evaluation with 10 marks for day-to-day work, and 20 marks from two internal tests (80% of first best + 20% of second best). End examination will be conducted for 70 marks.

- (d) **Internship:** It can be carried out with a minimum of two weeks and maximum of four weeks, any time after completion of 4<sup>th</sup> semester till end of 7<sup>th</sup> semester. It will be evaluated internally by an internal evaluation committee comprising of Head of the Department and two faculty of the department. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits

- (e) **Mini Project:** The 6<sup>th</sup>/7<sup>th</sup> Semester Mini Project work will be evaluated for 100 marks. The project work is evaluated for internal assessment for 30 and external examination for 70.

**i) Internal Assessment:** Internal Assessment will be monitored by Project Review Committee consisting of 1) Head of the Department 2) Supervisor and 3) Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

**ii) External Examination:** External Examination will be conducted through presentation / viva - voice by the student by Project external examination committee consisting of 1) Head of the Department 2) Supervisor and 3) External examiner appointed by COE.

- (g) **Project Work:** The 8th Semester main Project Work will be evaluated for 200 marks. The project work is evaluated for internal assessment of 60 and external examination for 140.

**i) Internal Assessment:** Internal Assessment will be monitored by Project Review Committee consisting of 1) Head of the Department 2) Supervisor and 3) Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

**ii) External Examination:** External Examination will be conducted through presentation / viva - voice by the student by Project external examination committee consisting of 1) Head of the Department 2) Supervisor and 3) External examiner appointed by COE.

**TABLE- 5 MARKS ALLOCATION**

Course type	Marks Allocation			
	Internal		End Semester	Total
	Internal test	Class Test/ Day to day work		
Theory course	20	10	70	100
Laboratory course	15	15	70	100
Design or Drawing course	20	10	70	100

- (h) **Mandatory Courses:** These courses are compulsory with zero credits. They shall be no external examination. However attendance in the mandatory course of minimum attendance (75%) in that particular course.

- (i) **Open Electives:** Students are to choose Open Elective – I during 5<sup>th</sup> Semester, Open Elective–II during 6<sup>th</sup> Semester and Open Elective – III and IV during 7<sup>th</sup> Semester from the list of Open Electives given in the Course Structure. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the courses offered by the parent Department in any Semester.



**9. ATTENDANCE REGULATIONS**

- (i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.
- (ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.
- (iii) Shortage of Attendance below 65% in aggregate shall not be condoned.
- (iv) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for examination shall be allowed.
- (v) Attendance may also be condoned for those who participate in Intercollegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/She shall pay the prescribed condonation fee.
- (vi) Prescribed Condonation fee shall be payable by the student to appear for the end examination.
- (vii) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively by the Department.
- (viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

**TABLE-7 ATTENDANCE REQUIREMENT**

<b>Attendance Percentage</b>	<b>Condonation fee</b>	<b>Appear End Exams</b>
Above 75 %	Nil	Eligible
65 % -75%	Yes (on medical grounds)	Eligible
Below 65 %	Nil	Not Eligible (Seek re-admission to that semester when offered)

**10. MINIMUM ACADEMIC REQUIREMENTS:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.9**.

- (i) A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the courses, for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass in the subject.
- (ii) A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.
- (iii) A student will be promoted from 4<sup>th</sup> Semester to 5<sup>th</sup> Semester, if he/she fulfills the academic requirements of 40% of the credits up to 4<sup>th</sup> Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.
- (iv) A student will be promoted from 6<sup>th</sup> to 7<sup>th</sup> Semester, only if he/she fulfills the academic requirements of 40% of the credits up to 6<sup>th</sup> Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.
- (v) There will be supplementary examinations along with the regular semester examinations enabling the students to give a fair chance to appear in the subject if any failed.



**TABLE-8 PROMOTION IN TO NEXT HIGHER CLASS**

Promotion From	Promotion to	Promotion Criteria
1 <sup>st</sup> Semester	2 <sup>nd</sup> Semester	Minimum Attendance requirement
2 <sup>nd</sup> Semester	3 <sup>rd</sup> Semester	
3 <sup>rd</sup> Semester	4 <sup>th</sup> Semester	
4 <sup>th</sup> Semester	5 <sup>th</sup> Semester	Minimum Attendance requirement & 40% of credits up to 4 <sup>th</sup> semester for all exams
5 <sup>th</sup> Semester	6 <sup>th</sup> Semester	Minimum Attendance requirement
6 <sup>th</sup> Semester	7 <sup>th</sup> Semester	Minimum Attendance requirement & 40% of credits up to 6 <sup>th</sup> semester for all exams
7 <sup>th</sup> Semester	8 <sup>th</sup> Semester	Minimum Attendance requirement

**11. GAP YEAR CONCEPT**

Students who wish to pursue entrepreneurship full time can take break of one year study, after the 4<sup>th</sup> Semester with the due recommendations of the GAP committee and approved by the principal. This may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation

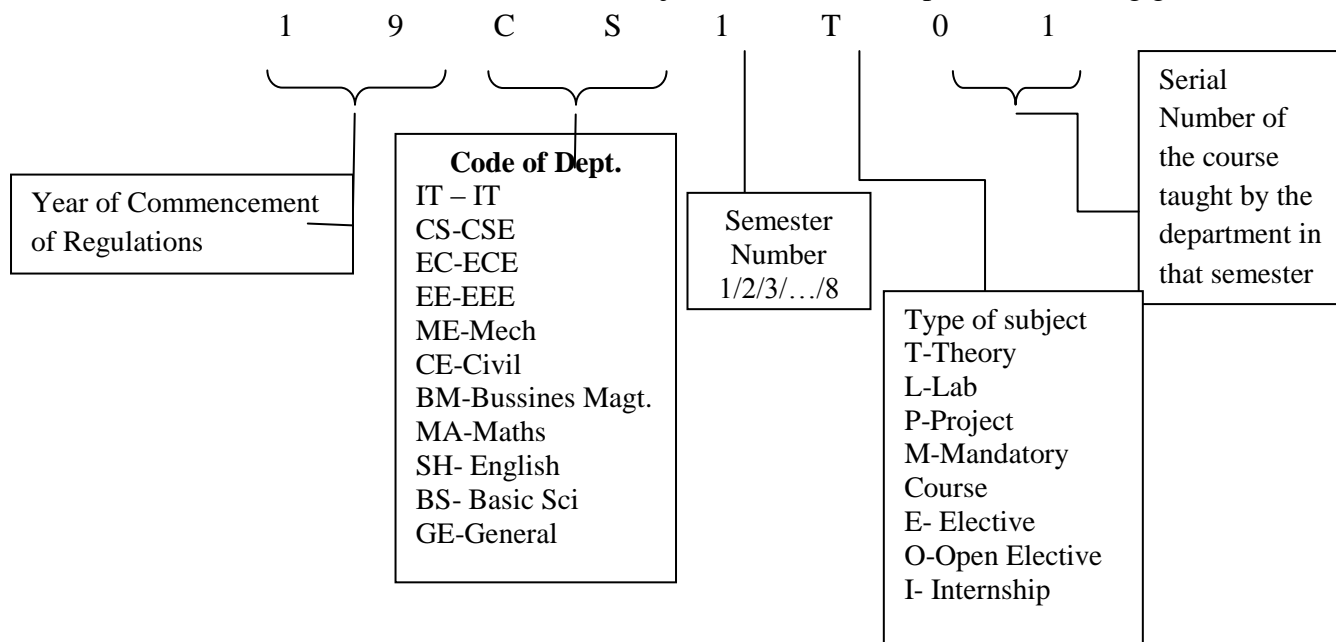
**12. ELIGIBILITY FOR AWARD OF DEGREE:**

A student shall be eligible for award of the B.Tech. Degree if he/she fulfills all the following conditions:

- (i) Pursue the programme of study for a stipulated period of four years and not more than eight years.
- (ii) Register for 160 credits and secure the same.
- (iii) Registered and successfully completed all the components prescribed in the programme of study in which he/she is admitted.
- (iv) All mandatory courses must be completed with satisfactory.
- (v) Obtained CGPA greater than or equal to 4.75 (minimum requirements for pass).

**13. COURSE CODE & COURSE NUMBERING SCHEME:**

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.

**14. GRADING SYSTEM:****14.1 Award of Grade:**

(i) Grade Point Average (GPA):

a) The Grade Point Average (GPA) will be calculated according to the formula

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where  $C_i$  = number of credits for the subject  $i$

$G_i$  = grade points obtained by the student in the subject.

b) To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

$$CGPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where  $C_i$  = number of credits for the subject  $i$

$G_i$  = grade points obtained by the student in the subject.

c) Equivalent percentage =  $(CGPA - 0.75) \times 10$

(ii) After a student satisfies the requirements prescribed for the award of UG/PG Programme he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10 and given in Table 9.

**Table -9**

CGPA	Award of Division
$\geq 7.75^*$	First Class with Distinction
$\geq 6.75$	First Division
$\geq 5.75$	Second Division
$\geq 4.75$	Pass Division
$< 4.75$	Unsatisfactory

\* In addition to the required CGPA of 7.75, the student must have necessarily passed all the courses of every semester in the minimum stipulated period for the programme.

**14.2 Award of Grade in Each Semester:**

- (i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table 10.

**Table -10**

Percentage of Marks Scored	Letter Grade	Level	Grade points
$\geq 90$	O	Outstanding	10
80 - 89	S	Excellent	9
70-79	A	Very Good	8
60-69	B	Good	7
50-59	C	Fair	6
40-49	D	Satisfactory	5
$< 40$	F	Fail	0
		Absent	0

- (ii) A student earns a minimum of 5 grade points (D grade) in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However, it should be noted that a pass in any subject/term paper/seminar/project/mini project shall be governed by the rules mentioned in **S.No. 8**.
- (iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.
- (iv) Transcripts: After successful completion of the programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to the student on request and by paying stipulated fee in force.
- (v) Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.
- (vi) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

**15. SUPPLEMENTARY EXAMINATIONS:**

In addition to the Regular Final Examinations held at the end of each semester, a Supplementary Examination will be conducted. A student can appear for any number courses of supplementary examinations till he/she clears the courses. However the maximum stipulated period of programme cannot be relaxed under any circumstance.

**16. ADVANCED SUPPLEMENTARY EXAMINATIONS:**

Candidate who fails the courses in 7<sup>th</sup> and 8<sup>th</sup> Semester can appear for Advanced Supplementary Examinations.

**17. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):**

- The students have to acquire 120 credits from 3<sup>rd</sup> Semester to 8<sup>th</sup> Semester of B. Tech Programme for the award of the degree.
- All mandatory courses must be completed with satisfactory for award of degree.
- Obtained CGPA greater than or equal to 4.75 (minimum requirements for pass).
- The same attendance regulations are to be adopted as per the rules mentioned in item No.10.
- Rules for Promotion from 6<sup>th</sup> Semester to 7<sup>th</sup> Semester:** A student shall be promoted from 6<sup>th</sup> Semester to 7<sup>th</sup> Semester only if he/she fulfills the academic requirements of 40% credits up to 6<sup>th</sup> Semester.
- Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

**18. CONDUCT AND DISCIPLINE:**

Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

**19. MALPRACTICES:**

If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

**20. WITHHOLDING OF RESULTS**

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

**21. ACADEMIC FLEXIBILITY:**

Students can study two elective courses of 8<sup>th</sup> Semester in advance, one in 6<sup>th</sup> and the other in 7<sup>th</sup> semester, those who cleared all the courses with CGPA 8.50 up to 5<sup>th</sup> semester. If a student fails in any course of the 6<sup>th</sup>/ 7<sup>th</sup> semester, the flexibility will be cancelled. 8<sup>th</sup> Semester elective courses can study in advance from the MOOC/NPTEL/SWAYAM/etc., courses.

**22. GENERAL:**

- a) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- b) The academic regulation should be read as a whole for the purpose of any interpretation.
- c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final and which is to be ratified by the Chairman of the Governing Body.
- d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

## INFORMATION TECHNOLOGY COURSE STRUCTURE – UG (CBCS)

### SEMESTER-I

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA1T01	Calculus and Linear Algebra	3	1	-	4.0	30	70	100
2	19BS1T02	Engineering Chemistry	3	-	-	3.0	30	70	100
3	19CS1T01	Problem Solving and Programming Using C	3	-	-	3.0	30	70	100
4	19HS1T01	English	3	-	-	3.0	30	70	100
5	19ME1L01	Engineering Workshop	-	-	3	1.5	30	70	100
6	19BS1L02	Engineering Chemistry Lab	-	-	3	1.5	30	70	100
7	19CS1L01	C Programming Lab	-	-	3	1.5	30	70	100
8	19HS1L01	English Proficiency Lab	-	-	3	1.5	30	70	100
<b>Total</b>			<b>12</b>	<b>1</b>	<b>12</b>	<b>19</b>	<b>240</b>	<b>560</b>	<b>800</b>

### SEMESTER-II

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA2T02	Differential Equation and Numerical Methods	3	-	-	3.0	30	70	100
2	19BS2T01	Engineering Physics	3	-	-	3.0	30	70	100
3	19CS2T02	Object Oriented Programming Using C++	3	-	-	3.0	30	70	100
4	19ME2T01	Engineering Graphics	3	-	-	3.0	30	70	100
5	19EE2T01	Basic Electrical Engineering	3	-	-	3.0	30	70	100
6	19CS2L02	IT Workshop	-	-	3	1.5	30	70	100
7	19BS2L01	Engineering Physics Lab	-	-	3	1.5	30	70	100
8	19CS2L03	C++ Programming Lab	-	-	3	1.5	30	70	100
9	19HS2L02	English Communication Skills Lab	-	-	3	1.5	30	70	100
<b>Total</b>			<b>15</b>	<b>-</b>	<b>12</b>	<b>21</b>	<b>270</b>	<b>630</b>	<b>900</b>

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS.  
IM-INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS

**SEMESTER-III**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19CS3T01	Discrete Mathematics	3	-	-	3.0	30	70	100
2	19BM3T01	Managerial Economics and Financial Analysis	3	-	-	3.0	30	70	100
3	19EC3T05	Digital Logic Design	3	-	-	3.0	30	70	100
4	19CS3T02	Data Structures	3	1	-	4.0	30	70	100
5	19IT3T01	Python for Data Science	3	-	-	3.0	30	70	100
6	19IT3L01	Data Structures Lab	-	-	3	1.5	30	70	100
7	19EC3L05	Digital Logic Design Lab	-	-	2	1.0	30	70	100
8	19IT3L02	Python for Data Science Lab	-	-	3	1.5	30	70	100
9	19BM0M03	Indian Constitution	2	-	-	-	-	-	-
<b>Total</b>			<b>17</b>	<b>1</b>	<b>8</b>	<b>20</b>	<b>240</b>	<b>560</b>	<b>800</b>

**SEMESTER-IV**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA4T05	Probability and Statistics	3	-	-	3.0	30	70	100
2	19IT4T01	Computer Organization and Architecture	3	-	-	3.0	30	70	100
3	19IT4T02	OOPs Through Java	2	1	-	3.0	30	70	100
4	19IT4T03	Theory of Computation	3	-	-	3.0	30	70	100
5	19CS4T02	Data Base Management Systems	3	-	-	3.0	30	70	100
6	19IT4T04	Software Engineering	3	-	-	3.0	30	70	100
7	19IT4L01	OOPs Through Java Lab	-	-	3	1.5	30	70	100
8	19IT4L02	Object Oriented Analysis and Design Lab	-	-	2	1.0	30	70	100
9	19IT4L03	Data Base Management Systems Lab	-	-	3	1.5	30	70	100
10	19BM0M01	Professional Ethics and Intellectual Property Rights	2	-	-	-	-	-	-
<b>Total</b>			<b>19</b>	<b>1</b>	<b>8</b>	<b>22</b>	<b>270</b>	<b>630</b>	<b>900</b>

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS.  
IM-INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS

**SEMESTER-V**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19IT5T01	Artificial Intelligence	3	-	-	3.0	30	70	100
2	19IT5T02	Operating Systems	3	-	-	3.0	30	70	100
3	19IT5T03	Advanced Java and Web Technologies	3	1	-	3.0	30	70	100
4		<b>Elective-I</b>	3	-	-	3.0	30	70	100
5		<b>Open Elective-I</b>	3	-	-	3.0	30	70	100
6	19IT5L01	Operating Systems Lab in Linux	-	-	3	1.5	30	70	100
7	19IT5L02	Advanced Java and Web Technologies Lab	-	-	3	1.5	30	70	100
8	19HS5L03	Advanced English Communication Skills Lab	-	-	2	1.0	30	70	100
9	19CE0M01	Environmental Science	2	-	-	-	-	-	-
<b>Total</b>			<b>17</b>	<b>1</b>	<b>8</b>	<b>19</b>	<b>240</b>	<b>560</b>	<b>800</b>

**SEMESTER-VI**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19IT6T01	Computer Networks	3	-	-	3.0	30	70	100
2	19IT6T02	Data Warehousing and Data Mining	3	-	-	3.0	30	70	100
3	19IT6T03	Design and Analysis of Algorithms	3	-	-	3.0	30	70	100
4		<b>Elective-II</b>	3	-	-	3.0	30	70	100
5		<b>Elective-III</b>	3	-	-	3.0	30	70	100
6		<b>Open Elective-II</b>	3	-	-	3.0	30	70	100
7	19IT6L01	Internet of Things Lab	-	-	3	1.5	30	70	100
8	19IT6L02	Data Warehousing and Data Mining Lab	-	-	3	1.5	30	70	100
9	19IT6P01	Mini Project - I	-	-	6	3.0	30	70	100
10	19BM0M02	Introduction to Cyber Laws	2	-	-	-	-	-	-
<b>Total</b>			<b>20</b>	<b>-</b>	<b>12</b>	<b>24</b>	<b>270</b>	<b>630</b>	<b>900</b>

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS.  
IM-INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS



**SEMESTER-VII**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19IT7T01	Cryptography and Network Security	3	-	-	3.0	30	70	100
2	19IT7T02	Machine Learning	3	-	-	4.0	30	70	100
3		<b>Elective-IV</b>	3	-	-	3.0	30	70	100
4		<b>Open Elective-III</b>	3	-	-	3.0	30	70	100
5		<b>Open Elective-IV</b>	3	-	-	3.0	30	70	100
6	19IT7L01	Cryptography and Network Security Lab	-	-	4	2.0	30	70	100
7	19IT7L02	Machine Learning Lab	-	-	2	1.0	30	70	100
8	19IT7P01	Mini Project - II	-	-	6	3.0	30	70	100
9	19IT7I01	Internship	-	-	2	1.0	50	-	50
<b>Total</b>			<b>16</b>	<b>-</b>	<b>12</b>	<b>23</b>	<b>290</b>	<b>560</b>	<b>850</b>

**SEMESTER-VIII**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1		<b>Elective-V</b>	3	-	-	3.0	30	70	100
2		<b>Elective-VI</b>	3	-	-	3.0	30	70	100
3	19IT8P01	Project Work	-	-	12	6.0	60	140	200
<b>Total</b>			<b>6</b>	<b>-</b>	<b>12</b>	<b>12</b>	<b>120</b>	<b>280</b>	<b>400</b>

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS.  
IM-INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS

**LIST OF ELECTIVES**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
<b>ELECTIVE – I :: V SEMESTER</b>									
1	19IT5E01	Compiler Design	3	-	-	3	30	70	100
2	19CS5E03	Software Project Management	3	-	-	3	30	70	100
3	19IT5E02	Agile with SCRUM	3	-	-	3	30	70	100
4	19EC5E18	Micro Processors and Controllers	3	-	-	3	30	70	100
<b>ELECTIVE – II :: VI SEMESTER</b>									
5	19IT6E03	Multimedia Application Development	3	-	-	3	30	70	100
6	19IT6E04	Distributed Systems	3	-	-	3	30	70	100
7	19CS6E05	Mobile Computing	3	-	-	3	30	70	100
8	19IT6E05	Service Oriented Architecture (SOA)	3	-	-	3	30	70	100
<b>ELECTIVE – III :: VI SEMESTER</b>									
9	19IT6E06	Parallel Computing	3	-	-	3	30	70	100
10	19IT6E07	Information Retrieval Systems	3	-	-	3	30	70	100
11	19EC6E19	Embedded Systems	3	-	-	3	30	70	100
12	19IT6E08	Pattern Recognition	3	-	-	3	30	70	100

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
<b>ELECTIVE – IV :: VII SEMESTER</b>									
13	19IT7E09	Soft Computing	3	-	-	3	30	70	100
14	19EC7E20	Image Processing	3	-	-	3	30	70	100
15	19IT7E10	Computer Vision	3	-	-	3	30	70	100
16	19IT7E11	Advanced Computer Networks	3	-	-	3	30	70	100
<b>ELECTIVE – V :: VIII SEMESTER</b>									
17	19IT8E12	Neural Networks and Deep Learning	3	-	-	3	30	70	100
18	19IT8E13	Cyber Security	3	-	-	3	30	70	100
19	19IT8E14	Big Data Analytics	3	-	-	3	30	70	100
20	19CS8E12	Augmented Reality and Virtual Reality	3	-	-	3	30	70	100
<b>ELECTIVE – VI :: VIII SEMESTER</b>									
21	19CS8E11	Cloud Computing	3	-	-	3	30	70	100
22	19IT8E15	Natural Language Processing	3	-	-	3	30	70	100
23	19CS8E13	Block Chain Technology	3	-	-	3	30	70	100
24	19IT8E16	Wireless and Adhoc Networks	3	-	-	3	30	70	100

**LIST OF OPEN ELECTIVES**

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19EEXO01	Electrical Safety Management	3	-	-	3	30	70	100
2	19EEXO02	Non-conventional Energy sources	3	-	-	3	30	70	100
3	19EEXO03	Electrical Vehicle	3	-	-	3	30	70	100
4	19EEXO04	Electrical Energy Conservation and Auditing	3	-	-	3	30	70	100
5	19CEXO01	Disaster Management	3	-	-	3	30	70	100
6	19CEXO02	Water Pollution and Control	3	-	-	3	30	70	100
7	19CEXO03	Solid Waste Management	3	-	-	3	30	70	100
8	19CEXO04	Building Planning and Drawing	3	-	-	3	30	70	100
9	19MEXO01	3D Printing	3	-	-	3	30	70	100
10	19MEXO02	Form Machinery	3	-	-	3	30	70	100
11	19MEXO03	Bio-Mechanical Engineering	3	-	-	3	30	70	100
12	19MEXO04	Waste to Energy Conversion	3	-	-	3	30	70	100
13	19CSXO01	Internet of Things and Applications	3	-	-	3	30	70	100
14	19CSXO02	Foundation to Data Analytics	3	-	-	3	30	70	100
15	19CSXO03	Data Engineering	3	-	-	3	30	70	100
16	19CSXO04	Machine Learning	3	-	-	3	30	70	100
17	19ECXO01	Nanotechnology and Applications	3	-	-	3	30	70	100
18	19ECXO02	Global Positioning and Navigation Satellite Systems	3	-	-	3	30	70	100
19	19ECXO03	Remote Sensing	3	-	-	3	30	70	100
20	19ECXO04	Mobile Communication and Applications	3	-	-	3	30	70	100
21	19ITXO01	Software Engineering Principles	3	-	-	3	30	70	100
22	19ITXO02	Cloud Computing Principles	3	-	-	3	30	70	100
23	19ITXO03	E-Commerce	3	-	-	3	30	70	100
24	19ITXO04	Web Technology Principles	3	-	-	3	30	70	100
25	19BMXO01	Innovations and Entrepreneurship	3	-	-	3	30	70	100
26	19BMXO02	Industrial Sociology and Psychology	3	-	-	3	30	70	100
27	19BMXO03	Digital Marketing	3	-	-	3	30	70	100
28	19BMXO04	Business Environment	3	-	-	3	30	70	100
29	19MAXO01	Operation Research	3	-	-	3	30	70	100
30	19MAXO02	Optimization Models	3	-	-	3	30	70	100
31	19BSXO01	Quantum Computing	3	-	-	3	30	70	100
32	19BSXO02	Optoelectronics	3	-	-	3	30	70	100

B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	3	1	-	4
19MA1T01 - CALCULUS & LINEAR ALGEBRA				

**Course Outcomes:**

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

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications (K3)
2. Apply the functions of several variables which is useful in optimization (K3)
3. Acquire important tools of calculus in higher dimensions and will become familiar with double integral(K3)
4. Solve the multiple integrals and are apply for special functions.(K3)

**Unit I: Matrix Operations and Solving Systems of Linear Equations**

Rank of a matrix by echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods - Eigen values and Eigen vectors and their properties (without proof).

**Unit II: Cayley-Hamilton theorem and Quadratic forms**

Cayley-Hamilton theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton theorem - Reduction to diagonal form - Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

**Unit III: Multivariable calculus**

Expansions of functions: Taylor's and Maclaurin's series - Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

**Unit IV: Multiple Integrals**

**Double Integrals:** change of order of integration, double integrals in polar coordinates, areas enclosed by plane curves.

**Triple Integral:** Evaluation of triple integrals, change of variables

**Unit V: Special Functions**

Beta and Gamma functions and their properties, relation between beta and gamma functions.

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012.

**References:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	3	-	-	3
19BS1T02: ENGINEERING CHEMISTRY				

**COURSE OUTCOMES**

**At the end of semester, the students will be able to**

1. Summarize the impurities present in raw water, problems associated and how to avoid them (K2)
2. List out the advantages of Polymers in daily life (K2)
3. Illustrate the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)
4. Compare conventional and non-conventional energy sources and their advantages and disadvantages. (K2)
5. Interpret the usage of advanced materials in day to day life (K2)

**UNIT I: WATER TECHNOLOGY**

Hardness of water-types of hardness-disadvantages of hard water-determination of hardness by EDTA complexometric method. Portable water and its specifications-steps involved in purification of water-chlorination, break point of chlorination. Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.

Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

**UNIT-II: POLYMERS AND COMPOSITE MATERIALS**

**Polymers**-Introduction-Types of polymers-degree of polymerization-functionality-preparation properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

**Plastics:** Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process (Any Four) - recycling of e-waste.

**Rubbers and elastomers:** Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

**Composite materials:** Fiber reinforced plastics-biodegradable polymers-biomedical polymers-conducting polymers

**UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION****Electrochemical Cells**

Introduction-single electrode potential-electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode.

Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid, Ni-Cd, Zinc-Air and Li-ion) battery. Fuel cells (H<sub>2</sub>-O<sub>2</sub>, Methanol-Air cells).

**Corrosion**

Defination-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere.

Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method.  
Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

#### **UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES**

##### **Conventional energy sources**

Introduction to fuels-classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking-petrol and diesel knocking-octane number and cetane number-gaseous fuels-Natural gas-CNG-LPG

##### **Non-conventional energy sources**

Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell-Introduction to hydro power-geo thermal power-tidal and wave power.

#### **UNIT V: CHEMISTRY OF MATERIALS**

Nano materials: Introduction-sol-gel method-characterization by BET, SEM and TEM methods-carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors: Preparation (Distillation, Zone refining, Czochralski crystal pulling epitaxy, diffusion, ion implantation)-semiconductor devices (P-N junction diode as rectifier, junction transistor)

Cement: Constituents of cement-setting and Hardening of cement, Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

##### **Text Books:**

**T1.** A Text Book of Engineering Chemistry - N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, Maruthi Publications. (2018)

**T2.** A Text Book of Engineering Chemistry - K. Sesha Maheswaramma, Mridula Chugh, Pearson Publications (2018).

##### **Reference Books:**

**R1.** Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (2017)

**R2.** Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited (2017)

**R3.** Chemistry –Prasanta Rath, Subhendu Chakroborthy, Cengage publications (2018)



B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	3	-	-	3
19CS1T01: PROBLEM SOLVING AND PROGRAMMING USING C				

**Course Outcomes:**

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

- Illustrate the Fundamental concepts of Computers and basics of computer programming. (K2)
- Apply Control Structures and Arrays in solving complex problems. (K3)
- Develop modular program aspects and Strings fundamentals. (K3)
- Summarize the ideas of pointers usage. (K2)
- Solve real world problems using the concept of Structures, Unions and File operations. (K3)

**UNIT-I**

**Introduction to Computer Problem Solving:** Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

**UNIT-II**

**Introduction to C Programming:** Introduction, Structure of a C Program, Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion.

**Control Flow, Relational Expressions:** Conditional Branching Statements: if, if-else, if-else-if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

**UNIT-III**

**Arrays:** Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays, Multi-dimensional arrays.

**Pointers:** Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

**UNIT-IV**

**Functions:** Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes, Recursion.

**Strings:** String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

**UNIT-V**

**Structures, Unions, Bit Fields:** Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type –enum variables, Using Typedef keyword, Bit Fields.

**Files:** Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

**Text Books:**

1. How to solve it by Computer, R. G. Dromey, and Pearson Education.
2. Computer Programming, ReemaThareja, Oxford University Press.

**Reference Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Programming In C A-Practical Approach, Ajay Mittal, Pearson.
3. C Programming – A Problem Solving Approach, Forouzan, Gilberg, Cengage.
4. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
5. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
6. Let us C ,YaswanthKanetkar, 16<sup>th</sup> Edition,BPB Publication.

**Web Links:**

1. <http://www.c4learn.com/>
2. <http://www.geeksforgeeks.org/c/>
3. <http://nptel.ac.in/courses/122104019/>
4. <http://www.learn-c.org/>
5. <https://www.tutorialspoint.com/cprogramming/>

B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	3	-	-	3
19HS1T01: ENGLISH				

**COURSE OUTCOMES:**

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

1. Identify the parts of speech, root words and apply relative writing formats to prepare notes (K3)
2. Precise the ideas coherently in day to day life. (K2)
3. Identify the importance of correct usage of grammar (K3)
4. Illustrate the ideas effectively on various topics (K2)
5. Develop the reports and essays by using appropriate sentences (K3)

**Syllabus:**

S No	Content
<b>UNIT –I</b>	<b>Vocabulary Building</b> <b>1.1</b> Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms <b>1.3 Parts of Speech</b> <b>1.4 Note- making, Note-taking</b>
<b>UNIT -II</b>	<b>Basic Writing Skills</b> <b>2.1</b> Video Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely <b>2.3 Tenses</b> <b>2.4 Letter Writing</b>
<b>UNIT-III</b>	<b>Identifying Common Errors in Writing</b> <b>3.1</b> Video Lesson 3.2.1 Sub + verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition 3.2.5 Redundancies 3.2.6 Clichés <b>3.3.1 Active - Passive Voice</b> <b>3.3.2 Reported Speech</b> <b>3.4 Resume Writing</b>
<b>UNIT-IV</b>	<b>Nature and Style of sensible Writing</b> <b>4.1</b> Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion <b>4.3.1 Conditional Sentences</b> <b>4.3.2 Degrees of Comparison</b> <b>4.4 Email writing</b>

<b>UNIT-V</b>	<b>Writing Practice</b> <b>5.1</b> Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing <b>5.3 Simple Compound and Complex Sentences</b> <b>5.4 Report Writing</b>
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**TEXT BOOK:** Building Effective Communication Skills by Maruti Publications (2019)

I SEMESTER	L	T	P	C
	0	0	3	1.5
<b>19ME2L01 - ENGINEERING WORKSHOP</b>				

**COURSE OUTCOMES:** Students will be able to

CO1: Model and Develop various basic prototypes in Carpentry trade [K3]

CO2: Model and Develop various basic prototypes in Fitting trade [K3]

CO3: Make use of Various Forging Operations [K3]

CO4: Develop various House Wiring Techniques. [K3]

CO5: Develop various basic prototypes in the trade of Sheet metal. [K3]

**NOTE:** At least **Two** Exercises to be done from each trade.

#### **TRADE:**

##### **1. CARPENTRY:**

1. CROSS LAP JOINT    2. DOVETAIL JOINT    3. MORTISE and TENNON JOINT

##### **1. FITTING:**

1. SQUARE FIT                      2. V-FIT                      3. HALF ROUND FIT

##### **1. FORGING:**

1. ROUND ROD TO SQUARE
2. S-HOOK
3. ROUND ROD TO SQUARE HEADED BOLT

#### **IV. HOUSE WIRING:**

1. PARALLEL/SERIES CONNECTION OF THREE BULBS
2. STAIRCASE WIRING
3. FLOURESCENT LAMP FITTING

#### **V. SHEET METAL:**

1. SQUARE TRAY                      2. HOLLOW CYLINDER                      3. OPEN SCOOP

#### **MANUAL:**

1. Engineering Workshop Practice Lab Manual Prepared by Mechanical Faculty.

I SEMESTER	L	T	P	C
	-	-	3	1.5
<b>19BS1L02: ENGINEERING CHEMISTRY LAB</b>				

**COURSE OUTCOMES:**

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

1. Identify the concentration of given solution by different methods of chemical analysis **(K3)**
2. Analyze the water purity by checking hardness, DO and Acidity. **(K4)**
3. Estimate the  $\text{Cu}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Ca}^{+2}$ ,  $\text{Mg}^{+2}$  ions and Ascorbic acid present in given solution. **(K4)**
4. Identify the pour and cloud point of lubricants. **(K3)**
5. Classify the principles of conductometric and potentiometric titrations. **(K2)**

**Syllabus:**

1. Estimation of HCl using standard  $\text{Na}_2\text{CO}_3$  through acid-base titration.
2. Estimate the total hardness of water using standardized EDTA solution through complexometric titration.
3. Estimation of  $\text{KMnO}_4$  using standard  $\text{H}_2\text{C}_2\text{O}_4$  through redox titration method.
4. Estimation of Dissolved Oxygen in given water sample by Winkler's Method
5. Determination of Ferric ( $\text{Fe}^{+3}$ ) ions using standard  $\text{K}_2\text{Cr}_2\text{O}_7$  solution
6. Determination of Copper (II) using standard hypo solution.
7. Estimation of strong acid by using strong base through conductometric titration method.
8. Estimation of strong acid by using strong base through potentiometric titration method.
9. Preparation of polymer (Demo).
10. Determination of Vitamin 'C'.
11. Determination of Pour and Cloud Point of lubricating oils

**Reference Books**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	-	-	3	1.5
19CS1L01: C PROGRAMMING LAB				

**Course Outcomes:**

- Develop basic programs in C and design flowcharts in Raptor. (K3)
- Apply Conditional and Iterative statements to solve the real time scenarios in C. (K3)
- Implement the concept of Arrays and Modularity and Strings. (K3)
- Apply the Dynamic Memory Allocation functions using pointers. (K3)
- Develop programs using structures and Files. (K3)

**List of Experiments:****1. Introduction to Algorithms and Flowcharts**

- 1.1) Implement Algorithm Development for Exchange the values of Two numbers.
- 1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.
- 1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

**2. Introduction to C Programming**

- 2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.
- 2.2) Writing simple programs using printf(), scanf() .

**3. Raptor**

- 3.1) Introduction to Raptor.
- 3.2) Draw a flow chart to find the Sum of 2 numbers.
- 3.3) Draw a flow chart to find Simple interest.

**4. Basic Math**

- 4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.
- 4.2) Write a C Program to find largest of three numbers using ternary operator.
- 4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

**5. Control Flow- I**

- 5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- 5.2) Write a C program to find the roots of a Quadratic Equation.
- 5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch...case.

**6. Control Flow- II**

- 6.1) Write a C Program to Find Whether the Given Number is Prime number or not.
- 6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.
- 6.3) Write a C program to print Floyd Triangle.

**7. Control Flow- III**

- 7.1) Write a C program to find the sum of individual digits of a positive integer.
- 7.2) Write a C program to check whether given number is palindrome or not.
- 7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression  $1+x+x^2+x^3+\dots+x^n$ .

**Practice Programs:**

Write a C program to print all natural numbers from 1 to n. - using while loop



Write a C program to print all natural numbers in reverse (from n to 1). - using while loop  
Write a C program to print all alphabets from a to z. - using while loop  
Write a C program to print all even numbers between 1 to 100. - using while loop  
Write a C program to print sum of all even numbers between 1 to n.  
Write a C program to print sum of all odd numbers between 1 to n.  
Write a C program to print table of any number.  
Write a C program to find first and last digit of any number.  
Write a C program to count number of digits in any number.  
Write a C program to calculate sum of digits of any number.  
Write a C program to calculate product of digits of any number.  
Write a C program to swap first and last digits of any number.  
Write a C program to enter any number and print its reverse.  
Write a C program to enter any number and check whether the number is palindrome or not.  
Write a C program to find frequency of each digit in a given integer.  
Write a C program to enter any number and print it in words.  
Write a C program to print all ASCII character with their values.  
Write a C program to enter any number and print all factors of the number.  
Write a C program to enter any number and calculate its factorial.  
Write a C program to find HCF (GCD) of two numbers.  
Write a C program to find LCM of two numbers.  
Write a C program to check whether a number is Prime number or not.  
Write a C program to check whether a number is Armstrong number or not.  
Write a C program to check whether a number is Perfect number or not.  
Write a C program to check whether a number is Strong number or not.  
Write a C program to print Fibonacci series up to n terms.

## 8. Arrays

- 8.1) Write a C program to search an element in the given array (Linear Search).  
8.2) Write a C program to perform matrix addition.  
8.3) Write a C program to perform matrix multiplication.

### Practice Programs:

Write a C program to read and print elements of array.  
Write a C program to find sum of all array elements. - using recursion.  
Write a C program to find maximum and minimum element in an array. - using recursion.  
Write a C program to find second largest element in an array.  
Write a C program to copy all elements from an array to another array.  
Write a C program to insert an element in an array.  
Write a C program to delete an element from an array at specified position.  
Write a C program to print all unique elements in the array.  
Write a C program to print all negative elements in an array.  
Write a C program to count total number of even and odd elements in an array.  
Write a C program to count total number of negative elements in an array.  
Write a C program to count total number of duplicate elements in an array.  
Write a C program to delete all duplicate elements from an array.  
Write a C program to count frequency of each element in an array.  
Write a C program to merge two array to third array.  
Write a C program to find reverse of an array.  
Write a C program to convert lowercase string to uppercase.  
Write a C program to convert uppercase string to lowercase.

Write a C program to toggle case of each character of a string.

Write a C program to find total number of alphabets, digits or special character in a string.

## 9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.

9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

## 10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.

10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.

10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

## Practice Programs:

Program to change the value of constant integer using pointers.

Program to print a string using pointer.

Program to count vowels and consonants in a string using pointer.

Program to read array elements and print with addresses.

## 11. Strings

11.1) Implementation of string manipulation operations with library function:

- a) copy
- b) concatenate
- c) length
- d) compare

11.2) Implementation of string manipulation operations without library function:

- a) copy
- b) concatenate
- c) length
- d) compare

11.3) Verify whether the given string is a palindrome or not.

## 12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

## 13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

## 14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

**Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.**

**Reference Books:**

1. Let Us C Yashwanth Kanetkar, 16<sup>th</sup> edition, BPB Publications.
2. Programming in C A-Practical Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal, 3<sup>rd</sup> Edition, TMG Publication.

**Web Links:**

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>
5. <https://raptor.martincarlisle.com/>
6. <https://nptel.ac.in/courses/106105085/2>

B. TECH 1 <sup>st</sup> SEMESTER	L	T	P	C
	-	-	3	1.5
19HS1L01: ENGLISH PROFICIENCY LAB				

## COURSE OUTCOMES

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

1. Acquire the sounds of words for correct pronunciation. (K2)
2. Identify and learn accent of words for mastering language proficiency. (K3)
3. Distinguish the word pronunciation relating to accent and accuracy of English language. (K4)
4. Apply the words for ensuring the ability for correct pronunciation. (K3)
5. Summarize the influence of mother tongue on target language. (K2)

## COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

## PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

### Syllabus

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

### Text Book:

“Infotech” by Maruthi Publications (2019)

### Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	3	-	-	3
19MA2T02: DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS				

**Course Outcomes:**

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

1. Solve the differential equations related to various engineering fields (K3)
2. Identify solution methods of partial differential equations that model physical processes (K3)
3. Evaluate the approximate roots of polynomial and transcendental equations by different algorithms (K3)
4. Solve integrate and ordinary differential equations by various numerical techniques. (K3)

**Unit I: Ordinary Differential Equations of First Order and First Degree:**

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories

**Unit II: Linear differential equations of higher order:**

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x^n$ ,  $e^{ax} V(x)$  and  $x^n V(x)$  – Method of Variation of parameters.

Applications: LCR circuit

**Unit –III: Partial Differential Equations of First Order:**

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

**Unit IV: Numerical Solution of Equations and Interpolation**

**Numerical Solution of Equations:** Solution of algebraic and transcendental equations - Bisection Method, Method of False Position, Newton-Raphson Method, useful deduction from Newton-Raphson Method.

**Interpolation-** Finite differences, Differences of a polynomial, relation between operators, Newton's interpolation formulae, and interpolation with unequal intervals- Newton's divided difference formula, Lagrange's formula.

**Unit V: Numerical Integration and Numerical Methods for Ordinary Differential Equations**

**Numerical Integration** – Trapezoidal rule, Simpson's  $\frac{1}{3}$  rule and Simpson's  $\frac{3}{8}$  rule.

**Numerical Methods for Ordinary Differential Equations** - Taylor's series, Euler's and modified Euler's methods, Runge-kutta method of fourth order for solving first order equations.

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna publishers, 2012.

**References:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	3	-	-	3
19BS2T01: ENGINEERING PHYSICS				

**COURSE OUTCOMES**

After completion of course student able to:

1. Acquire the knowledge of basic crystal systems and determination of crystal structures. (K2)
2. Summarize the Magnetic and Dielectric Materials properties. (K2)
3. Illustrate the concept of Magnetic Induction and Super Conducting properties. (K2)
4. Interpret Pure & Doped Semiconductor materials for better utility. (K2)
5. Acquire the knowledge on Optical fibers and Optical properties of materials and their applications (K2)

**SYLLABUS****UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION****CRYSTAL STRUCTURE:**

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

**X-RAY DIFFRACTION:**

Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

**UNIT – II:MAGNETIC AND DIELECTRIC PROPERTIES**

**MAGNETIC PROPERTIES:** Introduction- Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis-soft and Hard Magnetic materials.

**DIELECTRIC PROPERTIES:** Introduction-Dielectric constant- Relation between three electric vectors- Electronic and ionic polarizations (Quantitative) – orientation polarizations(Qualitative) - Internal fields in solids- Clausius-Mossotti equation.

**UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY**

**ELECTROMAGNETIC WAVES:** Introduction- Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law-Biot-Savart's law-Magnetic Induction due to current carrying circular loop-Faraday's law - Maxwell's equations.

**SUPERCONDUCTIVITY:** General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization –BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

**UNIT-IV: PHYSICS OF SEMICONDUCTORS:**

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

## **UNIT-V: LASERS AND OPTICAL FIBERS**

**LASERS:** Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein’s coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

**FIBER OPTICS:** Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Applications of optical fibers.

### **TEXT BOOK:**

A text book of “Engineering Physics” by M. N. Avadhanulu, P.G. Kshirasagar& TVS Arun Murthy, SChand publications, 11<sup>th</sup> Addition 2019.

### **REFERENCE BOOKS:**

1. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Education, 2018.
2. Engineering Physics by Palanisamy(Scitech Publishers)
3. Engineering Physics by D. Thirupathi Naidu and M. Veeranjanyulu



B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS2T02 : OBJECT ORIENTED PROGRAMMING THROUGH C++				

**COURSE OUTCOMES:**

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

1. Outline the Principles of object oriented technology. (K2)
2. Summarize the Evolution and Purpose of Object Oriented Programming. (K2)
3. Acquire the Object Oriented programming concepts and logic implementations. (K2)
4. Analyze the file I/O operations and exceptions. (K4)
5. Identify and implement appropriate Solution for a given Problem. (K3)
6. Summarize the terms Object oriented Programming, Class ,Object ,Constructor, Destructor, friend, static, Data Abstraction, Encapsulation, Inheritance, Polymorphism, File I/O, templates, Exceptions and where they are applicable. (K2)

**UNIT I**

**INTRODUCTION:** The Object Oriented Technology, Disadvantages of Conventional Programming, Advantages of OOP, Structure of a C++ Program, Differences between C and C++

**INPUT AND OUTPUT IN C++:** Streams, Stream Classes Hierarchy, Bit Fields, Manipulators. Tokens in C++, Data Types, Constants, L Value and R Values, Operators in C and C++, Scope Access Operator, Comma Operator, This Operator, Reference Variable, Decision and Loop Statements.

**UNIT II**

**FUNCTIONS IN C++:** Passing Arguments to a Function, Default Arguments, Const Arguments, Inputting Default Arguments, Inline Functions, Function Overloading.

**CLASSES AND OBJECTS:** Class Definition, Declaring Objects, Access specifiers and their scope, Member functions, Outside member functions as inline, Data Hiding or Encapsulation, Memory for Class and Objects, Static Member variables, Static Member Functions, Static Object, Array of Objects, Objects as Function Arguments, Friend Functions, Friend class, Local class, Empty Class, Qualifiers and Nested Classes, Member Function and Non-Member Function.

**UNIT III**

**CONSTRUCTORS AND DESTRUCTORS:** Introduction of Constructor, Destructor & Characteristics, Parameterized Constructor, Overloading Constructors, Constructor with Default Arguments, Copy Constructor

**OPERATOR OVERLOADING:** Introduction of Overloading, Overloading Unary Operators, Constraint on Increment and Decrement Operators, Overloading Binary Operators, Overloading with Friend Functions, Overloading Assignment Operator, Rules for Overloading Operators.

**UNIT IV**

**INHERITANCE:** Introduction of Inheritance, Access specifiers, Protected Data with Private Inheritance, Types of Inheritances, Virtual Base Class, Constructors and Destructors in Inheritance, Constructor and Destructor in Derived Class, Advantages and Disadvantages of Inheritance. **POLYMORPHISM:** Polymorphism, Types, Pointer and Inheritance, Virtual and Pure Virtual Functions, Abstract Classes.

## **UNIT V**

**APPLICATIONS WITH FILES:** File Stream Classes, File Opening Modes, File Pointers and Manipulators, Sequential Access Files, Binary and ASCII Files, Random Access Files.

## **TEMPLATES & EXCEPTION HANDLING**

Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.

Generic Programming with Templates, Need for Templates- Definition of class Templates.

Introduction to STL- Containers, Algorithms, Iterators.

## **TEXT BOOKS**

1. Programming in C++, Ashok N Kamthane, Pearson, 4th edition
2. The C++ Programming Language, B. Stroustrup, Pearson Education. , 4th edition
3. The Complete Reference C++, Herbert Schildt, Tata McGraw Hill, 4th edition

## **REFERENCES**

1. Object Oriented Programming C++, Joyce Farrell, Cengage, 4th edition
2. Mastering C++ , Venugopal, Raj Kumar, Ravi Kumar TMH, 2nd edition
3. Object Oriented Programming with C++, SouravSahay and OXFORD, 2nd edition

## **LINKS**

<https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/>

[https://www.tutorialspoint.com/cplusplus/cpp\\_object\\_oriented.htm](https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm)

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	3	-	-	3
19ME2T02: ENGINEERING GRAPHICS				

**COURSE OUTCOMES:** Students will be able to

CO1: Construct polygons, conics, cycloids, involutes. (K3)

CO2: Develop the orthographic projections of points, lines in different positions. (K3)

CO3: Develop the orthographic projections of plane surfaces in different positions. (K2)

CO4: Develop the orthographic projections of solids like prisms, cylinder, pyramids and cone. (K2)

CO5: Translate Isometric views to orthographic views and vice-versa and also visualize 2D & 3D objects using Auto CAD. (K2)

### UNIT I

**POLYGONS:** Constructing regular polygons by general methods, inscribing and describing polygons on circles. Curves: Parabola, Ellipse and Hyperbola by Eccentricity method, Cycloid, Epi-cycloid and Hypo-cycloid and Involute.

### UNIT II

**ORTHOGRAPHIC PROJECTIONS:** Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, and angle of inclination.

### UNIT III

**PROJECTIONS OF PLANES:** regular planes perpendicular and parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

### UNIT IV

**PROJECTIONS OF SOLIDS:** Prisms, Pyramids, Cone and Cylinder, Simple positions of solids and Axis of the Solid parallel to one plane and inclined to other plane.

### UNIT V

#### ISOMETRIC VIEWS:

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

#### CAD:

#### FUNDAMENTALS OF AUTOCAD - FOR POLYGONS, CREATING 2D AND 3D DRAWINGS USING AUTOCAD:

Computer Aided Design, Drawing practice using Auto CAD simple figures like polygons, creating 2D&3D drawings of objects using Auto CAD

**Note:** In the End Examination there will be no question from CAD.

#### TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications 2016
2. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age 2010

#### REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers 2016.
2. Engineering Graphics for Degree by K.C. John, PHI Publishers 2009.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers 2013.

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	3	-	-	3
19EE2T01: BASIC ELECTRICAL ENGINEERING				

**COURSE OUTCOMES:** *After successful completion of this course, students should be able to:*

- CO1 : Solve simple DC circuit using KVL, KCL and Network Theorems. (K3)
- CO2 : Acquire the basic concepts of single-phase and three phase systems analysis for simple AC circuit.
- CO3 : Compare the construction, working principles and operating characteristics of DC machines, transformer and AC rotating machines. (K2)
- CO4 : Acquire the basic Concepts of Electrical installations. (K2)

## SYLLABUS

### UNIT-I : DC CIRCUIT ANALYSIS

Electrical Circuit Elements (R, L and C), Voltage and Current Sources, Ohms Laws, Kirchoff's Laws and Star/Delta Conversion, Network Reduction Techniques-Series-Parallel- Series and Parallel (Only Resistor), Superposition, Thevenin's and Norton's Theorems, Problems in Simple Circuits with DC Excitation.

### UNIT-II : AC CIRCUIT ANALYSIS

Representation of Sinusoidal Waveforms, Peak and RMS Values, Phasor Representation, Real Power, Reactive Power, Apparent Power, Power Factor, Analysis of Single Phase AC Circuits Consisting of R, L, C, RL, RC and RLC Combinations (Series and Parallel), Resonance, Three Phase Circuits- Voltage and Current Relations in Star/Delta Connections-Simple Problems.

### UNIT-III : DC MACHINES & TRANSFORMERS

**DC MACHINES:** Introduction-Construction Details - Principle of Operation-EMF Equation – Classification Based on Excitation- Torque Equation- Characteristics: OCC of DC Shunt Generator-Load Characteristics of DC Shunt Motor, 3-Point Starter– Speed Control by Armature Voltage, Field Control of DC Motors-Simple Problems. **TRANSFORMERS:** Introduction-Constructional Details - Principle of Operation - EMF Equation – OC and SC Test –Equivalent Circuit, Voltage Regulation, Losses and Efficiency.

### UNIT-IV : AC MACHINES

**3-Ø INDUCTION MOTOR:** Introduction- Construction Details - Principle of Operation- Generation of Rotating Magnetic Fields, Torque-Slip Characteristic. Losses and Efficiency.

**ALTERNATOR:** Introduction- Construction Details - Principle of Operation–Definition for Pitch Factor and Distribution Factor-E.M. F Equation- Determination of Voltage Regulation by E.M.F Method.

## **UNIT-V : ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics of Batteries. Elementary Calculations for Energy Consumption, Battery Backup.

### **TEXT BOOKS:**

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGrawHill.
2. Basic Electrical Engineering, P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Cengage, 2019.

### **REFERENCE BOOKS:**

1. Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.
2. Fundamentals of Electrical Engineering, L.S. Bobrow, Oxford University Press, 2011
3. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
4. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
5. Principles of Electrical Engineering and Electronics”, V K Mehta & Rohit Mehta, S Chand Publishers, 2019 edition.

SEMESTER-II	L	T	P	C
	0	0	3	1.5
<b>19CS2L02 : IT WORKSHOP</b>				

**COURSE OUTCOMES:**

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

1. Acquire complete knowledge of computer hardware. (K2)
2. Install basic computer engineering software. (K2)
3. Document a task through MS office. (K2)
4. Apply the usage of Google Tools and Email handling. (K3)
5. Make use of network troubleshooting. (K3)

WEEK	TOPIC
1	<b>KNOWING OF COMPUTER</b> <b>Identification of peripherals of a PC, Laptop, and Smart Phones:</b> Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.
	<b>OPERATING SYSTEMS</b> Functions of OS, Types, <b>OS simple setting</b> : Changing system date and time, display properties, to add or remove a window component and changing mouse properties <b>File and Directory Management</b> : Creating and renaming of files and directories, <b>MS-DOS Commands</b>
3	<b>INTERNET SERVICES</b> Web Browser usage and <b>Advanced settings</b> like LAN, Proxy, Content, Privacy, Security, Cookies, Extensions/ Plug-in, <b>Antivirus installation</b> , Configuring a firewall, blocking pop-ups, <b>Email</b> creation and usage.
4	Practice on <b>Microsoft-Word</b>
5	Practice on <b>Microsoft-PowerPoint</b>
6	Practice on <b>Microsoft-Excel</b>
7	Creating pdf documents.
8	<b>CLOUD BASED COLLABORATION TOOLS</b> Store, sync, and share files with ease in the cloud using Google Drive Manage event registrations, create quizzes, and analyze responses using Google Forms
9&10	<b>STATIC WEB PAGE DESIGNING</b> Basic HTML Tags, Table Tags, List Tags, Image Tags, Forms

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	-	-	3	1.5
19BS2L01: ENGINEERING PHYSICS LAB				

## COURSE OUTCOMES

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

CO1: Apply the basic knowledge to know the frequency of a vibrator, hall coefficient. (K3)

CO2: Apply the knowledge to verify some of the properties of physical optics. (K3)

CO3: Develop skills to plot various characteristic curves and to calculate the physical properties of given materials. (K3)

CO4: Estimate some the properties of semiconducting materials. (K3)

## STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (I/V) of a Zener diode to determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee's experiment.
8. Study of Characteristic curves (I/V) of a P-N diode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

SEMESTER-II	L	T	P	C
	0	0	3	1.5
19CS2L03 : C++ Programming Lab				

**COURSE OUTCOMES:**

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

1. Distinguish structure oriented programming and object oriented programming. (K4)
2. Apply various object oriented features. (K3)
3. Acquire the concepts in operator overloading, function overloading & polymorphism. (K2)
4. Develop, compile and debug programs in C++ language. (K3)
5. Develop programs involving constructors, destructors. (K3)
6. Illustrate the reuse of code using inheritance. (K2)
7. Apply the concept of files, templates and exceptions. (K3)
8. Develop diversified solutions using C++ language. (K3)

**EXERCISE-1(BASICS)**

- A. Write a CPP Program to demonstrate the structure of a C++ program.
- B. Write a CPP Program to display the names of header files, definitions and list of functions supported.
- C. Write a program to show the base of a numeric value of a variable using **Hex**, **Oct** and **Dec** manipulator functions.
- D. Write a CPP Program to use of the standard manipulators normally used in the stream classes.
- E. Write a CPP Program to demonstrate the usage of bit fields.
- F. Write a CPP Program to define constant pointer and pointer to constant and perform possible operations.
- G. Write a CPP Program access a variable in different scopes by using scope resolution operator and the use of comma operator.

**EXERCISE-2(CLASSES & OBJECTS)**

- A. Write a CPP Program to swap two numbers using call by value, call by address, call by reference and return by reference.
- B. Write a CPP Program to calculate square and cube of a number using inline functions and macros. (Demonstrate the use of inline functions compared to macros).
- C. Write a CPP Program to find the area of a rectangle, a triangle and surface area of a sphere using function overloading.
- D. Write a CPP Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private).
- E. Write a CPP Program to access the member functions inside and outside a class.



- F. Write a CPP Program to access private data using non-member functions. (Use friend function).
- G. Write a CPP Program to pass objects to functions by pass by value method.
- H. Write a CPP Program to declare main () function as member function and overload it.

### **EXERCISE-3(CONSTRUCTORS AND OPERATOR OVER LOADING)**

- A. Write a CPP Program to show that “for each object constructors is called separately” and read the values through keyboard (Use Constructor).
- B. Write a CPP Program to create constructor with arguments and pass the arguments to constructor.
- C. Write a CPP Program to create object and release them using destructor.
- D. Write a CPP Program to perform addition, subtraction, multiplication of two objects using operator keyword.
- E. Write a CPP Program to overload unary and binary operator overloading with friend function.

### **EXERCISE-4(INHERITANCE AND POLYMORPHISM)**

- A. Write a CPP Program to derive a class publicly from base class. Declare base class members under public, private and protected.
- B. Write a CPP Program to derive single and multiple inheritances.
- C. Write a CPP Program to declare virtual base class. Derive a class using two virtual classes.
- D. Write a CPP Program to implementation of Virtual Function.
- E. Write a CPP Program to Implementation of Pure Virtual Function.

### **EXERCISE- 5(FILES, TEMPLATES AND EXCEPTION HANDLING)**

- A. Write a CPP Program to write and read text in a file. Use ofstream and ifstream classes.
- B. Write a CPP Program to open a file for writing and reading purpose. Use open () function.
- C. Write a CPP Program write text in a file. Read the text from the file from EOF. Display the contents in reverse order.
- D. Write a CPP Program to demonstrate that the data is read from file using ASCII format.
- E. Write a CPP Program to find the factorial of a number. Throw multiple exceptions and define multiple catch statements to handle exceptions.
- F. Write a C++ Program to illustrate template class

### **Practice Programs**

- 1. Write C++ Program to Create Floyd's Triangle
- 2. Write a C++ program Add Two Matrices using Multi-dimensional Arrays
- 3. Write a C++ program Multiply Matrix by passing it to a Function
  - To perform this task three functions are made:
  - To take matrix elements from user
  - To multiply two matrix
  - To display the resultant matrix after multiplication
- 4. Write a C++ program to create a class for student to get and print details of N students.  
(C++ program to demonstrate example of array of objects.)
- 5. Write a C++ program to convert time from HH:MM:SS format to seconds using class
- 6. Write a C++ program to convert time from seconds to HH:MM:SS format using class
- 7. Write a C++ program to define a class employee having members Emp-id, Emp-name, basic salary and functions accept() and display(). Calculate DA=25% of basic salary,

HRA=800, I-tax=15% of basic salary. Display the pay slip using appropriate output format.

- 1) To accept the data
  - 2) To display the data
8. Write a C++ Program to check prime Number or not using class
9. To create a class staff having fields: Staff-id , name, salary and functions accept() and display(). Calculate DA=25% of basic salary, HRA=800, I-tax=15% of basic salary. Display the pay slip using appropriate output format.
- 1) To accept the data
  - 2) To display the data
  - 3) To sort the data by name
10. To define a class to represent a bank account. Include the following members:
- Data members:
- 1) Name of the depositor
  - 2) Account number
  - 3) Type of account
  - 4) Balance amount in the account.
- Member functions:
- 1) To assign initial values
  - 2) To deposit an amount
  - 3) To withdraw an amount after checking the balance
  - 4) To display name and balance.
11. To create a class for an electricity board that charges the following rates to users
- a) For first 100 units : 40p per unit
  - b) For next 200 units : 50p per unit
  - c) Beyond 300 units : 60p per unit

All users are charged a minimum of Rs.500. If the total cost is more than Rs.250.00 then an additional charges of 15% are added.

Write a C++ program using class to read the names of users & number of units consumed & print out the charges with names.

12. Write C++ program to demonstrate Overloading new and delete operator
13. Write C++ program to compare two Strings using Operator Overloading
14. Write C++ Program to concatenate two strings using Operator Overloading
15. Write a C++ Program to Find the Number of Vowels, Consonants, Digits and White Spaces in a String
16. Write a C++ Program to remove all Characters in a String except Alphabets.
17. Write a C++ Program to Find the Frequency of Characters in a String
- 18) Write C++ Program for remove all duplicates from the input string. Print all the duplicates in the input string.
18. Write C++ Program for remove characters from the first string which is present in the second string
19. Write C++ Program to check if strings are rotations of each other or not
20. Write C++ Program to read a string .Add the same string in the reverse order to the end of the same string.
21. Write a C++ program to read a string. Change the first letter of every capital word.
22. Write C++ program to declare string objects .Perform assignment and concatenation with the string objects.
23. Write C++ program to perform string operations using string library functions.
24. Write C++ Program for return maximum occurring character in the input string
25. Write C++ program using string manipulating functions.
26. Write a C++ Program to Implement Stack in STL using the following

1. Insert Element into the Stack
  2. Delete Element from the Stack
  3. Size of the Stack
  4. Top Element of the Stack
  5. Exit
28. Write a C++ Program to Implement String in STL using following
1. Insert Substring in a String
  2. Erase Substring from a String
  3. Append Substring to a String
  4. Replace the String with a Substring
  5. Size of the String
  6. Find substring in a String
  7. Display the String
  8. Exit
29. Write a C++ Program to Implement Array in STL using following
1. Insert Element into the Array
  2. Size of the array
  3. Front Element of Array
  4. Element of Array
  5. Display elements of the Array
  6. Exit
30. Write C++ program to implement Bubble Sort using templates in C++

B. TECH 2 <sup>nd</sup> SEMESTER	L	T	P	C
	-	-	3	1.5
19HS2L01: ENGLISH COMMUNICATION SKILLS LAB				

**COURSE OUTCOMES:**

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

1. Identify the difference between impromptu and extempore.(K3)
2. Express hypothetical situations in different ways.(K2)
3. Outline the etiquettes of telephonic conversation and interviews.(K2)
4. Identify the need of the presentation skills to participate in various oral activities.(K3)
5. Apply preparatory techniques for Job interviews.(K3)

**COURSE DESCRIPTION**

Communicating in a language is also a skill. So a student has to look for an opportunity to practice the language he is learning in order to acquire communication skills. 'Enrich your interactive Skills: Part - B' is designed to provide opportunities for engineering students to revise and consolidate communication skills in different contexts formal and informal. It prepares the student for facing Interviews, participating in group discussions and making presentations.

**PRE REQUISITES**

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

**Syllabus**

UNIT	TOPIC
1	Oral Activity : JAM, Hypothetical situations, self / peer profile, Common errors in pronunciation, Neutralizing Accent
2	Oral Activity : Telephonic Etiquette, Role plays, Poster presentations and e-mail Writing
3	Oral Activity : Oral Presentation Skills, Public Speaking Data Interpretation
4	Oral Activity : Group Discussion: Do's and Don'ts –Types, Modalities
5	Oral Activity : Interview Skills: Preparatory Techniques, FAQ, Mock Interviews Pronunciation : Connected speech (pausing, tempo, tone, fluency etc.,)

**Text Book:**

"Infotech" by Maruthi Publications (2019)

**Reference Books:**

1. How to Face Interviews – by Clive Fletchers
2. The 7 Habits of Highly Effective People – by Stephen Covey.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS3T01 : DISCRETE MATHEMATICS				

**COURSE OBJECTIVES:**

The Objective of this course is to

1. Provide the fundamentals and the concepts of Discrete Mathematical Structures with applications to Computer Sciences including Mathematical Logic, Boolean Algebra and its Applications, Switching circuit & Logic Gates, Graphs and Trees. Important theorems with constructive proofs, real life problems & graph theoretic algorithms.
2. Help the students to understand the computational and algorithmic aspects of Sets, Relations, Mathematical Logic, Boolean Algebra, Graphs, Trees and Algebraic Structure in the field of Computer sciences and its applications.

**COURSE OUTCOMES:**

Upon successful completion of this course the student should be able to

1. Identify programming errors efficiently through enhanced logical capabilities (K3)
2. Discover a general solution of recurrence equation (K4)
3. Acquire set theory, graph of the relations which are used in data structures (K2)
4. Analyze the concepts in graph theory (K4)
5. Apply graph theory concepts in core subjects such as data structures and network theory effectively (K3)

**Unit 1: Mathematical logic**

Connectives, negation, conjunction, disjunction, statement formula and Truth Tables, conditional and bi-conditional, well formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, other connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, consistency of premises, indirect method of proof, Theory of inference for the statement calculus, validity using Truth tables.

**Unit 2: Recurrence relations**

Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

**Unit 3: Set theory and Relations**

Relations and ordering, Relations, Properties of binary Relations in a set, Relation Matrix and the Graph of a Relation, partition and covering of a set, Equivalence, Compatibility Relations, Composition of Binary Relations, Partial ordering, Hasse diagram, Principle of Inclusion-Exclusion, Pigeonhole Principle and its applications.

#### **Unit 4: Graph theory**

Basic Concepts, Representation of Graph, Sub graphs, Multigraphs, Planar graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number.

#### **Unit 5: Trees**

Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees.

#### **Text Books:**

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and R. Manohar Tata McGraw Hill, 2017.
2. Discrete Mathematics for computer scientists & Mathematicians, Joe L. Mott, Abraham Kandel and T. P. Baker 2/e, Prentice Hall of India Ltd, 2012.

#### **References:**

1. Discrete Mathematics and its Applications, Kenneth. H. Rosen, 6/e, Tata McGraw-Hill, 2009.
2. Discrete Mathematics, Richard Johnsonburg, 7/e, Pearson Education, 2008
3. Graph Theory with Applications to Engineering and Computer Science, Narsingh Deo, Prentice Hall of India, 2006.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	3	-	-	3
19BM3T01 : MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				

**COURSE OBJECTIVES:**

1. To acquire knowledge of economics to facilitate the process of economic Decision making
2. To analyze production function and its laws of variable proportions and cost concepts
3. To differentiate and distinguish price and output decisions in different market structures
4. To compare and contrast the difference between private and public sector in their functioning
5. To develop the skills to analyze financial statements.

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Summarize the importance of Managerial Economics and its utility in decision making (K2)
2. Identify the meaning and usefulness of the production function and cost function in analyzing the firms production activity (K3&K4)
3. Comprehend the market structure, different types of markets and pricing policies (K4)
4. Identify the different forms of business organization and analyze their merits and demerits (K3)
5. Evaluate the Investment proposal through techniques of capital budgeting and financial performance of the company through financial statements (K5)

**UNIT-I Managerial Economics & Demand Analysis:** Definition – Nature and Scope - Relation with other disciplines - Concept of Demand-Types-Determinants - Law of Demand – Exceptions - Elasticity of Demand - Types and Measurement-Demand forecasting and its Methods.

**UNIT-II Production and Cost Analysis:** Production function - Law of Variable proportions - Isoquants and Isocosts -Law of returns Economies of Scale - Cost Concepts - Fixed, Variable Costs, Explicit Costs, Implicit Costs & Opportunity cost - Cost Volume Profit Analysis - Break Even Point (Simple Problems)

**UNIT-III Market Structures & Pricing Policies:** Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly – Features – Price & Output Determination - Pricing Methods

**UNIT-IV Forms of Organizations & Business Cycles:** Business Organization- Sole Trader – Partnership - Joint Stock Company - State/Public Enterprises and their forms - Business Cycles: Meaning and Features - Phases of Business Cycle.

**UNIT-V Capital Budgeting and Accounting:** Concept and sources-Techniques of capital budgeting-Traditional and Modern Methods (Simple problems)

**Introduction to accounting:** Branches-Systems of Accounting-Single Entry-Double Entry System-Journal-Ledger-Trail Balance-Final Accounts(Simple problems)

**TEXTBOOKS:**

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. T.V.Ramana & B. Kuberudu: Managerial Economics and Financial Analysis, Himalaya Publishing House,Mumbai
3. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

**REFERENCE BOOKS:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson. .  
Narayanaswamy: Financial Accounting A Managerial Perspective, PHI.
7. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
8. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.



B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	3	1	-	3
19EC3T05 : DIGITAL LOGIC DESIGN				

**COURSE OBJECTIVES:**

The course is designed with the objective to:

1. To solve typical number base conversions.
2. Optimize logic gates for digital circuits using various techniques.
3. To apply knowledge for mapping techniques & adders for higher order digital circuits.
4. To develop advanced combinational logic circuits & PLO's.
5. To identify new areas for applying the knowledge of flip-flops & registers.

**COURSE OUTCOMES:**

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

1. Distinguish number systems and digital codes & explain the function of various logic gates. (K4)
2. Outline hardware concepts in a digital system. (K2)
3. Examine logic functions for economical design of logic circuits. (K4)
4. List out various types of combinational and sequential circuits. (K1)
5. Analyze the logic behind the operation of counters.(K4)

**UNIT- I: Digital Systems and Binary Numbers**

Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

**UNIT -II: Concept of Boolean algebra**

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

**Gate level Minimization**

Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

**UNIT- III: Combinational Logic**

Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, Realization of Switching Functions Using PROM, PAL and PLA.

**UNIT- IV: Synchronous Sequential Logic**

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

## **UNIT -V: Registers and Counters**

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

### **TEXT BOOKS:**

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

### **REFERENCE BOOKS:**

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	3	1	0	4
19CS3T02 : DATA STRUCTURES				

**COURSE OBJECTIVES**

1. To impart the basic concepts of data structures and algorithms.
2. To gain knowledge of linear and non-linear data structures.
3. To familiarize with different sorting and searching techniques.
4. To understand basic concepts about stacks, queues, lists, trees and graphs.
5. To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**COURSE OUTCOMES:**

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

1. Design the applications using stacks and implement various types of queues. (K3)
2. Analyse and implement operations on linked lists and demonstrate their applications. (K4)
3. Identify the operations on trees. (K3)
4. Implementation of various types of Graphs and Graph Traversals. (K3)
5. Apply the various searching and sorting techniques.(K3)

**UNIT-I:**

**Introduction:** Definition of data structure, types and overview of data structures.

**Algorithm:** Preliminaries of algorithm, Algorithm analysis and complexity.

**Stacks and Queues:** Stack Representation using Arrays, operations on stack, Applications of stacks - Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions. Queue Representation using Arrays, operations on queues, Applications of queues, Circular queues, Priority queues, Implementation of queue using stack.

**UNIT-II:**

**Linked Lists:** Introduction, Single linked list, representation of a linked list in memory, Operations on a single linked list. Double linked list, Operations on a double linked list. Circular linked list, Operations on a circular linked list. Applications of single linked list.

**UNIT-III:**

**Trees:** Basic tree concepts. **Binary Trees:** Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of binary tree from pre-order, in-order and post order traversals, threaded binary tree. **Binary search trees:** Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

**AVL Trees:** Self Balanced Trees, Height of an AVL Trees and AVL Tree Rotations.

#### **UNIT-IV:**

**Graphs:** Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph Traversals - BFS & DFS, Applications: Dijkstra's shortest path algorithm, Minimum Spanning Tree using Prim's algorithm and Kruskal's algorithm, Transitive closure, Warshall's algorithm.

#### **UNIT-V:**

**Searching:** Linear Search, Binary Search and Fibonacci search.

**Sorting:** Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Radix sort.

**Hashing:** Introduction, Hash Function, Collision Resolution Techniques: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Separate Chaining, Extendible Hashing.

#### **TEXT BOOKS:**

1. Data Structures: A Pseudo code approach with C by Richard F. Gilberg and Behrouz.A. Forouzan, 2nd edition, Cengage, 2012.
2. Classic Data Structures, Debasissamanta, PHI, 2<sup>nd</sup> edition, 2016.
3. Data Structures through C, 2<sup>nd</sup> edition by Yashavant Kanetker, BPB publications, 2017.
4. Data Structures & Algorithms, Alfred V Aho, John E Hopcraft, Jeffery D Ullman, Pearson Education. Ltd., Second Edition 2016.

#### **REFERENCE BOOKS**

1. Data Structure with C, Seymour Lipschutz , TMH, 2017
2. Data Structures and Algorithms, G. A. V. Pai , TMH, 2017.
3. Fundamentals of Data Structure in C, Horowitz, Sahani, Anderson Freed, University Press, 2nd edition, 2018.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT3T01 : PYTHON FOR DATA SCIENCE				

**CORSE OBJECTIVES:**

The student should be made to:

1. To develop skills on procedural oriented and object oriented programming in Python.
2. To understand and apply different data wrangling techniques using Python.
3. To perform data analysis using python libraries like NumPy, Pandas and exploratory data analysis using Matplotlib.

**COURSE OUTCOMES:**

After the completion of the course the students are able to:

1. Outline the programming knowledge on Basics of Python (K2)
2. Apply programming knowledge on Searching and sorting using Python (K3)
3. Analyze programming knowledge on Text and File Handling and to calculate Mean, Median, Mode, Correlation (K4)
4. Examine programming knowledge on NumPy, Pandas Library (K2)
5. Illustrate on Graph Visualizations in Python and Data Analysis using Python (K2)

**UNIT-I: Introduction to Python:** Introduction, **Rapid Introduction to Procedural programming, Data Types:** Identifiers and Keywords, Integral Types, Floating Point Types, **Strings:** Strings, Comparing Strings, Slicing and Striding Strings, String Operators and Methods, String formatting with str.format, Collections Data Types, Control structures and functions. **Introduction to Python Library Modules:** random, math, num, time, os, shutil, sys, glob, re, statistics, requests, creating a custom module

**UNIT-II: NumPy Arrays and Vectorized Computation:** NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random numbers. **File Handling:** Writing and Reading Binary Data, Writing and Parsing Text Files

**UNIT-III: Data Analysis with Pandas:** An overview of the Pandas package, The Pandas data structure-Series, The DataFrame, The Essential Basic Functionality: Reindexing and altering labels, Head and tail, Binary operations, Functional statistics, Function application Sorting, Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data.

**UNIT-IV: Interacting with Databases:** Interacting with Data in Text Format: Reading data from text format, Writing data to text format, Interacting with data in binary format: HDF5, Interacting with Data in MongoDB, Interacting with data in Redis: The simple value, List, Set, Ordered set.

**UNIT-V: Data Visualization:** The matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas, Additional Python data visualization tools-Bokeh, MayaVi.

**Text Books:**

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications, 2009.
2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis, Phuong VothiHong , Martin Czygan, Packt Publishing Ltd, 2017

**Reference Books:**

1. Learning Python, Mark Lutz, Orielly, 5th edition, 2013.
2. Python for Data Analysis, Wes McKinney, Orielly Publications, 2012.
3. Think Python: How to think like a computer scientist, Allen B Downey, Green Tea Press, 2016.
4. Fundamentals of Python: First programs, Second edition, Kenneth A. Lambert, Cengage, 2019.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	-	-	3	1.5
19IT3L01 : DATA STRUCTURES LAB				

**COURSE OUTCOMES:**

At the end of the lab students are able to

1. Construct stack and queue using arrays and linked lists. (K3)
2. Illustrate applications of stack. (K2)
3. Construct the operations on linked lists. (K3)
4. Develop the binary search trees. (K3)
5. Illustrate the different searching and sorting algorithms. (K2)

**LIST OF EXPERIMENTS:**

1. Implement a menu driven program in C for the following operations on stack of integers using arrays.
  - i) PUSH()
  - ii) POP()
  - iii) PEEK()
  - iv) Display of stack elements
2. Implement C program to demonstrate how stack can be used to check whether the given string is palindrome or not.
3. Implement a C Program for converting an infix expression to postfix expression.
4. Implement a C Program to evaluate postfix expression.
5. Implement a menu driven program in C for the following operations on queue of integers using arrays.
  - i) Insertion
  - ii) Deletion
  - iii) Queue overflow and underflow conditions
  - iv) Display of queue elements
6. Implement a C program for the queue operations by using stacks.
7. Implement a C program for the following
  - (i) Create a singly linked list.
  - (ii) Insert an element into a singly linked list.
  - (iii) Delete an element from a singly linked list.
8. Implement a C program for stack operations using Linked list.
9. Implement a C program for queue operations using linked list.
10. Implement a C program to reverse elements of a single linked list.
11. Implement a C program for the following
  - (i) Create a circular linked list.

(ii) Insert an element into a circular linked list.

(iii) Delete an element from a circular linked list.

12. Implement a C program for the following

(i) Create a Doubly linked list.

(ii) Insert an element into a doubly linked list.

(iii) Delete an element from a doubly linked list.

13. Implement a C program to create a Binary Search Tree of integers, insert, delete and search integers into (from) Binary search tree.

14. Implement a C program by using recursive functions to traverse a binary search tree in preorder, in-order and post-order.

15. Implement C programs for recursive and iterative functions to perform Linear search for a Key value in the given list.

16. Implement C programs for recursive and iterative functions to perform Binary search for a Key value in the given list.

17. Implement following techniques to sort a given list of integers in ascending order.

(i) Insertion sort

(ii) Bubble sort

(iii) Selection sort

18. Implement a C program that read any string and sort in alphabetical order using Bubble sort.

19. Implement following techniques to sort a given list of integers in ascending order.

(i) Quick sort

(ii) Merge sort



B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	0	0	2	1.0
19EC3L05 : DIGITAL LOGIC DESIGN LAB				

**COURSE OBJECTIVE:**

To learn and understand the Basics of digital electronics and able to design basic logic circuits, combinational and sequential circuits

**COURSE OUTCOMES:**

At the end of the lab students are able to

1. List out the principles of digital circuits. (K1)
2. Analyze the logic behind the operation of counters. (K4)
3. Analyze the internal design of integrated circuits. (K4)
4. Apply the design procedures to design basic sequential circuits (K3)
5. Design the basic digital circuits and to verify their operation (K6)

**LIST OF EXPERIMENTS:**

- 1) Verification of Basic Logic Gates.
- 2) Implementing all individual gates with Universal Gates NAND & NOR.
- 3) Design a circuit for the given Canonical form, draw the circuit diagram and verify the De-Morgan laws.
- 4) Design a Combinational Logic circuit for 4x1 MUX and verify the truth table.
- 5) Design a Combinational Logic circuit for 1x4 De- MUX and verify the truth table.
- 6) Construct Half Adder and Full Adder using Half Adder and verify the truth table.
- 7) Verification of truth tables of the basic Flip- Flops with Synchronous and Asynchronous modes.
- 8) Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for race around condition.
- 9) Design a Decade Counter and verify the truth table.
- 10) Ripple counter using-JK Flip -Flop.
- 11) Construct a 4-bit ring counter with T-Flip –Flop and verify the truth table.
- 12) Design an 8 – bit right Shift Register using D-Flip -Flop and verify the truth table.

B. TECH 3 <sup>rd</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
19IT3L02 : PYTHON FOR DATA SCIENCE LAB				

**COURSE OUTCOMES:**

After the completion of the course the students should able to

1. Analyze the Python scripting fundamentals. (K4)
2. Apply the data structures using the python (K3)
3. Examine the object oriented programming principles. (K4)
4. Illustrate read and write using files. (K2)

**List of Experiments**

1. Python Programs on lists & Dictionaries
2. Python Programs on Searching and sorting
3. Python Programs on Text Handling
4. Python Programs on File Handling
5. Python Programs for Mean, Mode, Median, Variance, Standard Deviation
6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation
7. Python Programs on NumPy Arrays, Linear algebra with NumPy
8. Python Programs on DataFrame using Pandas Library
9. Write a Python program for the following
  - Importing matplotlib,
  - Simple Line Plots,
  - Adjusting the Plot: Line Colors and Styles, Axes Limits,
  - Labeling Plots,
  - Simple Scatter Plots,
  - Histograms,
  - Customizing Plot Legends,
  - Choosing Elements for the Legend,
  - Multiple Legends,
  - Customizing Colorbars,
  - Multiple Subplots,
  - Text and Annotation,
  - Customizing Ticks
10. Python Programs for Interacting with data in text format, interacting with data in binary format, interacting with data in MongoDB, Cleaning, Filtering and Merging Data.

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	-	-	3
19MA4T05 : PROBABILITY AND STATISTICS				

**Course Objectives:**

1. To familiarize the students with the foundations of probability and statistical methods
2. To impart probability concepts and statistical methods in various applications of Engineering
3. To introduce the correlation and regression and method of least squares

At the end of this unit, the student will be able to

1. Illustrate the concepts of probability and their applications (K2)
2. Apply discrete and continuous probability distributions (K3)
3. Identify the components of a classical hypotheses test (K3)
4. Examine Significance tests based on small and large sampling tests (K4)
5. Evaluate correlation methods and principle of least squares, regression lines (K5)

**Unit-1 Probability:**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

**Unit-2 Probability distributions:**

Probability distribution-Binomial, Poisson approximation to the binomial distribution and normal distribution –their properties.

**Unit-3 Sampling distribution and Testing of hypothesis, large sample tests:**

Basic terminology in sampling, sample techniques (with and without replacement), sampling distribution of means for large and small samples (with known and unknown variance).

Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

**Unit-4 Small sample tests:**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variance (F-test), Chi-square test for goodness of fit and independence of attributes.

**Unit-5 Curve Fitting and Correlation:**

**Curve Fitting :** Method of least squares -Fitting a straight line, Second degree parabola -exponential curve-power curves

**Correlation:** Simple correlation, correlation coefficient (for ungrouped data), rank correlation. Linear regression, regression lines, regression coefficients.

**Books:**

- 1 –Probability and Statistics, Dr. K. Murugesan & P.Gurusamy, Anuradha Publications,2011
- 2- Higher Engineering Mathematics, 42<sup>nd</sup> Edition, Khanna Publications by Dr. B.S.Grewal,2012

**Reference:**

- 1 – Ramana B.V., Higher Engineering Mathematics, Tata Mc Graw Hill New Delhi 11<sup>th</sup> Reprint2010
- 2- Probability and statistics for engineers by Miller & Freund

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	-	-	3
19IT4T01 : COMPUTER ORGANIZATION AND ARCHITECTURE				

## COURSE OBJECTIVES

1. To discuss the basic knowledge of computer system including the analysis and design of components of the system.
2. To understand the register transfer language, micro operations and design of basic components of the system.
3. To explain different types of addressing modes and memory organization.
4. To learn the concepts of parallel processing, pipelining and vector processing.

## COURSE OUTCOMES

After completion of the course students able to

1. Acquire the knowledge on structure of computers and computer arithmetic. (K2)
2. Analyze Micro operations such as Arithmetic micro operations, Shift micro operations and Logic micro operations. (K4)
3. Outline the appropriate addressing modes and instructions for writing programs.(K2)
4. List out the Peripheral devices for efficient operation of system. (K4)
5. Acquire the knowledge on parallel and vector processing. (K2)

## UNIT-I

### Basic Structure of Computers:

Basics of computer, Von Neumann Architecture, Generation of Computer, Types of Compute, Functional unit, Basic Operational Concepts and Bus Structures.

**Computer Arithmetic:** Addition and Subtraction, multiplication algorithms, Division Algorithms.

## UNIT-II

**Register Transfer Language and Micro Operations:** Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

**Basic Computer Organization and Design:** Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction Cycle, Memory – Reference, Input – Output and Interrupt Instructions. Design of basic computer, Design of Accumulator logic.

## UNIT-III

**Central Processing Unit:** General Register Organization, STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer.

**Micro Programmed Control:** Control Memory, Address sequencing, micro program example, design of control unit.

## UNIT-IV

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

**The Memory System:** Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory and Virtual Memory.

## **UNIT-V**

### **Parallel Processing and Vector Processing**

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

#### **Text Books:**

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill, 2016.
2. Computer Organization, a quantitative approach, John L. Hennessy and David A. Patterson, Fifth Edition, 2011.
3. Computer System Organization, M. Moris Mano, 3rd Edition, Pearson / PHI, 2007.

#### **Reference Books:**

1. Computer Organization and Architecture - William Stallings, Ninth Edition, Pearson / PHI, 2012.
2. Structured Computer Organization - Andrew s. Tanenbaum, 6th Edition, PHI/ Pearson, 2012.
3. Fundamentals of Computer Organization and Design, - Sivaraama Dandamudi, Springer Int. Edition, 2006.

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	-	-	3
19IT4T02 : OOPS THROUGH JAVA				

**COURSE OBJECTIVES:**

1. Understand fundamentals of programming such as variables, conditional and iterative execution and methods etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods and using class libraries etc.
3. Be aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Be able to use the Java SDK environment to create, debug and run simple Java programs.

**COURSE OUTCOMES:**

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

1. Apply the concepts of OOPs through Java programming. (K3)
2. Analyze the inheritance and packages in Java. (K4)
3. Illustrate the concepts of Exception handling and Multithreading. (K2)
4. Acquire knowledge on I/O concepts in file operations and HttpClient methods. (K2)
5. Implement the concepts and usage of Collection framework. (K3)

**UNIT-I:**

**Introduction to Java:** History, java features, JVM, program structure, Creating and Executing a Java program, Java tokens, Variables, arrays, data types, operators, expressions, control statements, type conversion and casting. **Classes and objects:** Class declaration, creating objects, methods, constructors, overloading methods and constructors, garbage collection, access control, static and this keywords, command line arguments, nested classes.

**UNIT-II:**

**Inheritance:** Extending a class, types of inheritance, super keyword, final keyword, overriding methods, abstract methods and classes. **Interfaces:** Defining an interface, implementing interface, Differences between classes and interfaces, variables in interface and extending interfaces. **Packages:** Java API packages, creating and importing packages, importance of CLASSPATH.

### **UNIT-III:**

**Exception handling:** Exception handling fundamentals, exception hierarchy, usage of try, catch, throw, throws and finally keywords, built-in and user defined exceptions.

**Multithreading:** Introduction, Differences between multi threading and multitasking, Creating Threads, thread life cycle, thread methods, thread priorities, thread exceptions, thread synchronization, Inter thread communication, Daemon threads.

### **UNIT-IV:**

**Input/Output Streams:** Introduction to java I/O, Streams, BufferedStreams, Readers, Reading and Writing data from/to files and HttpClient, Pipelines.

### **UNIT-V:**

**Collection Framework:** Lists - ArrayList & LinkedList, Sets - HashSet & TreeSet, Maps - HashMap & TreeMap, Queue, Stack, Iterator – ListIterator, Lambda Expressions.

**Strings:** Strings in java, Creation of a String and String handling methods, StringBuilder, StringBuffer

### **TEXT BOOKS:**

1. Herbert Schildt: “Java The complete reference”, 8th Edition, Tata McGraw Hill, 2017.
2. E. Balaguruswamy: “Programming with Java A Primer”, 5th Edition, Tata McGraw Hill, 2017.

### **REFERENCE BOOKS:**

1. Programming in Java by Saurabh Chaudhary and Sachin Malhotra, 2<sup>nd</sup> edition, Oxford, 2013.
2. Java: How to Program, 8/e, Dietal, Dietal, PHI, 2018.
3. Core JAVA: An integrated approach, Dr. R. Nageswara Rao, Wiley, Dream Tech, 2016.

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	-	-	3
19IT4T03 : THEORY OF COMPUTATION				

**COURSE OBJECTIVES:**

The student should be made to:

1. To understand the language hierarchy
2. To construct automata for any given pattern and find its equivalent regular expressions
3. To design a context free grammar for any given language
4. To understand Turing machines and their capability
5. To understand undecidable problems and NP class problems

**COURSE OUTCOMES:**

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

1. Construct automata, regular expression for any pattern. (K3)
2. Apply Context free grammar for any construct. (K3)
3. Summarize Turing machines for any language. (K2)
4. Apply computation solutions using Turing machines. (K3)
5. Discover whether a problem is decidable or not. (K4)

**UNIT I:**

**Fundamentals:** Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.

**Finite Automata:** NFA with  $\hat{I}$  transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without  $\hat{I}$  transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

**UNIT II:**

**Regular Languages:** Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

**Grammar Formalism:** Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and leftmost derivation of strings.

**UNIT III:**

**Context Free Grammars:** Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).

**Push down Automata:** Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.



#### UNIT IV:

**Turing Machine:** Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required). Linear bounded automata and context sensitive language.

#### UNIT V:

**Computability Theory:** Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR (0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

#### TEXT BOOKS:

1. Introduction to Automata Theory Languages and Computation. Hopcroft H.E. and Ullman J. D. Pearson Education, Third edition, 2008.
2. Introduction to Theory of Computation – Michael Sipser, 3<sup>rd</sup> edition, Cengage, 2014.

#### REFERENCES BOOKS:

1. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R, 1<sup>st</sup> edition, Pearson, 2009.
2. Introduction to Computer Theory, Daniel I.A. Cohen, 2<sup>nd</sup> edition John Wiley.
3. Theory of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley, 2011.
4. "Elements of Theory of Computation", Lewis H.P. & Papadimitriou C.H. Pearson /PHI.
5. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekar, 2nd edition, PHI, 2006.

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS4T02 : DATABASE MANAGEMENT SYSTEMS				

**COURSE OBJECTIVES:**

The objectives of the course is

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on Entity- Relationship (E-R) model, the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
5. To provide an overview of transaction management, Database storage and indexing techniques.

**COURSE OUTCOMES**

Upon successful completion of this course, students should be able to:

1. Illustrate the basic concepts of database management system and design an Entity-Relationship (E-R) model and convert E-R model to relational model. (K2)
2. Construct database using Relational algebra and SQL. (K3)
3. Apply Normalization techniques to normalize the database. (K3)
4. Examine transaction management using different concurrency control protocols and recovery algorithms. (K4)
5. Illustrate different file organization and indexing methods. (K2)

**UNIT-1**

**Introduction**-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages , Database Architecture, Database Users and Administrators.

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

**Relational Model:** Introduction to the Relational Model - Integrity Constraints over Relations.

Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

**UNIT-II**

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

**SQL:** Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

### UNIT-III

**SCHEMA REFINEMENT AND NORMAL FORMS:** Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

### UNIT-IV

**Transaction Management** - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

**CRASH RECOVERY:** Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

### UNIT-V

**Overview of Storage and Indexing:** Data on External Storage, File Organization and Indexing- Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

**Tree Structured Indexing:** Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

#### EXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2014.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, 6<sup>th</sup> edition, 2016.

#### Reference Books:

1. Fundamentals of Database Systems, Ramez Elmasri, Shamkant B Navathe-7<sup>th</sup> Edition, 2016.
2. Introduction to Database Systems, 8/e, C.J. Date, Pearson, 2012.
3. Database System Design, Implementation and Management, 5/e, Rob, Coronel, Thomson, 2012.

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT4T04 : SOFTWARE ENGINEERING				

**COURSE OBJECTIVES:**

The student should be made to:

1. Understand the phases in a software project
2. Understand fundamental concepts of requirements engineering and Analysis Modeling.
3. Understand the major considerations for enterprise integration and deployment.
4. Learn various testing and implementation techniques
5. Understand the activities involved in project management

**COURSE OUTCOMES:**

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

1. Identify formulate and solve software engineering problems (K3)
2. Analyze and specify software requirements with various stakeholders of a software development project and different software development process models. (K4)
3. Apply systematic procedure for software design and deployment. (K3)
4. Compare and contrast the various testing methods (K4)
5. Identify the key activities in managing a software project. (K3)

**UNIT I**

**INTRODUCTION AND SOFTWARE PROCESS:** Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Myths, Software Engineering- A layered Technology, a Process Framework, Capability Maturity Model Integration (CMMI), Process Assessment, Process Models – Waterfall Model, Incremental Process Models, Evolutionary Process Models, The Unifies Process.

**UNIT II**

**REQUIREMENTS ANALYSIS AND SPECIFICATION:** Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

**UNIT III**

**SOFTWARE DESIGN:** Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

**UNIT IV**

**TESTING AND IMPLEMENTATION:** Software testing fundamentals-Internal and external views of Testing-white box testing- basis path testing-control structure testing-black box testing- Regression Testing –

## **UNIT V**

**PROJECT MANAGEMENT:** Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics.

### **TEXT BOOK:**

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-Hill International Edition, 2014.
2. “Software Engineering”, Ian Sommerville, 10th Edition, Pearson Education Asia, 2016.

### **REFEENCE BOOKS:**

1. Software Engineering, Pankaj Jalote, A Precise Approach”, Wiley India, 2010.
2. Systems Analysis and Design- Shely Cash man Rosenblatt, 9th Edition, Thomson publications, 2016.
3. Software Project Management , Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
4. <https://nptel.ac.in/courses/106101061>

B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
19IT4L01 : OOPS THROUGH JAVA LAB				

## COURSE OBJECTIVES

1. Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
2. Able to implement Exception Handling, Multithreading, Applet programming and Event handling in java.

## COURSE OUTCOMES

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

1. Develop solutions for a range of problems using object-oriented programming. (K3)
2. Construct Java programs that solve simple business problems. (K3)
3. Illustrate the multithreaded applications with synchronization. (K2)
4. Solve problems using java collection framework and I/O classes. (K3)

## LAB EXPERIMENTS

1. Installation of JDK, setting Class path and Executing simple java programs.
2. Write a program that displays welcome dear user followed by user name. Accept username from the user.
3. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
4. Write a JAVA program that checks whether a given string is a palindrome or not by using command line arguments.
5. Write a JAVA program to implement array of objects.
6. Write a JAVA program to practice using String class and its methods.
7. Write a JAVA program to implement constructor overloading.
8. Write a JAVA program implement method overloading.
9. Write a JAVA program to implement multilevel inheritance by applying various access controls to its data members and methods.
10. Write a JAVA program to create and Manage bank account using inheritance concept.
11. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
12. Write a JAVA program to demonstrate super key word.
13. Write a JAVA program to develop a vehicle class hierarchy in Java to demonstrate the concept of polymorphism.
14. Write a JAVA program to demonstrate user defined packages.
15. Write a JAVA program for abstract class to find areas of different shapes.
16. Write a JAVA program for creation of Java Built-in Exceptions
17. Write a JAVA program for creation of User Defined Exception

18. Write a JAVA program that creates 3 threads by extending Thread class. First thread displays “Good Morning” every 1 sec, the second thread displays “Hello” every 2 seconds and the third displays “Welcome” every 3 seconds. (By implementing Runnable interface).
19. Write a program to read contents from a file using BufferedInputStream.
20. Write a program to read contents from a web page using HttpClient and Buffered Reader and write them to a local file using BufferedWriter.
21. Write a program to read two numbers and one operator from user console and perform the calculation.
22. Write a JAVA program to get sub list from ArrayList.
23. Write a JAVA program to iterate all elements of a list in both directions.
24. Write a JAVA program to add all elements of a list to LinkedList.
25. Write a JAVA program to implement the basic operations on TreeMap.

**Text Books:**

1. Herbert Schildt: “Java The complete reference”, 8th Edition, Tata McGraw Hill, 2017.
2. E. Balaguruswamy: “Programming with Java A Primer”, 5th Edition, Tata McGraw Hill, 2017.

<b>B. TECH 4<sup>th</sup> SEMESTER</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>19IT4L02 : OBJECT ORIENTED ANALYSIS AND DESIGN LAB</b>				

**COURSE OUTCOMES**

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

1. Construct various UML models and diagrams (K3)
2. Develop UML model in object-oriented software. (K3)
3. Analyze and design in solving computer Based problems. (K4)
4. Develop software architecture for a project. (K3)

**LAB EXPERIMENTS**

- 1) To create a UML diagram of ATM APPLICATION
- 2) To create a UML diagram of LIBRARY MANAGEMENT SYSTEM
- 3) To create a UML diagram of ONLINE BOOK SHOP
- 4) To create a UML diagram of RAILWAY RESERVATION SYSTEM
- 5) To create a UML diagram of BANKING SYSTEM
- 6) To create a UML diagram of CREDIT CARD PROCESSING



B. TECH 4 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
<b>19IT4L03 : DATABASE MANAGEMENT SYSTEMS LAB</b>				

**COURSE OUTCOMES:**

After the completion of the` course the students are able to

1. Illustrate the basic Structured Query Language (SQL) commands. (K2)
2. Build the Database Integrity Constraints. (K3)
3. Discover SQL Queries on set operators, sub queries, nested queries, aggregate functions, other SQL functions and views. (K4)
4. Develop applications using various features of PL/SQL like Functions, Procedures, Packages, cursors and triggers. (K3)
5. Develop Database system to handle the real world problem. (K3)

**LIST OF EXPERIMENTS:**

1. DDL and DML Commands.
2. Restricting and storing the Data using Key constraints. And displaying Data from Multiple Tables using SELECT command.
3. Queries (along with sub Queries and nested Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP by, HAVING Clause.
5. Creation and dropping of Views.
6. Queries using Conversion functions (to char, to number and to date), string functions (Concatenation, lpad , rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr ), date functions (Sysdate, next day, add months, last day, months between, least, greatest, trunc, round, to char, to date).
  - (i) Creation of simple PL/SQL programs which includes declaration section, executable section and exception handling section.
  - (ii) Insert data into tables and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
7. Develop a program that includes the features IF, NESTED IF, CASE and CASE expression.
8. Program development using simple loops, while loops, numeric for loops, nested loops.
9. ERROR Handling, BUILT-IN Exceptions, User defined Exceptions, RAISE- APPLICATION ERROR.
10. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
11. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
12. Program development using creation of package specification, package bodies, private objects, package variables and calling stored packages.
13. Develop programs using Cursors.
14. Develop Programs using Triggers.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT5T01 : ARTIFICIAL INTELLIGENCE				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Illustrate the fundamentals of AI techniques and search techniques. (K2).
2. Compare the Knowledge representation rules. (K4)
3. Identify various Reasoning Techniques. (K3)
4. Implement the concepts of Game playing and Natural Language Processing. (K3)
5. Acquire the knowledge in Planning system and Expert system. (K2)

## UNIT - I

**Introduction:** Artificial Intelligence definition, AI problems, Problem Spaces, Defining the Problem as a State Space Search, problem characteristics, production Systems.

**Basic Search Strategies:** Issues in the design of search programs, Uninformed Search (Breadth-First, Depth-First Search), Heuristic Search (Generate-And- Test, Hill Climbing, Best-First Search, A\* Algorithm, Problem Reduction, AO\* Algorithm, Constraint Satisfaction, Means-Ends Analysis.

## UNIT – II

**Knowledge Representation Issues:** Representation and Mapping, Representing Simple Facts in Predicate Logic, Representing Instance and ISA Relations, Computable Functions and Predicates, Resolution, Natural Deduction

**Representing Knowledge Using Rules:** Procedural Vs Declarative Knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge.

## UNIT - III

**Reasoning under Uncertainty:** Introduction to Non-Monotonic Reasoning, Logics for non monotonic reasoning, Implementation of DFS (Dependency-Directed Back tracking, Justification-Based Truth Maintenance System, Logic Based Truth Management Systems), Implementation of BFS.

**Statistical Reasoning:** Probability and Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks

## UNIT - IV

**Game Playing:** Overview- Minimax Search, Alpha – Beta Cutoffs

**Natural Language Processing:** Steps in the Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems.

## UNIT V

**Planning:** Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constraint Posting, Hierarchical Planning.

**Experts Systems:** Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems- Rule Based, Frame Based, Decision Tree based, Case Based Architectures.

**Text Books:**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shiva Sankar B. Nair, The McGraw Hill publications, Third Edition, 2017.
2. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI, 2010.

**Reference Books:**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.
2. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
3. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT5T02 : OPERATING SYSTEMS				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. List out the basic concepts of operating systems. (K1)
2. Summarize the process management, scheduling and concurrency control mechanisms. (K2)
3. Analyze the various memory management schemes.(K4)
4. Identify the various issues in the deadlock.(K3)
5. Compare the various Disk Scheduling Algorithms. (K4)

## UNIT-I

**Computer System and Operating System Overview:** Overview of computer operating systems, Evolution of operating systems-Simple, batch, multi programmed, time shared. Operating systems Services, parallel and distributed systems, special Purpose systems. System calls, Types of system calls.

**Introduction to Linux And Linux Utilities:** A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin. Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

## UNIT-II

**Process Management** – Process concept- process scheduling, operations, Inter process communication. Threading overview, multi thread programming models. Process scheduling criteria, algorithms and their evaluation.

**Concurrency:** Back ground of process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, and classic problems of synchronization, monitors, and Synchronization examples.

## UNIT-III

### Main Memory:

Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

### Virtual Memory:

Back ground, virtual memory, demand paging, copy-on-write, page-Replacement algorithms, Allocation of Frames, Thrashing.

## UNIT-IV

**Principles of deadlock** – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

### Protection and Security:

Protection. Goals of Protection, Principles of Protection. Domain of protection Access Matrix, Implementation of Access Matrix. Access control, Revocation of Access Rights. Security-Problems, Program Threats, System and Network Threats, cryptography as security tool, user authentication.

## UNIT-V

**File system:** Concept of a file, Access Methods, Directory structure, file sharing, protection, File system structure, Implementation, Directory implantation, file allocation methods, free-space management

**Mass-storage structure:** overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling algorithms.

### Text Books

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Gagne 7<sup>th</sup> Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education

### Reference Books

1. Operating systems- A Concept based Approach- D. M. Dhamdhare, 2<sup>nd</sup> Edition, TMH.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, And rew S Tanenbaum 3<sup>rd</sup> edition PHI.

### Reference Link

1. [http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/ New\\_index1. html](http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/New_index1.html)

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	1	0	3
19IT5T03 : ADVANCED JAVA AND WEB TECHNOLOGIES				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Distinguish various static web pages and dynamic web pages using html and java script.(K4)
2. Apply the client side validation using Java Script.(K3)
3. Develop a well formed XML document.(K3)
4. Construct the web servers with servlets.(K3)
5. Illustrate a java server side programming and connection with database.(K2)

## UNIT-I

**HTML5:** Introduction, Basic Formatting Tags, Block and inline elements, Lists, Image, Hyperlink, Table, Iframe, Form Elements, Layout Elements and Miscellaneous.

**CSS3:** Introduction, CSS Syntax, Selectors, Add CSS to HTML : External, Internal and Inline, CSS Styling : Backgrounds, Text, Fonts, Links, Lists, Tables, CSS Box Model.

## UNIT-II

Introducing DHTML, Introducing JavaScript, Client Side benefits of using JavaScript, Embedding JavaScript in an HTML page, Using Variables, Using Operators, Working with Control Flow statements, Working with functions, Handling Events, Using Arrays, Creating objects in JavaScript.

## UNIT-III

**XML EXTENSIBLE MARKUP LANGUAGE:** XML- Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX.

**JDBC:** JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs, Creating a Simple Application, Describing Basic JDBC Statement, Creating tables by using JDBC, Working with Prepared Statement.

## UNIT-IV

**Web Servers and Servlets:** Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, Reading Servlet parameters, Reading Initialization parameters. Handling HTTP Request & Responses, Using Cookies-Session Tracking, Security Issues.

**Introduction to JSP:** The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC.

## **UNIT-V**

**JSP Application Development:** Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Passing Control and Data Between Pages – Sharing Session and Application Data Memory Usage Considerations. Accessing a Database from a JSP Page.

### **TEXT BOOKS:**

1. Web Technologies – Black Book, Kogent Learning solutions Inc sol. Dreamtech press.
2. Herbert Schildt: “Java The complete reference”, 11th Edition, Tata McGraw Hill, 2019.
3. JDBC, Servlets, and JSP, New Edition, Santhosh Kumar K ,Kogent Learning Solutions Inc, Dreamtech Press
4. An Introduction to Web Design + Programming, Wang, Katila, CENGAGE

### **REFERENCE BOOKS:**

1. Web Technologies, Uttam K Roy - Oxford .
2. Head first Java – Kathy seirra -Orielly –
3. Core Servlets and Java Server Pages Volume 1 CORE TECHNOLOGIES , Marty Hall and Larry Brown Pearson
4. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT5E01 : COMPILER DESIGN				

**Course Outcomes:**

At the end of the course students are able to

1. Outline language processors and its phases. (K2)
2. Develop the concepts of scanning of tokens. (K3)
3. Illustrate the syntax analysis by using parsing techniques. (K2)
4. Distinguish memory Management techniques in runtime environment. (K4)
5. Discover optimization techniques for intermediate code forms and code generation. (K4)

**UNIT-I**

Overview of language processing: – preprocessors – compiler – assembler – Linkers & loaders, difference between compiler and interpreter- structure of a compiler –phases of a compiler. Lexical Analysis: - Role of Lexical Analysis – Input Buffering – Specification of Tokens – Recognition of Token – The Lexical Analyzer Generator Lex.

**UNIT-II**

Syntax Analysis: – Role of a parser – Context Free Grammar – Top down Parsing – Recursive Descent Parsing — Non recursive Predictive Parsing- FIRST and FOLLOW –LL(1) Grammar – Error Recovery in Predictive Parsing.

**UNIT-III**

Bottom up Parsing: – Reductions – Handle Pruning - Shift Reduce Parsing - Introduction to simple LR –Why LR Parsers – Model of an LR Parsers — Construction of SLR Tables. More powerful LR parsers: - Construction of CLR (1) - LALR Parsing tables.

**UNIT-IV**

Intermediate code: - DAG - Three address code – Quadruples - Triples - Indirect Triples. Basic Blocks: – DAG representation of Block.

Runtime Environment: - Storage organization - Stack allocation – Static allocation - Heap management-Parameter passing mechanisms.

**UNIT-V**

Code Optimization, Machine independent code optimization - Common sub expression elimination - Constant folding - Copy propagation - Dead code elimination – Strength reduction - Loop optimization. Machine dependent code optimization - Peephole optimization – Instruction scheduling - Inter Procedural.

Code Generation – Instruction selection, Register allocation, Input to the code generator, Target programs, Memory management.



**Text Books:**

1. Compilers: Principles, Techniques and Tools: 2nd Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ulman; 2nd Edition, Pearson Education.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

**References:**

1. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly.
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley reamtech.
3. Engineering a Compiler-Cooper & Linda, Elsevier.
4. Compiler Construction, Loudon, Thomson.
5. Principles of compiler design, V. Raghavan, 2nd edition, TMH, 2011.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS5E03 : SOFTWARE PROJECT MANAGEMENT				

**Course Outcomes:**

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

1. Apply the process to be followed in the software development life-cycle models. (K3)
2. Outline the concepts of project management & planning. (K2)
3. Test for project plans through managing people, communications and change (K4)
4. Examine the activities necessary to successfully complete and close the Software projects. (K4)
5. Illustrate communication, modeling and construction and deployment practices in software development. (K2)

**UNIT – I:**

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

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

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

**UNIT – II:**

**The Old Way and The New:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

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

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

**UNIT – III:**

**Model Based Software Architectures:** A Management perspective and technical perspective.

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

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

**UNIT – IV:**

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

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

**UNIT – V:**

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

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

**Project Estimation and Management:** COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

**Text Books:**

- 1) Software Project Management, Walker Royce, Pearson Education, 2005.
- 2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

**Reference Books:**

- 1) Software Project Management, Joel Henry, Pearson Education.
- 2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
- 3) Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT5E02 : AGILE WITH SCRUM				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Outline the basics of Scrum framework. (K2)
2. Summarize the principles of Agile methodology. (K2)
3. Analyze life time period of a sprint. (K4)
4. List out the roles, responsibilities and principles of a ScrumMaster. (K1)
5. Analyze the scrum team structures and scrum planning principles. (K4)

### UNIT- 1

**Introduction:** What Is Scrum? Scrum Origins, Why Scrum? Genomica Results, Complex Domain, Complicated Domain, Simple Domain, Chaotic Domain, Disorder, Interrupt-Driven Work

**Core Concepts:** Scrum Framework, Scrum Roles, Product Owner, ScrumMaster, Development Team, Scrum Activities and Artifacts, Product Backlog

### UNIT-2

**Agile Principles:** Variability and Uncertainty: Embrace Helpful Variability, Employ Iterative and Incremental Development, Leverage Variability through Inspection, Adaptation, and Transparency, Reduce All Forms of Uncertainty Simultaneously, Prediction and Adaptation, Keep Options Open, Validated Learning, Validate Important Assumptions Fast, Leverage Multiple Concurrent Learning Loops, Organize Workflow for Fast Feedback

### UNIT-3

**Sprints:** Timeboxed, Establishes a WIP Limit, Forces Prioritization, Demonstrates Progress, Avoids Unnecessary Perfectionism, Motivates Closure, Improves Predictability, Short Duration, Ease of Planning, Fast Feedback, Improved Return on Investment, Bounded Error, Rejuvenated Excitement, Frequent Checkpoints, Consistent Duration, No Goal-Altering Changes

### UNIT-4

**ScrumMaster:** Principal Responsibilities, Coach, Servant Leader, Process Authority, Interference Shield, Impediment Remover, Change Agent, Characteristics/Skills, Knowledgeable, Questioning, Patient, Collaborative, Protective, Transparent, Fulfilling the Role, Who Should Be a ScrumMaster? Is ScrumMaster a Full-Time Job? ScrumMaster Combined with Other Roles

### UNIT-5

**Scrum Team Structures:** Overview, Feature Teams versus Component Teams, Multiple-Team Coordination, Scrum of Scrums, Release Train, Scrum Planning Principles: Correctly Manage the Planning Inventory, Favor Smaller and More Frequent Releases, Plan to Learn Fast and Pivot When Necessary.

**Text Books:**

1. Essential SCRUM (A Practical guide to the most popular Agile Process) –Kenneth S.Rubin , July 2012
2. Agile Product Management with Scrum, Pichler Roman, 2008

**References:**

1. Introducing Agile Project Management With Scrum, Sammons Andrew.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19EC5E18 : MICRO PROCESSORS AND INTERFACING				

**COURSE OUTCOMES:**

Students are able to

1. Analyze the development and design of 8086 Microprocessor.(K4)
2. Illustrate different programming solutions for various industrial requirements.(K2)
3. Develop different interfacing applications using Peripherals with 8086 microprocessor.(K3)
4. Build minimum controllable applications using Microcontrollers.(K3)
5. Distinguish between microcontroller and microprocessor and develop programming with Embedded 'C'. (K4)

**UNIT-I****8086 MICROPROCESSOR**

**Introduction to Microprocessors:** Family of Intel processors.

**8086 Microprocessor:** Internal block diagram, Pin description, Register organization, Physical memory organization, General bus operation, I/O addressing capability, Special purpose activities.

**UNIT-II****8086 PROGRAMMING:**

Minimum mode and maximum mode configurations, Minimum mode RD/WR Timing diagrams and, Maximum mode RD/WR Timing diagrams, program development steps, Addressing modes of 8086, Instruction set of 8086, Assembler directives, writing simple programs with an assembler, Procedures and Macros.

**UNIT-III****BASIC PERIPHERALS AND INTERFACING WITH 8086:**

Introduction to Programmable Peripheral Interface-8255, Internal architecture, modes of operation of 8255, Interfacing EPROM/RAM, Interfacing to D/A and A/D converters, Stepper motor interfacing, Control of high power devices using 8255.

**UNIT-IV****SPECIAL PURPOSE PROGRAMMABLE INTERFACING DEVICES:**

Interrupts and interrupt service routines, Interrupt cycle of 8086, maskable interrupt and non-maskable interrupts, interrupt programming, Programmable interrupt controller-8259, programmable communication interface USART-8251, DMA Controller-8257.

**UNIT-V****8051 MICROCONTROLLER:**

Introduction to microcontrollers, Difference between microprocessor and microcontroller, Internal architecture of 8051 microcontroller, 8051 pin description, Special function registers, I/O ports, Memory organization, Addressing modes, Instruction set, Interrupts, Timers, Timers programming in different modes, Serial port, Programming with Embedded C.

**TEXT BOOKS:**

1. A .K .Ray, K. M. Bhurchandi, "Advanced Microprocessors and Peripherals" 3<sup>rd</sup> Edition, TataMcGraw Hill Publishers, 2012. (UNITS – I to IV)
2. Kenneth Ayala, "8051 Microcontroller", 3<sup>rd</sup> Edition, Cengage Learning Publishers, 2007. (UNIT - V)

**REFERENCE BOOKS:**

1. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, and Pentium processors. Architecture, programming and interfacing”, 8 th Edition, Pearson Publication, 2012.
2. Douglas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, 2<sup>nd</sup> Edition, TMH, 2012.

**E-REFERENCES:**

1. Microprocessors and Microcontrollers  
<https://www.tutorialspoint.com/microprocessor/index.html>
2. Microprocessors and Microcontrollers, NPTEL  
<https://nptel.ac.in/courses/108/105/108105102/>

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
19IT5L01 : OPERATING SYSTEMS LAB IN LINUX				

**COURSE OUTCOMES**

At the end of the lab student is able to

1. Acquire basic knowledge in Linux operating System (K3)
2. Illustrate the concepts of CPU Scheduling. (K2)
3. Discover the process management, scheduling and concurrency control mechanisms. (K4)
4. Analyze Page Replacements and deadlocks. (K4)
5. Classify various file systems and its operating systems examples (K2)

**List of Programs:**

1. Execution of various file/directory handling commands in Linux.
2. To study the various commands operated in vi editor in LINUX.
3. To study the various File Access Permission and different types users in LINUX
4. Simulate First Come First Serve CPU scheduling algorithm.
5. Simulate Shortest Job First CPU scheduling algorithm.
6. Simulate Priority CPU scheduling algorithm.
7. Simulate Round Robin CPU scheduling algorithm.
8. Simulate Sequential file allocation strategy.
9. Simulate Linked file allocation strategy.
10. Simulate Indexed file allocation strategy.
11. Simulate First In First Out page replacement algorithm.
12. Simulate Least Recently used page replacement algorithm.
13. Simulate Optimal page replacement algorithm.
14. Write Programs to simulate free space management.
15. Simulate Bankers Algorithm for Dead Lock Avoidance.



B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
<b>19IT5L02 : ADVANCED JAVA AND WEB TECHNOLOGIES LAB</b>				

## COURSE OUT COMES

After the completion of the course the students are able to

1. Distinguish various static web pages and dynamic web pages using HTML, XML and JavaScript.(K4)
2. Construct and review on database connectivity.(K3)
3. Develop web applications using Servlets & JSP using oracle database connectivity.(K3)
4. Illustrate the web application projects.(K2)

## LIST OF PROGRAMS:

1. Create a simple webpage using HTML
2. Use frames to Include Images and Videos.
3. Add a Cascading Style sheet for designing the web page
4. Design a dynamic web page with validation using JavaScript.
5. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome.  
When a button is pressed an appropriate Javascript function should be called to display
  - a. Factorial of that number
  - b. Fibonacci series up to that number
  - c. Prime numbers up to that number
  - d. Is it palindrome or not
6. Write java script programs to demonstrate
  - a. Math Object with at least five methods.
  - b. String Object with at least five methods.
  - c. Array Object with at least five methods.
  - d. Date Object with at least five methods.
7. Write JavaScript programs on Event Handling
  - a. Validation of registration form
  - b. Open a Window from the current window
  - c. Change color of background at each click of button or refresh of a page
  - d. Display calendar for the month and year selected from combo box
  - e. On Mouse over event

8. a) Design an XML document to store information about a student in Swarnandhra Engineering college. The information must include Student ID, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.  
b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
9. Write a java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table
10. Write a java program to display all records in the student table
11. Develop a simple Servlet to display Welcome to Servlet
12. Develop a Servlet to validate username and password with the data stored in Servlet configuration file.  
Display authorized user if she/he is authorized else display unauthorized user
13. Write JSP Program to store student information sent from registration page into database table.
14. Develop a program to validate username and password that are stored in Database table using JSP
15. Write appropriate JSP pages to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management
16. **Mini Project** : Build web application (with Home page, Insert, View, Delete, Update, Search) based on the **choice of student/faculty**.

B. TECH 5 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	2	1
19HS5L03 : ADVANCED ENGLISH COMMUNICATION SKILLS LAB				

At the end of the course students will be able to prepare themselves for their career which may require them to listen and speak in English both for their professional and interpersonal communication in the globalized context.

### Course objectives

- Analyzing a topic of discussion and relating to it.
- Planning and executing an assignment creatively.
- Presenting ideas coherently within a stipulated time.
- Communicating ideas effectively in prescribed oral activities.
- Applying relevant writing formats for resume and presentations.
- Facing interviews with confidence.

### Course outcomes

At the end of the course students will be able to

1. Summarize ideas and organize information relevantly and coherently. (K2)
2. Prove in group discussions and face interviews with confidence. (K5)
3. Build resume with covering letter.(K3)
4. Plan oral presentations and public speaking. (K3)
5. Take part in social and professional communication. (K4)

## SYLLABUS

The following course content is prescribed for the **Advanced English Communication Skills Lab:**

### UNIT I

#### Communication Skills

- Introduce Yourself
- JAM
- J2M
- Identifying one's career objective, projecting strengths and skills, organization of ideas within given time.

### UNIT II

#### Interaction Skills

- Body Language
- Role- Plays
- Students start a conversation - Respond appropriately and relevantly in different situations with right body language.

### UNIT III

#### Oral Skills

- Presentations
- Public Speaking
- Planning preparation and presentation - organization of ideas with clarity , coherence and style.

#### **UNIT IV**

##### **Writing Skills**

- Covering Letter
- Resume Writing
- To communicate the ideas relevantly and coherently in writing.

#### **UNIT V**

##### **Team Work Skills**

- Group Discussion
- Dynamics of Group Discussion - Modulation of voice, Body language , relevance , fluency and coherence.

#### **UNIT VI**

##### **Interview Skills**

- Pre-interview planning, opening strategies, answering strategies, interview through tele and video conference.

#### **Reference Books:**

1. Ashraf Rizvi- Effective Technical Communication - McGraw Hill Education- 2017.
2. Madhavi Apte - A Course in English Communication – Prentice - Hall of India- 2007.
3. Dr. Shalini Verma - Body Language – Your Success Mantra- S. Chand- 2006.
4. Sunita Mishra & C.Murali Krishna- Communication Skills for Engineers - Pearson Education - 2007.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	2	0	0	-
19CE0M01 : ENVIRONMENTAL SCIENCE				

**UNIT-I: Multidisciplinary nature of Environmental Studies:**

Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT-II: Natural Resources:**

Natural resources and associated problems. Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

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

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

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

**UNIT-III: Biodiversity and its conservation:**

Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

**UNIT – IV Environmental Pollution:**

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

**UNIT – V Social Issues and the Environment:**

Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

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

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

**Text Books:**

1. K. V. S. G. Murali Krishna , Environmental Studies,VGS Publishers, Vijayawada, 2010
2. R. Rajagopalan, Environmental Studies, 2nd Edition, Oxford University Press, 2011
3. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani, Environmental Studies, 2nd Edition , Pearson Education, Chennai,2015

**Reference:**

1. Deeshita Dave & P. Udaya Bhaskar Text Book of Environmental Studies, Cengage Learning, 2011
2. Shaashi Chawla, A Textbook of Environmental Studies, TMH, New Delhi,2017
3. Benny Joseph, Environmental Studies, Tata McGraw Hill Co, New Delhi, 2006
4. Anubha Kaushik, C P Kaushik , Perspectives in Environment Studies, New Age International Publishers, 2014

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6T01 : COMPUTER NETWORKS				

## COURSE OUTCOMES

**At the end of the course students are able to**

1. Classify network reference models such as OSI, TCP/IP. (K2)
2. Apply Data Link Layer protocols for Error detection and correction. (K4)
3. Distinguish various MAC sub layer Protocols such as ALOHA, CSMA, CSMA/CD. (K4)
4. Identify various Network layer and Transport layer protocols. (K3)
5. Illustrate various application layer protocols such as WWW and HTTP etc. (K2)

### UNIT 1:

**Data communication Components:** Representation of data and its flow Networks, categories of Networks, Various Connection Topology, Protocols and Standards, OSI model, TCP/IP Protocol suit, Transmission Media.

### UNIT 2:

**Data Link Layer:** Error Detection and Error Correction -Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control, protocols - Stop and Wait, Go back – NARQ, Selective Repeat ARQ, Sliding Window, Piggybacking.

### UNIT 3:

**Medium Access Sub Layer:** Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA.

**Network Layer:** Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

### UNIT 4:

**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

### UNIT 5:

**Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP.

### Text Books

1. Data Communication and Networking, 4<sup>th</sup> Edition, Behrouz A. Forouzan, McGrawHill.
2. Data and Computer Communication, 8<sup>th</sup> Edition, William Stallings, Pearson Prentice Hall India.

### Reference Books

1. Computer Networks, 8<sup>th</sup> Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6<sup>th</sup> Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6T02 : DATA WAREHOUSING AND DATA MINING				

## COURSE OUTCOMES

After the completion of the course the students are able to

- 1: List out the fundamentals of data mining concepts.(K1)
- 2: Analyze the data pre-processing techniques to build data warehouse.(K4)
- 3: Apply the classification methods and Model Over fitting.(K3)
- 4: Summarize the association analysis.(K2)
- 5: Classify various clustering techniques for categorizing data. (K4)

### UNIT-I

**Introduction:** What Motivated Data Mining? Why Is It Important, Data Mining—On What Kind of Data, Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Are All of the Patterns Interesting? Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major Issues in Data Mining.

### UNIT-II

**Data Pre-processing:** Why Pre-process the Data? Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

**Data Warehouse and OLAP Technology:** An Overview: What Is a Data Warehouse? Differences between OLAP and OLTP, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, schemas, From Data Warehousing to Data Mining.

### UNIT-III

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

**Model Over fitting:** Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap.

### UNIT-IV

**Association Analysis:** Basic Concepts and Algorithms- Introduction, Frequent Item Set generation, Rule generation, Compact Representation of frequent item sets, FP-Growth Algorithm.



## **UNIT-V**

**Cluster Analysis:** Basic Concepts and Algorithms - What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, K-means, The Basic K-means Algorithm, K-means: Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, K-means as an Optimization Problem, Agglomerative Hierarchical Clustering, Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, DBSCAN, Traditional Density: Center-Based Approach, The DBSCAN Algorithm, Strengths and Weaknesses.

### **Text Books:**

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

### **Reference Books:**

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

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6T03 : DESIGN AND ANALYSIS OF ALGORITHMS				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Analyze the asymptotic runtime complexity of algorithms for real world problems developed using different algorithmic methods. (K4)
2. Identify the optimal solutions by using advanced design and analysis of algorithm techniques like Divide & conquer and greedy method. (K3)
3. Apply the fundamentals of Dynamic Programming methods along with its applications. (K3)
4. Apply the search space and optimization problem techniques like backtracking and branch and bound method to solve problems optimally where advanced algorithm design techniques fail to find solution. (K3)
5. Distinguish the problems and its complexity as polynomial and NP problems and can formulate some real world problems to abstract mathematical problems. (K4)

## UNIT-I

**Introduction:** Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic Analysis. **Disjoint Sets** - disjoint set operations, union and find algorithms, spanning trees, connected components and bi-connected components.

## UNIT-II

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication.

**Greedy method:** General method, applications, Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees and Single source shortest path problem.

## UNIT – III

**Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem and Reliability design.

## UNIT-IV

**Backtracking:** General method, Applications- n-queen problem, sum of subsets problem, graph coloring and Hamiltonian cycles.

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

## UNIT-V

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

### Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam, Universities Press.
2. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer.
3. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd.

### Reference Books:

1. Introduction to the Design and Analysis of Algorithms, AnanyLevitin, PEA
2. Design and Analysis of Algorithms, Parag Himanshu Dave, Himansu B Alachandra Dave, Pearson Education.
3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGraw Hill.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E03 : MULTIMEDIA APPLICATION DEVELOPMENT				

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Apply the fundamental concepts in Text and Image. (K3)
2. Outline the Fundamental concepts in video and digital audio. (K2)
3. Distinguish the differences between Action Script I and Action Script II. (K4)
4. Summarize the application Development and Multimedia data compression. (K2)
5. Analyze the Video Compression Techniques and Multimedia Networks.(K2)

**UNIT-I**

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

**UNIT-II**

**Fundamental concepts in video and digital audio:** Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

**UNIT – III**

**Action Script I:** ActionScript Features, Object-Oriented ActionScript, Data types and Type Checking, Classes, Authoring an ActionScript Class.

**Action Script II:** Inheritance, Authoring an ActionScript 2.0 Subclass, Interfaces, Packages, Exceptions.

**UNIT-IV**

**Application Development:** An OOP Application Frame work, Using Components with ActionScript MovieClip Subclasses.

**Multimedia data compression:** Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding, Embedded Zerotree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT).

**UNIT-V**

**Basic Video Compression Techniques:** Introduction to video compression. Video compression based on motion compensation. search for motion vectors. MPEG. Basic Audio Compression Techniques.

**Multimedia Networks:** Basics of Multimedia Networks, Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, Multimedia over IF, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD).

**Text Books:**

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Pearson Education.
2. Essentials ActionScript 2.0, Colin Moock, SPD O, REILLY.

**Reference Books:**

1. Digital Multimedia, Nigel chapman and jenny chapman, Wiley- Dreamtech.
2. Macromedia Flash MX Professional 2004 Unleashed, Pearson.
3. Multimedia and communications Technology, Steve Heath, Elsevier (Focal Press).

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E04 : DISTRIBUTED SYSTEMS				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Outline the concept of distributed systems and various distributed models. (K2)
2. Develop the knowledge on inter-process communication mechanisms used in distributed systems and Compare RPC and RMI. (K3)
3. Examine Global states and replication. (K4)
4. Label distributed file systems and name services. (K1)
5. Examine distributed transactions and concurrency control. (K4)

## UNIT-I

**Characterization of Distributed Systems:** Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.

**System Models:** Introduction, Architectural Models, Fundamental Models.

## UNIT-II

**Inter Process Communication (IPC):** Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: IPC in UNIX.

**Distributed Objects and Remote Invocation:** Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI.

## UNIT-III

**Time and Global States:** Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Replication.

## UNIT-IV

**Distributed File Systems:** Introduction, File Service Architecture, Case Study 1: Sun Network File System, Case Study 2: The Andrew File System. **Name Services:** Introduction, Name Services and the Domain Name System, Directory Services, Case Study of the Global Name Services.

**Process & Resource Management:** Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

## UNIT-V

**Transactions and Concurrency Control:** Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control. **Distributed Transactions:** Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery.

**Text Books:**

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 5<sup>th</sup> Edition. 2012.

**Reference Books:**

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 3<sup>rd</sup> Edition, PHI, 2017.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Taylor & Fransis Group, 2<sup>nd</sup> Edition, 2011.
3. Distributed systems: Software Design and Implementation, Albert Fleischmann, 1st Edition, Springer, 2011.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS6E05 : MOBILE COMPUTING				

**Course Outcomes:**

Upon successful completion of this course, students should be able to:

1. Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI. (K2)
2. List the fundamental challenges in mobile communications and potential Techniques in GSM(K1).
3. Apply Mobile IP in Network layer. (K3)
4. Illustrate different data delivery methods and synchronization protocols. (K2)
5. Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts. (K3)

**UNIT – I:**

**Mobile Communications: An Overview** - Mobile Communication: Guided Transmission; Unguided Transmission; Modulation Methods and Standards for Voice - Oriented Data Communication Standards; Modulation Methods and Standards for Data and Voice Communication;

**Mobile Computing** - Novel Applications and Limitations; Mobile Computing Architecture; Mobile System Networks; Mobile Devices and Systems - Cellular Networks and Frequency Reuse; Mobile Smartphones, Smart Mobiles and Systems; Handheld Pocket Computers - Handheld devices; Smart Systems; Limitations of Mobile Devices.

**UNIT – II:**

**GSM and other 2G Architectures:** GSM - Services and System Architecture; Radio Interfaces of GSM; Protocols of GSM; Localization; Call Handling; Handover; GPRS System Architecture;

**Wireless Medium Access Control, CDMA, 3G, 4G and 5G Communication:** Controlling the Medium Access; Spread Spectrum; Coding Methods; IMT-2000 3G Wireless Communication Standards; WCDMA 3G communication standards; CDMA 2000 3G Communication Standards; Broadband Wireless Access; 4G Networks; MIMO; LTE; 5G Networks.

**UNIT – III:**

**Mobile IP Network Layer:** IP and Mobile IP Network Layers - OSI Layer Functions, TCP/IP and Internet Protocol, Mobile Internet Protocol; Packet Delivery and Handover Management; Location Management; Registration; Tunnelling and Encapsulation; Route Optimization;

**Introduction to Mobile Ad-hoc Network:** fixed infrastructure architecture, MANET Infrastructure Architecture; MANET: Properties, Spectrum, Applications; Security in Ad-hoc network; Wireless Sensor Networks; Sensor Network Applications.



#### **UNIT - IV:**

**Synchronization:** Synchronization in Mobile Computing Systems, Usage Models for Synchronization in Mobile Application, Domain - dependent specific rules for Data Synchronization; Personal Information Manager;

**Mobile Agent:** Mobile Agent Design, Aglets; Application Server; Gateways; OMADM.

#### **UNIT - V:**

**Mobile Wireless Short Range Networks and Mobile Internet:** Wireless Networking and Wireless LAN, Wireless LAN (WLAN) Architecture, IEEE 802.11 Protocol Layers; Wireless Application Protocol (WAP) - WAP1.1 Architecture, Wireless Datagram protocol (WDP), Wireless Transport Layer Security (WTLS),

**Bluetooth** - enabled Devices Network; ZigBee

#### **Text Books:**

1. Raj kamal, “Mobile Computing”, 2<sup>nd</sup> edition, Oxford, 2011
2. Asoke K Talukder, Hasanahmed, Roopa R Yavagal, “Mobile Computing, Technology Applications and Service Creation”, 2<sup>nd</sup> Edition, McGraw Hill, 2017

#### **Reference Books:**

1. Lothar Merk, Martin S. Nocklous, Thomas Stober, “Principles of Mobile Computing”, 2<sup>nd</sup> Edition, UWE Hansmann, Springer, 2003 e-Resources:

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E05 : SERVICE ORIENTED ARCHITECTURE (SOA)				

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline XML fundamentals. (K2)
2. Build applications based on XML. (K3)
3. Analyze the key principles behind SOA. (K4)
4. Identify the web services technology elements for realizing SOA. (K3)
5. Illustrate the various web service standards. (K2)

**UNIT-I****INTRODUCTION TO XML 9**

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X-Files.

**UNIT-II****BUILDING XML- BASED APPLICATIONS 9**

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

**UNIT-III****SERVICE ORIENTED ARCHITECTURE 9**

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA — Principles of Service orientation – Service layers.

**UNIT-IV****WEB SERVICES 9**

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography – WS Transactions.

**UNIT-V****BUILDING SOA-BASED APPLICATIONS 9**

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines — Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.

**TEXTBOOKS:**

1. Ron Schmelzer et al. “XML and Web Services”, Pearson Education, 2002.
2. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.

**REFERENCES:**

1. Frank P.Coyle, “XML, Web Services and the Data Revolution”, Pearson Education, 2002

2. Eric Newcomer, Greg Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005
3. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services: An Architect’s Guide”, Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, “Java Web Services Architecture”, Morgan Kaufmann Publishers, 2003.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E06 : PARALLEL COMPUTING				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Outline the need of parallel computing and know the various aspects to improve the parallelism in computations. (K2)
2. Apply the Principles of parallel algorithm design and Basic communication operations. (K3)
3. Examine the Analytical modeling of parallel programs and Programming using the message passing paradigm.(K4)
4. Apply the Analytical modeling of parallel programs and Programming using the message passing paradigm. (K3)
5. Illustrate the Dense matrix algorithm and sorting techniques. (K2)

## UNIT-I

**Introduction to parallel computing:** Parallel programming platforms: Trends in microprocessor Architectures, Limitations of memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, communication costs in parallel machines, Routing mechanisms for interconnection network, Impact of process processors mapping and mapping techniques.

## UNIT-II

**Principles of parallel algorithm design:** Preliminaries, Decomposition techniques, Characteristics of tasks and interactions, Mapping techniques for load balancing, Methods for containing. Interactions overheads, Parallel algorithm models.

**Basic communication operations:** One-to-All Broadcast and All-to-One Reduction, All-to-All broadcast and reduction All-Reduce and prefix sum operations, scatter and gather, All-to-All personalized communication, circular shift, improving the speed of some communication operation.

## UNIT-III

**Analytical modeling of parallel programs:** Performance metrics for parallel systems, Effect of granularity of performance, scalability of parallel system, Minimum execution time and minimum cost-optimal execution time, Asymptotic analysis of parallel programs, other scalability metrics.

**Programming using the message passing paradigm:** Principle of message – Passing programming, Send and receive operations, The message passing interface, Topologies and embedding, Overlapping communication with computation, collective communication and computation operations, Groups and communicators.

## UNIT-IV

**Programming using share address space paradigm:** Multi-threading, Explicit multithreading using pthread library, Thread management, Thread synchronization using mutex and condition objects, Directive based multithreading – OpenMP, work sharing directives - parallel, for, sections directives, data sharing directives and clauses, Global functions and environment variables.

## UNIT-V

**Dense matrix algorithm:** Matrix-vector multiplication, Matrix-matrix algorithm, Solving a system of linear equations.

**Sorting:** Parallel sorting methods, Bitonic Sort, Odd-even transposition Sort, Merge sort, Quick Sort, Sample Sort and Shell Sort.

### Text Books:

1. Introduction to Parallel Computing, Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar Person Education.
2. Parallel computing Theory and Practice, Second Edition, Michael J. Quinn, TMH.

### Reference Books:

1. Introduction to Parallel Processing- by M.SasiKumar(Author), Dinesh Shikare(Author), P.Raviprakash (Author), PHI, 2<sup>nd</sup> Edition.
2. Parallel and Distributed Systems (WIND) Paperback – 2016 by Arun Kulkarni, Nurpur Prasad, Nikhilesh Joshi and Bhushan Jadhav.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E07 : INFORMATION RETRIEVAL SYSTEMS				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Outline the basic information storage and retrieval concepts. (K2)
2. Apply various data structures to store and represent information.(K3)
3. Analyze effective information retrieval system using automatic indexing and clustering techniques.(K4)
4. Apply user searching techniques for different data base systems. (K3)
5. Compare various information visualization technologies and explain different types of search algorithms. (K4)

## UNIT-I

**Introduction:** Definition, Objectives, Functional Overview, Relationship to DBMS, Digital Libraries and Data Warehouses.

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

## UNIT-II

**Data Structures:** Introduction, Stemming Algorithms, Inverted File Structure, N-Gram data Structure, PAT data structure, Signature file structure, Hypertext data structure.

## UNIT-III

**Automatic Indexing:** Classes of Automatic Indexing, Statistical Indexing, Natural language, Concept indexing, Hypertext linkages.

**Document and Term Clustering:** Introduction, Thesaurus Generation, Item Clustering, Hierarchy of clusters

## UNIT-IV

**User Search Technique** Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the internet and Hypertext.

## UNIT-V

**Information Visualization** Introduction, Cognition and Perception, Information Visualization Technologies.

**Text Search Algorithms:** Introduction, Software Text Search Algorithms, Hardware Text Search Systems.

**Text Books:**

1. Kowalski, Gerald, Mark T May bury: Information Retrieval Systems Theory and Implementation, Kluwer Academy Press, 1997.

**Reference Books:**

1. Modern Information Retrieval by Yates, Pearson Education.
2. Information Storage and Retrieval by Robert Korfhage - John Wiley and Sons.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19EC6E19 : EMBEDDED SYSTEMS				

**COURSE OUTCOMES:**

After completion of the course, students are able to

1. Interpret the fundamentals of Embedded Systems. (K2)
2. Distinguish various components used in Embedded systems. (K4)
3. Develop the Embedded Firmware. (K3)
4. Summarize the concepts of PIC, AVR controllers and Processors. (K2)
5. Build a case study on Embedded Systems. (K3)

**UNIT-I:** Introduction to Embedded Systems Definition of Embedded System, Embedded Systems Vs. General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT-II:** Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**UNIT-III:** Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT-IV:** Overview of PIC, AVR controllers and ARM processors: Introduction to PIC family of Microcontroller. Introduction to AVR family of Microcontroller. Introduction to ARM family Processors.

**UNIT-V:** Design Case studies: Digital clock, Battery operated smartcard reader, Automated meter reading system, Digital camera.

**TEXT BOOKS:**

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill, 2014 (Unit I-V)

**REFERENCE BOOKS:**

1. Raj Kamal, "Embedded Systems", TMH.2003
2. David E Simon, "An Embedded Software Primer", Pearson Education, 2015.

**E-REFERENCES:**

1. Embedded Systems

<https://archive.org/details/K.ShibuIntroductionToEmbeddedSystemsTmh2009/page/n5/mode/2up?view=theater>



B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT6E08 : PATTERN RECOGNITION				

**Course Outcomes**

After the completion of the course the students are able to

1. Outline the overview of pattern recognition.(K2)
2. List out the different types of classifiers. (K1)
3. Analyze the Hidden Markov Models and Decision Trees. (K4)
4. Summarize the concepts of Support Vector Machines and Combination of Classifiers. (K2)
5. Compare and contrast between Clustering algorithms and classification algorithms. (K4)

**UNIT - I:**

Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

**UNIT - II:**

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

**UNIT - III:**

Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

**UNIT - IV:**

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

**UNIT - V:**

Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

**TEXT BOOK:**

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Springer Pub, 1<sup>st</sup> Edition.

**REFERENCE BOOKS:**

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

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
19IT6L01 : INTERNET OF THINGS LAB				

**COURSE OUTCOMES:** Students will be able to

1. Analyze temperature and humidity using various sensors (K4)
2. Apply IR sensor/push button to on/off LED (K3)
3. Build a Bluetooth module with Arduino and Use the same (K3)
4. Construct Actuating elements with Arduino and control the same (K3)

**List of Experiments:-**

1. Familiarization with Arduino and perform necessary software installation.
1. To interface LED/Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
2. To interface Push button/Digital sensor (IR/LDR) with Arduino and write a program to turn ON LED when push button is pressed or at sensor detection.
3. To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.
4. To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.
5. To interface OLED with Arduino and write a program to print temperature and humidity readings on it.
6. To interface Bluetooth with Arduino and write a program to send sensor data to smart phone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
8. To interface Servo motor with Arduino and write a program to control the same
9. To interface Stepper motor with Arduino and write a program to control the same using potentiometer
10. To interface thermistor with Arduino for temperature measurement
11. To measure temperature using thermocouple by interfacing it with Arduino
12. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
13. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	3	1.5
19IT6L02 : DATA WAREHOUSING AND DATA MINING LAB				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Apply Data Pre-Processing techniques. (K4)
2. Develop and implement the Clustering algorithms. (K3)
3. Develop and implement the Classification algorithms. (K3)
4. Apply the techniques of feature selection and visualization to real world data. (K4)

All the programs should be carried out using tools like Weka/Python/R.

### List of Programs:

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses. arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k-means
11. Demonstration of clustering rule process on dataset student.arff using Bayesian Network.

B. TECH 6 <sup>th</sup> SEMESTER	L	T	P	C
	1	0	0	-
19BM0M02 : INTRODUCTION TO CYBER LAWS				

**UNIT I:** Introduction Computers and its Impact in Society-Overview of Computer and Web Technology-Need for Cyber Law-Cyber Jurisprudence at International and Indian Level.

**UNIT II:** Cyber Law - International Perspectives UN & International Telecommunication Union (ITU) Initiatives Council of Europe - Budapest Convention on Cybercrime- Asia Pacific Economic Cooperation (APEC) -Organization for Economic Co-operation and Development (OECD) -World Bank- Commonwealth of Nations.

**UNIT III:** Constitutional & Human Rights- Issues in Cyberspace -Freedom of Speech and Expression in Cyberspace- Right to Access Cyberspace – Access to Internet- Right to Privacy-Right to Data Protection

**UNIT-IV:** Cyber Crimes & Legal Framework-Cyber Crimes against Individuals, Institutions and State-Hacking- Digital Forgery- Cyber Stalking/Harassment- Cyber Pornography- Identity Theft & Fraud-Cyber terrorism-Cyber Defamation-Different offences under IT Act, 2000.

**UNIT V:** Cyber Torts-Cyber Defamation-Different Types of Civil Wrongs under the IT Act, 2000-Intellectual Property Issues in Cyber Space Interface with Copyright Law- Interface with Patent Law-Trademarks & Domain Names Related issues

#### TEXTBOOKS:

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
3. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).

#### REFERENCE BOOKS:

1. Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)
2. S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd., Jaipur (2003).
3. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi, (2003).
4. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT7T01 : CRYPTOGRAPHY AND NETWORK SECURITY				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Acquire the basic knowledge of different types of Security attacks. (K2)
2. Analyze and compare different security mechanisms and services. (K4)
3. Illustrate the Number Theory and Public Key Cryptography. (K2)
4. Implement the usage of Cryptographic Hash Functions. (K3)
5. Compare different Authentication Mechanisms. (K4)

### UNIT-I

**Introduction:** Security Attacks, Security Services, Security Mechanisms, and a Model for Network Security, Basics of Cryptography - Symmetric Cipher Model, Substitution Techniques, and Transportation Techniques, Stenography.

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### UNIT-II

**Secret Key Cryptography:** Data Encryption Standard (DES), Strength of DES, Block Cipher Design Principles and Modes of Operations, Triple DES, Blowfish, AES.

### UNIT-III

**Number Theory:** Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, the Chinese Remainder Theorem, Discrete Logarithms.

**Public Key Cryptography:** Principles of Public Key Cryptosystems, RSA Algorithm, Diffie-Hellman Key Exchange, Introduction to Elliptic Curve Cryptography.

### UNIT-IV

**Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions, Secure Hash Algorithm, MD5, Message Authentication Codes - Message Authentication Requirements and Functions, HMAC, Digital signatures, Digital Signature Schemes, Authentication Protocols, Digital Signature Standards.

### UNIT-V

**Authentication Applications:** Kerberos, X.509 Authentication Service. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, IP Security: IP Security architecture, Web Security, Intruders, Malicious Software, Firewalls.

**Text Books:**

1. Cryptography and Network Security: Principles and Practice, 5th Edition, William Stallings, Pearson Education, 2011.
2. Network Security and Cryptography, Bernard Menezes, Cengage Learning, 2011.
3. Cryptography and Network, 2nd Edition, Behrouz A. Fourouzan and DebdeepMukhopadhyay, McGraw-Hill, 2010.

**Reference Books:**

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Principles of Information Security, Whitman, Thomson.
3. Introduction to Cryptography, Buchmann, Springer..

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	4
19IT7T02 : MACHINE LEARNING				

### Course Outcomes

After the completion of the course the students are able to

1. List out the wide variety of learning algorithms. (K1)
2. Apply a variety of learning algorithms to data. (K3)
3. Analyze the strengths and weaknesses of many popular machine learning approaches. (K3)
4. Evaluate the learning algorithms and model selection. (K5)
5. Apply the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning. (K3)

### UNIT-I

Introduction: Learning, Types of Machine Learning. Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm. Learning with Trees: Constructing Decision Trees, CART and Classification Example.

### UNIT-II

Linear Discriminants: The Perceptron, Linear Separability. Linear Regression Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, deriving back, Propagation Support Vector Machines: Optimal Separation, Kernels.

### UNIT-III

Linear Regression & Logistic Regression:

Predicting numeric values: regression - Finding the best fit lines with linear regression, locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff.

Logistic Regression: Classification with logistic regression and the sigmoid function, using optimization to find the best regression coefficients.

### UNIT-IV

Some Basic Statistics: Averages, Variance and Covariance, The Gaussian. The Bias-Variance Tradeoff, Bayesian learning: Introduction, Bayes theorem, Bayes Optimal Classifier, Naive Bayes Classifier.

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models and The Forward Algorithm.



## **UNIT-V**

Evolutionary Learning: Genetic Algorithms, Genetic Operators. Genetic Programming Ensemble learning: Boosting, Bagging. Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis.

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

### **Text Books:**

1. Tom M. Mitchell, "Machine Learning ",MacGraw Hill, 2017.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 2009.

### **Reference Books:**

1. Margaret H Dunham, "Data Mining", Pearson Edition, 2003.
2. GalitShmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007.
3. RajjallShinghal, "Pattern Recognition ", Oxford University Press, 2006.

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT7E09 : SOFT COMPUTING				

**Course Outcomes:**

At the end of the course the student should be able to

1. List the soft computing techniques and their applications. (K1)
2. Analyze various neural network architectures. (K4)
3. Build perceptrons and counter propagation networks. (K3)
4. Outline the fuzzy systems. (K2)
5. Analyze the genetic algorithms and their applications. (K4)

**UNIT –I**

Soft Computing: Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Artificial Intelligence: Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A\* algorithm, AO\* Algorithms and various types of control strategies. Knowledge representation issues, Propositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

**UNIT–II**

Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, haracteristic and applications of ANN, single layer network.

**UNIT–III**

Perceptron: Perceptron training algorithm, Linear separability , Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA.

Counter propagation network: architecture, functioning & characteristics of counter Propagation network, Hop field/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

**UNIT–IV**

Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions. Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

**UNIT–V**

Genetic algorithm: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator

,Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

**Text Books:**

1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.
2. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.

**References:**

1. N.K.Bose, Ping Liang, Neural Network fundamental with Graph, Algorithms & Applications, TMH, 1st Edition, 1998.
2. Bart Kosko, Neural Network & Fuzzy System, PHI Publication, 1st Edition, 2009.
3. Rich E, Knight K, Artificial Intelligence, TMH, 3rd Edition, 2012.
4. George J Klir, Bo Yuan, Fuzzy sets & Fuzzy Logic, Theory & Applications, PHI Publication, 1st Edition, 2009.
5. Martin T Hagen, Neural Network Design, Nelson Candad, 2<sup>nd</sup> Edition, 2008.

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19EC7E20 : DIGITAL IMAGE PROCESSING				

**COURSE OUTCOMES:**

After the completion of this course, students are able to

1. List out the basic concepts of image processing and image geometry. (K1)
2. Apply various operations on image both in spatial and frequency domains to solve various real time problems by converting them between domains. (K3)
3. Distinguish different types of images, such as black & white, gray scale and color images, and can convert image from one color model to other. (K4)
4. Analyze different features of the images for the purpose of Compression, authentication and safety. (K4)
5. Summarize Morphological Image Processing, Segmentation and Color Image Processing. (K2)

**UNIT-I****BASICS OF DIGITAL IMAGE PROCESSING:**

Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels.

**UNIT-II****INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING:**

Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Filtering in the frequency domain: Preliminary concepts, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing and sharpening using frequency domain filters.

**UNIT-III****IMAGE RESTORATION AND RECONSTRUCTION:**

A model of the image degradation Restoration process, Noise models, restoration in the presence of noise only- Spatial Filtering - Mean filters, order statistic filters and adaptive filters. Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

**UNIT-IV****MULTI-RESOLUTION PROCESSING AND IMAGE COMPRESSION:**

Image pyramids, sub-band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

## **UNIT-V**

### **MORPHOLOGICAL IMAGE PROCESSING, SEGMENTATION AND COLOR**

#### **IMAGE PROCESSING:**

Preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, Image segmentation- Fundamentals, point, line, edge detection thresholding, region -based segmentation, color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

#### **TEXT BOOKS:**

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing, 3rd edition”, Prentice Hall, 2008. (UNIT I-V)

#### **REFERENCES:**

1. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , “Digital Image Processing Using MATLAB” 2nd edition, Prentice Hall, 2009.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, “Digital Image Processing”, Tata McGraw-Hill Education, 2011.

#### **E-REFERENCES:**

1. Digital Image Processing, Tutorialspoint  
<https://www.tutorialspoint.com/dip/index.htm>
2. Digital Image Processing, Javatpoint  
<https://www.javatpoint.com/digital-image-processing-tutorial>

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT7E10 : COMPUTER VISION				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. List out the fundamental image processing techniques required for computer vision. (K1)
2. Evaluate the shape analysis and Implement boundary tracking techniques. (K5)
3. Apply Hough Transform for line, circle and ellipse detections. (K3)
4. Illustrate 3D vision techniques and Implement motion related techniques. (K2)
5. Develop applications using computer vision techniques. (K3)

## UNIT-I

### IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

## UNIT-II

### SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

## UNIT-III

### HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

## UNIT-IV

### 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

## UNIT-V

### APPLICATIONS

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis

Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

**TEXT BOOKS:**

1. D. L. Baggio et al., —Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.
2. E. R. Davies, —Computer & Machine Vision, Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, —Programming Computer Vision with Python: Tools and algorithms for analyzing images, O'Reilly Media, 2012.

**REFERENCES:**

1. Mark Nixon and Alberto S. Aquado, —Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
2. R. Szeliski, —Computer Vision: Algorithms and Applications, Springer 2011.
3. Simon J. D. Prince, —Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT7E11 : ADVANCED COMPUTER NETWORKS				

### Course Outcomes

After the completion of the course the students are able to

1. Identify the basic computer network technology and the different types of routing algorithms.(K3)
2. Compare IPV4 & IPV6 address, address space and types of addressing (K5)
3. Distinguish transport layer protocols TCP, UDP & SCTP and also process to process delivery. (K4)
4. Summarize the DNS, Architecture of World Wide Web, E-mail and different multimedia streaming protocols. (K2)
5. Distinguish functioning and services of Wireless Sensor and Wireless Mesh networks (K4)

### UNIT-I

**Network Layer:** Network layer design issues: store and forward packet switching, services provided to transport layer, implementation of connectionless service, implementation of connection oriented service, comparison of virtual circuit and datagram subnets.

**Routing algorithm:** Shortest path routing algorithm, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, routing in adhoc networks.

### UNIT-II

**IPV4 Address:** Address space, notations, classful addressing, classless addressing, network address translation (NAT).

**IPV6 address:** structure address space **Internetworking:** need for network layer internet as a datagram, internet as a connection less network.

IPV4 datagram, fragmentation, checksum, options. IPV6 advantages, packet format, extension headers, translation from IPV4 to IPV6.

### UNIT-III

**Process to Process delivery:** client/server paradigm, multiplexing and demultiplexing, connectionless versus connection oriented services, reliable versus unreliable.

**UDP:** Well-known ports for UDP, user datagram, checksum, UDP operation, and uses of UDP.

**TCP:** TCP services, TCP features, segment, A TCP connection, flow control, error control, congestion control.

**SCTP:** SCTP services, SCTP features, packet format, SCTP Association, flow control, error control.

### UNIT-IV

**Domain Name System:** the name space, resource records, name servers.

**E-mail:** architecture and services, the user agent, message formats, message transfer, final delivery.

**WWW:** architecture overview, static web documents, dynamic web documents, hypertext transfer protocol, performance elements, the wireless web.

**Multimedia:** introduction of digital audio, audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, voice on demand, the MBone-the multicast backbone.

### UNIT-V



**Wireless Sensors networks:** WSN functioning, operation system support in sensor devices, WSN characteristics, sensor network operation, sensor architecture, cluster management.

**Wireless Mesh networks:** WMN design, issues in WMNs.

**Computational Grids:** grid features, issue in grid construction technology.

**P2P networks:** characteristics and addressing, components of SIP, SIP session establishment, SIP security, HTMLS.

**Text Books:**

1. Data Communications and Networking, 4<sup>th</sup> Edition, Behrouz A Fourzan, TMH.
2. Computer Networks, 4<sup>th</sup> Edition, Andrew S Tannenbaum, Perarson.
3. Computer Networks, Mayank Dave, Cengage.

**Reference Books:**

1. Computer networks: A systems approach, 5<sup>th</sup> Edition, Larry L Peterson and Bruce S Davie, Elsevier.

B. TECH 7 <sup>th</sup> SEMESTER	L	T	P	C
	0	0	4	2
19IT7L01 : CRYPTOGRAPHY AND NETWORK SECURITY LAB				

### Course Outcomes

After the completion of the course the students are able to

1. Identify and classify various Attacks and explain the same. (K3)
2. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks. (K4)
3. Illustrate the role of third-party agents in the provision of authentication services. (K2)
4. Apply authentication, email security, web security services and mechanisms. (K3)
5. Distinguish different protocol like SSL, TLS Vis-à-vis their applications. (K3)

### List of Experiments

1. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a JAVA program to perform encryption and decryption using the following algorithms:
  - a) Ceaser Cipher
  - b) Substitution Cipher
  - c) Hill Cipher
4. Write a JAVA program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic
6. Write a C/JAVA program to implement the Rijndael algorithm logic
7. Using Java Cryptography, encrypt the text "Helloworld" using BlowFish. Create your own key using Java key tool.
8. Write a program to implement RSA Algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

<b>B. TECH 7<sup>th</sup> SEMESTER</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>19IT7L02 : MACHINE LEARNING LAB</b>				

## **COURSE OUTCOMES**

After the completion of the course the students are able to

1. Apply Data summarization and visualization. (K3)
2. Develop and implement the Linear Regression Analysis (K3)
3. Develop and implement the Logistic Regression Analysis. (K3)
4. Apply the Classification using Support Vector Machine. (K3)

All the programs should be carried out using tools like Weka/Python/R-Programming/Orange.

## **List of Experiments**

1. Installation and running of Scipy.
2. Data loading
3. Data summarization
4. Data visualization
5. Data Predictions
6. Case Study on Linear Regression Analysis
7. Case Study on Logistic Regression Analysis
8. Case Study on Data Classification using Support Vector Machine

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT8E12 : NEURAL NETWORKS AND DEEP LEARNING				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Identify the Learning Networks in modeling real world systems.(K3)
2. Outline the Unsupervised Learning Network. (K2)
3. Illustrate to use an efficient algorithm for Deep Models. (K2)
4. Summarize the Regularization for Deep Learning. (K2)
5. Apply optimization strategies for large scale applications. (K3)

### UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

### UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

### UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

### UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

### UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms  
Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

### TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT8E13 : CYBER SECURITY				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Outline the basic knowledge on Cybercrime. (K2)
2. Analyze the concepts of Cyber offenses. (K4)
3. Build the Cybercrime Mobile and Wireless Devices. (K3)
4. Develop the Tools and Methods Used in Cybercrime. (K3)
5. Apply the Cybercrimes and Cyber security scenarios. (K3)

## COURSE CONTENTS

### UNIT- I: Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security ,Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

### 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, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft:Introduction, Phishing, IdentityTheft (IDTheft)

### UNIT -V: Cybercrimes and Cyber security:

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

**TEXT BOOKS:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, Micheal E. Whitman and Herbert J. Mattord, Cengage Learning.

**REFERENCES:**

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT8E14 : BIG DATA ANALYTICS				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Acquire the basic concepts of Big Data Analytics. (K2)
2. Design and explain the Hadoop architecture. (K3)
3. Develop the Map Reduce application and Make use of the Advanced Analytical methods for clustering. (K3)
4. Apply the Advanced Analytical methods using classification and Text Analysis. (K3)
5. Identify the various tools in Hadoop Ecosystem. (K3)

## UNIT-I

**Introduction to Big Data Analytics:** Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics Data Analytics Lifecycle: Data Analytics Lifecycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize.

## UNIT-II

**Introduction Hadoop:** Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

## UNIT-III

**MapReduce Programming:** A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

**Advanced Analytical Theory and Methods-Clustering-:** k-means, additional algorithms; Association Rules: Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Transactions in a Grocery Store, Validation and Testing.

## UNIT-IV

**Advanced Analytical Theory and Methods-Classification:** Decision Trees, Naïve Bayes; Advanced Analytical Theory and Methods-Time Series Analysis: Overview of Time Series Analysis, ARIMA Model.

**Advanced Analytical Theory and Methods**-Text Analysis: Text Analysis Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments.

## UNIT-V

**Hadoop Ecosystem:** Using Query Languages HIVE and PIG for data analytics, HBASE, Mahout-machine learning algorithms using Hadoop map reduce HDFS

### Text Books:

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services- Wiley
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss.

### Reference Books:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne .
3. Big Data Analytics with R and Hadoop-VigneshPrajapati.  
Software Links:
4. Hadoop:<http://hadoop.apache.org/>
5. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
6. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>



B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS8E12 : AUGMENTED REALITY AND VIRTUAL REALITY				

**COURSE OUTCOMES:**

At the end of the course student are able to

1. Apply various principles and concepts of Virtual Reality and its Application. (K3)
2. Apply appropriate method of Geometric Modeling (K3)
2. Analyze various VR Hardware and Software (K4)
3. Summarize the concepts of Augmented Reality. (K2)
4. Outline Augmented Reality Contents and its Applications. (K2)

**UNIT – I:****INTRODUCTION TO VIRTUAL REALITY**

Virtual Reality & Virtual Environment: Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments –requirement – Benefits of Virtual Reality - Historical development of VR : 3D Computer Graphics - Human Factors – Vision - Vision and Display Technology – Hearing – Tactile - Equilibrium.

**UNIT – II:****GEOMETRIC MODELING**

Geometric Modeling : Introduction – From 2D to 3D – 3D space curves – 3D boundary representation – Other modeling strategies – Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection – A Generic VR system : Introduction – The virtual environment – The Computer environment – VR Technology – Model of interaction – VR System.

**UNIT – III:****VR HARDWARE, SOFTWARE AND APPLICATIONS**

Introduction-Computers-Tracking-Input Devices-Output Devices-Glasses-Displays-Audio-VR-Software Features-Web-based VR-Division's dVISE, Blueberry 3D-Boston Dynamics-Multigen-Introduction-Industrial-Training Simulators-Entertainment-VR Centres.

**UNIT – IV:****INTRODUCTION TO AUGMENTED REALITY**

Introduction to Augmented Reality-Definition and Scope-A Brief History of AR-Examples-Related Fields-Augmented Reality Concepts-How does AR Work-Concepts Related AR-Ingredients of an AR-AR Hardware and Software-Major Hardware Components for AR Systems- Major Software Components for AR Systems.

**UNIT – V:****AR CONTENT, INTERACTION AND ITS APPLICATIONS**

**AR Content**-Introduction-What is Content-Creating Visual Content-Creating Audio Content-Creating Content for Other Senses-Representation and Perceptual Issues-**AR Interaction**-Introduction-What is Interaction-Mobile AR-**AR Applications**-Introduction-Application Areas-Collaborative AR-Applying AR to a Problem-Evaluating AR Applications-Example AR Applications-The Future of Augmented Reality.

**TEXT BOOKS:**

1. John Vince, Virtual Reality Systems, Pearson Education Asia, 2016.
2. John Vince, Introduction to Virtual Reality, Springer London, 2016.
3. Dieter Schmalstieg, Tobias Hollerer, Augmented Reality, Principles and Practice, Pearson Education, 2016.
4. Alan B. Craig, Elsevier -Morgan Kaufmann Understanding Augmented Reality Concepts and Applications, Publications, 2013.

**REFERENCE BOOKS:**

1. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology , Wiley-Inter science, First Edition,1994
3. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.
4. <https://nptel.ac.in/courses/106105195/13>
5. <https://www.mooc-list.com/course/making-your-first-virtual-reality-game-coursera>

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS8E11 : CLOUD COMPUTING				

**Course Outcomes:**

1. Outline the concepts, characteristics, delivery models and benefits of cloud computing(K1)
2. Analyze the key security and compliance challenges of cloud computing(K4)
3. Summarize the key technical and organizational challenges(K2)
4. Develop the different characteristics of public, private and hybrid cloud deployment models.(K3)
5. Develop the Data Security Model in Cloud (K3)

**UNIT – I:**

Systems Modeling, Clustering and virtualization: Distributed system Models and Enabling Technologies, Computer Clusters for scalable parallel computing, Virtual Machines and Virtualization of clusters and data centers

**UNIT- II:**

Foundations: Introduction to cloud computing, Migrating into a Cloud, Enriching the ‘Integration as a Service’ Paradigm for the cloud era, The Enterprise Cloud computing paradigm.

**UNIT - III:**

Infrastructure as a service: Virtual machines provisioning and Migrations services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing cloud computing environments using a cluster as a service, secure distributed data storage in cloud computing Platform as a service: Aneka, Comet cloud, T-systems Work flow engine for cloud, Understanding scientific Applications for cloud Environments.

**UNIT - IV:**

Monitoring and Management: An Architecture Federated cloud commuting, SLA Management in cloud computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting cloud applications in the AWS cloud, Building content delivery networks using clouds, Resource cloud Mashups.

**UNIT- V:**

Governance and case studies: Organizational Readiness and change Management in the cloud age, Data security in the cloud, Legal Issues in cloud computing, Achieving production readiness for cloud services.

**Text Books**

1. Rajkumar Buyya, Cloud Computing: Principles and Paradigms Wiley, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack J. Donnaragarr, Distributed and cloud computing, Elsevier, 2012.

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT8E15 : NATURAL LANGUAGE PROCESSING				

### Course Outcomes

After the completion of the course the students are able to

1. Outline the linguistic phenomena and an ability to model them with formal grammars. (K2)
2. Analyze experimental methodology for training and evaluating empirical NLP systems. (K2)
3. Build probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods. (K3)
4. Develop, implement and analyze NLP algorithms. (K3)
5. Develop different language modeling Techniques. (K3)

### UNIT-1

#### Finding the Structure of Words:

Words and Their Components, Issues and Challenges, Morphological Models

#### Finding the Structure of Documents:

Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

### UNIT-2

#### Syntax Analysis:

Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

### UNIT-3

#### Semantic Parsing:

Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

### UNIT-4

**Predicate-Argument Structure** - Predicate-Argument Structure, Meaning Representation Systems, Software.

#### Discourse Processing:

Cohension, Reference Resolution, Discourse Cohension and Structure

### UNIT-5

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling.

### TEXT BOOKS:

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

### REFERENCE:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19CS8E13 : BLOCK CHAIN TECHNOLOGIES				

**Course Outcome:**

1. Apply the fundamentals of Cryptography in Cryptocurrency. (K3)
2. Analyze about various operations associated with the life cycle of Blockchain and Cryptocurrency. (K4)
3. Illustrate the methods for verification and validation of Bitcoin transactions. (K2)
4. Outline the general ecosystem of several Cryptocurrency. (K2)
5. Summarize the principles, practices and policies associated Bitcoin business. (K2)

**UNIT - I:****Introduction to Cryptography and Cryptocurrencies**

Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.

**UNIT - II:****How Blockchain Achieves and How to Store and Use**

Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

**UNIT - III:****Mechanics of Bitcoin**

Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements.

**Bitcoin Mining**

The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies

**UNIT - IV:****Bitcoin and Anonymity**

Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.

**UNIT - 5:****Community, Politics, and Regulation**

Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who's in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York's Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds.

**Text Book:**

1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press. 2016

**Reference Books:**

1. Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. O'Reilly Media, Inc.”.
2. Franco, P. Understanding Bitcoin: Cryptography, engineering and economics. John Wiley and Sons 2014

B. TECH 8 <sup>th</sup> SEMESTER	L	T	P	C
	3	0	0	3
19IT8E16 : WIRELESS AND ADHOC NETWORKS				

**Course Outcomes**

After the completion of the course the students are able to

1. Outline the overview of Adhoc networks.(K2)
2. Apply data transmission over TCP.(K3)
3. Outline the basics of Wireless Sensors and Applications.(K2)
4. Apply the Data Retrieval in Sensor Networks.(K3)
5. Analyze the security in Adhoc networks.(K4)

**UNIT-I**

**Introduction to Ad Hoc Networks:** Characteristics of MANETs, applications of MANETs, and challenges of MANETs. Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms.

**UNIT-II**

**Data Transmission:** Broadcast storm problem, Broadcasting, Multicasting and Geocasting, TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, and Solutions for TCP over Ad hoc.

**UNIT-III**

**Basics of Wireless Sensors and Applications:** Applications, Classification of sensor networks, Architecture of sensor networks, Physical layer, MAC layer, Link layer.

**UNIT-IV**

**Data Retrieval in Sensor Networks:** Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, and Sensor Networks and mobile robots.

**UNIT-V**

**Security:** Security in ad hoc networks, Key management, Secure routing, Cooperation in MANETs, and Intrusion detection systems. Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms, TinyOS, NS-2 and TOSSIM.

**Text Books:**

1. Ad hoc and Sensor Networks - Theory and Applications, by Carlos Cordeiro and Dharma P. Agrawal, World Scientific Publications, March 2006, ISBN 981-256-681-3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science ISBN: 978-1-55860-914-3, (Morgan Kauffman)

**Reference Books:**

1. Guide to Wireless Ad Hoc Networks (Computer Communications and Networks), Sudip Misra (Editor), Isaac Woungang (Editor), Subhas Chandra Misra (Editor), Springer; 2009th edition.



OPEN ELECTIVE	L	T	P	C
	3	-	-	3
<b>19EEXO01 :: ELECTRICAL SAFETY MANAGEMENT</b>				

**COURSE OUTCOMES:**

*After successful completion of this course, students should be able to:*

- CO1 : Explain the Electrical Safety precautions and Prevention. (K2)
- CO2 : Illustrate Safety aspects during Installation of Plant and Equipment. (K2)
- CO3 : Estimate the electrical safety in residential, commercial and agricultural installations.(K5)
- CO4 : Categorize various Electrical Safety in Hazardous Areas (K4)
- CO5 : List the electrical systems safety management and IE rules.(K1)

**SYLLABUS****UNIT-I : ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION**

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current, and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety.

Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

**UNIT-II : SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT**

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switch yard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

**UNIT-III : ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS**

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

**UNIT-IV : ELECTRICAL SAFETY IN HAZARDOUS AREAS**

Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

**EQUIPMENT EARTHING AND SYSTEM NEUTRAL EARTHING:** Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding( System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

**UNIT-V : SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS**

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

**REVIEW OF IE RULES AND ACTS AND THEIR SIGNIFICANCE:** Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003, (Part1, 2, 3,4 & 5)

**TEXT BOOKS:**

- 1 S. Rao, Prof. H.L. Saluja, “Electrical safety, fire safety Engineering and safety management”, Khanna Publishers. New Delhi, 1988.(units-I to V)
- 2 [www.apeasternpower.com/downloads/elecact2003.pdf](http://www.apeasternpower.com/downloads/elecact2003.pdf) (Part of unit-V)

**REFERENCE BOOKS:**

- 1 Pradeep Chaturvedi, “Energy management policy, planning and utilization”, Concept Publishing company, New Delhi, 1997.
2. The Electricity Act, 2003 MINISTRY OF LAW AND JUSTICE (Legislative Department) New Delhi, the 2nd June, 2003.Jyaistha 12, 1925 (Saka)

OPEN ELECTIVE	L	T	P	C
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19EEXO02 :: NON CONVENTIONAL ENERGY SOURCES				

**COURSE OUTCOMES:**

*After successful completion of this course, students should be able to:*

- CO1 : Show the need of energy conversion and the analysis of solar radiation. (K1)
- CO2 : Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface and solar thermal systems. (K4)
- CO3 : Identify the methods and analysis of Wind energy generation and its maximum power point techniques. (K3)
- CO4 : Explain basic principle and working of hydro and tidal energy systems. (K2)
- CO5 : Explain the Biomass, Fuel cells and Geothermal energy, its mechanism of production and its applications (K2)

**SYLLABUS****UNIT-I : FUNDAMENTALS OF ENERGY SYSTEMS:**

Energy conservation principle – Energy scenario (world and India) – Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

**UNIT-II : SOLAR THERMAL SYSTEMS**

Liquid flat plate collections: Performance analysis –Introduction to solar air heaters – Concentrating collectors and solar pond– Numerical problems.

**Solar Photovoltaic Systems** :Solar Photovoltaic cell, Module, Array – Construction– Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Applications and systems – Maximum power point tracking.

**UNIT-III : WIND ENERGY**

Sources of wind energy – Wind patterns – Types of turbines – Horizontal axis and vertical axis machines – Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking.

**UNIT-IV : HYDRO AND TIDAL POWER SYSTEMS**

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

**UNIT-V : BIOMASS, FUEL CELLS AND GEOTHERMAL SYSTEMS**

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. Fuel cell: Classification of fuel for fuel cell – Fuel cell voltage – Efficiency – VI characteristics. Geothermal: Classification – Dry rock and hot aquifer – Energy analysis.

**TEXT BOOKS:**

- 1 Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition, 2013
- 2 Non conventional sources of Energy by G.D.Rai, Kanna Publications.
- 3 Renewable Energy Technologies /Ramesh & Kumar /Narosa.

**REFERENCE BOOKS:**

- 1 Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press, 2017.
- 2 Renewable Energy- Edited by Godfrey Boyle-oxford university, press, 3rd edition, 2013.
- 3 Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore
- 4 Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
- 5 Non conventional energy source –B.H. Khan- TMH-2nd edition
- 6 Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition

OPEN ELECTIVE	L	T	P	C
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19EEXO03::ELECTRICAL VEHICLE				

**COURSE OUTCOMES:**

*After successful completion of this course, students should be able to:*

- CO1 : Explain the basics of electric vehicles fundamentals.(K2)  
 CO2 : Discuss different energy storage concepts used for electric vehicles.(K6)  
 CO3 : Explain about fundamental of electrical Machines .(K2)  
 CO4 : Analyze various drive trains suitable for electric vehicles .(K4)  
 CO5 : Explain about different types of EV Systems.(K2)

**SYLLABUS****UNIT-I : INTRODUCTION TO ELECTRIC VEHICLES**

Components of an EV ,EV History, EV Advantages ,EV mechanics , Roadway Fundamentals , Laws of Motion , Vehicle Kinetics , Dynamics of Vehicle Motion , Propulsion Power, Velocity and Acceleration, Propulsion System Design

**UNIT-II : BATTERY**

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Lead-Acid Battery, Alternative Batteries, Battery Parameters, Technical Characteristics, Targets and Properties of Batteries , Battery Modeling

**UNIT-III : DC & AC ELECTRICAL MACHINES**

Motor and Engine rating, Requirements, Fundamental concepts of DC machines- Three phase A/c machines- Induction machines- permanent magnet machines-switched reluctance machines

**UNIT-IV : ELECTRIC VEHICLE DRIVE TRAIN**

EV Transmission Configurations , Transmission Components, Ideal Gearbox, EV Motor Sizing

**UNIT-V : HYBRID ELECTRIC VEHICLES**

Types of Hybrids, Internal Combustion Engines, Design of an HEV, Drive train, sizing of components.

**TEXT BOOKS:**

- 1 Iqbal Hussein, “Electric and Hybrid Vehicles: Design Fundamentals”, CRC Press, 2003.

**REFERENCE BOOKS:**

- 1 James Larminie and John Lowry, “Electric Vehicle Technology Explained”, Wiley, 2003.
- 2 Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay and Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.
- 3 Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2004.
- 4 Introduction to hybrid and electric vehicles: Dr Praveen Kumar & Dr S Majhi, IIT Guwahati , <https://nptel.ac.in/courses/108/103/108103009/> .

OPEN ELECTIVE	L	T	P	C
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<b>19EEX004:: ELECTRICAL ENERGY CONSERVATION AND AUDITING</b>				

**COURSE OUTCOMES:**

*After successful completion of this course, students should be able to:*

- CO1 : Explain energy efficiency, conservation and various technologies [K2]  
 CO2 : Identify the concepts of energy management and energy audit [K3]  
 CO3 : Explain energy conservation in HVAC systems.[K2]  
 CO4 : Analyze the concepts of different energy efficient devices [K4]  
 CO5 : Estimate life cycle costing analysis and energy efficient Technologies [K5]

**SYLLABUS****UNIT-I : BASICS OF ENERGY AND ITS VARIOUS FORMS**

Energy consumption –choice of fuels. Energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity and humidity & heat transfer, units and conversion.

**UNIT-II : ENERGY MANAGEMENT & AUDIT**

Energy conservation schemes: Short term - Medium term - Long term energy conservation schemes – Industrial energy use - Energy index – Cost index. Representation of energy consumption: Pie charts - Sankey diagrams – Load Profile.

Energy auditing: General Auditing, Detailed Energy Audit. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

**UNIT-III : ENERGY EFFICIENCY IN INDUSTRIAL & ELECTRICAL SYSTEMS**

Heat – Heat content – Rate of heat transfer – Heat transfer coefficient - Conduction – Convection and radiation. Thermal insulation & its importance - space heating – HVAC system – Heating of Buildings. Energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

**UNIT-IV : ENERGY EFFICIENT INSTRUMENTS**

Digital Energy Meter – Data loggers – Thermo couples – Pyranometer – Lux meters – Tong testers – Power analyzers – Power factor – effects with non-linear loads – effect of harmonics on power factor – Power Factor Improvement – Capacitor rating - Effects of power factor improvements - Electric lighting – Types of lighting – Luminaries – Energy efficient lighting.

**UNIT-V : ECONOMICAL ASPECTS & FINANCIAL ANALYSIS**

Costing Techniques – cost factors – break-even charts – sources of capital and hire charges -capital recovery – depreciation – budgeting and standard costing – charging energy – cash flow diagrams and activity charts. Financial appraisal and profitability : investment decision- methods of investment appraisal discounted cash flow – summary of investment appraisal techniques – Cost optimization – optimization with one variable – optimization with more than one variable.

### TEXT BOOKS:

- 1 Energy management by W.R. Murphy & G. McKay Butter worth, Elsevier publications.
- 2 Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
- 3 Energy management hand book by W.C.Turner, John wiley and sons.
- 4 Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
- 5 Economic Analysis of Demand Side Programs and Projects - California Standard Practise Manual, June 2002 – Free download available online
- 6 Energy Efficiency And Management For Engineers, November 2020, TMH, by Mehmet Kanoglu , Yunus A. Cengel

### REFERENCE BOOKS:

- 1 Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition,1998.
- 2 Energy management and conservation –k v Sharma and pvenkatasessaiah-I K International Publishing House pvt.ltd,2011
- 3 Fundamentals of Energy Engineering by Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey, 1984.
- 4 Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
- 5 Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)

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<b>19CEX001: DISASTER MANAGEMENT</b>				

**Course Outcomes:**

Students are able to

1. Identify the tools of integrating disaster management principles in disaster mitigation process.
2. Discuss about different approaches needed to manage pre and post- disaster activities.
3. Prepare the process of risk management and develop a basic understanding method for the role of public in risk management.
4. Administer the role of technology in Disaster management.
5. Conclude the planning strategies for education and community preparedness programmes.

**UNIT-I : Natural Hazards and Disaster management:**

Introduction of DM – Inter disciplinary nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

**UNIT-II: Man Made Disaster and their management along with case study methods of the following:**

Fire hazards - transport hazard dynamics -Solid waste management- post disaster – Bio terrorism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

**UNIT-III: Risk and Vulnerability:**

Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financial management of disaster - related losses.

**UNIT-IV: Role of Technology in Disaster managements:**

Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities- electrical substations- roads and bridges- mitigation programme for earth quakes -flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

**UNIT-V: Education and Community Preparedness**

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

**Textbooks:**

1. Rajib shah & R. Krishnamurthy, 'Disaster Management - Global Challenges and Local Solutions' Universities press-2009.
2. Tushar Bhattacharya, 'Disaster Science & Management', Tata McGraw Hill Education Pvt. Ltd., New Delhi.-2012
3. Jagbir Singh , 'Disaster Management - Future Challenges and Opportunities' , I K International Publishing House Pvt. Ltd-2017

**References:**

1. H K Gupta , 'Disaster Management', Universities press-2003
2. Prof. R.B. Singh , "Disaster Management and Mitigation", World Focus 2016



OPEN ELECTIVE	L	T	P	C
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<b>19CEX002: ENVIRONMENTAL POLLUTION AND CONTROL</b>				

**Course Outcomes:**

Students are able to

1. Identify the air pollutant causes and control devices
2. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
3. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
4. know the causes for noise pollution and ISO14000 standards
5. Treatment and management of hazardous waste

**SYLLUBUS****UNIT – I : Air Pollution**

Air pollution causes-control methods–particulate control devices – methods of controlling Gaseous Emissions – Air quality standards.

**UNIT –II: Industrial wastewater Management**

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

**UNIT – III : Solid Waste Management**

Solid waste characteristics–basics of on-site handling and collection–separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of land filling.

**UNIT – IV: Noise Pollution**

Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000

**UNIT – V: Hazardous Waste**

Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

**Text/References books:**

1. Ruth F. Weiner and Robin Matthews , ‘Environmental Engineering‘, 4th Edition Elsevier, 2003.
2. J.G. Henry and G.W. Heinke, ‘Environmental Science and Engineering‘ – Pearson Education, 2002
3. Mackenzie L Davis & David A Cornwell, “Environmental Engineering ‘, McGraw Hill Publishing, 2002.
4. K. Sasi Kumar, S.A. Gopi Krishna ,”Solid Waste Management”, PHI New Delhi, 2014
5. D. Srinivasan, “Environmental Engineering”, PHI Learning Private Limited, New Delhi, 2011.
6. Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus,”Environmental Engineering”, Mc-Graw-Hill Book Company, New Delhi, 1985.

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<b>19CEXO03: SOLID WASTE MANAGEMENT</b>				

**Course Outcomes:**

Students are able to

1. Understand classification of solid waste generated
2. know the collection systems of solid waste of a town
3. analyze the importance of transfer and transport of solid waste
4. apply the knowledge in processing of solid waste
5. design treatment of municipal solid waste and landfill

**SYLLUBUS:****UNIT- I****Introduction to Solid Waste Management:**

Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization – Future changes in waste composition, major legislation, monitoring responsibilities.

**UNIT- II****Collection of Solid Waste:**

Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

**UNIT- III****Transfer and Transport:**

Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

**UNIT- IV****Processing and Treatment:**

Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

**UNIT- V****Disposal of Solid Waste:**

Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

**Text/ Reference books:**

1. George Tchobanoglous, Frank Kreith ,Integrated Solid Waste Management- McGraw Hill Publication, 1993.
2. R.Saravanan, R.Dinesh Kumar, A.Suriya , Muncipal solid waste management , Lakshmi publications- 2015.
3. Vesilind, P.A., Worrell, W., Reinhart, D.,“Solid Waste Engineering”, Cenage learning, New Delhi, 2004.
4. Charles A. Wentz, “Hazardous Waste Management”;; McGraw Hill Publication, 1995.

OPEN ELECTIVE	L	T	P	C
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<b>19CEX004: BUILDING PLANNING AND DRAWING</b>				

**COURSE OUTCOMES**

Students are able to

1. Understand the building bye-laws, plan various buildings as per the building bye-laws.
2. Plan the individual rooms with reference to functional and furniture requirements.
3. prepare different sign conventions and bonds
4. Learn the skills of drawing building elements like doors and windows.
5. Develop the skills of Drawing Plans, Sections and Elevations of different buildings.

**SYLLABUS:****UNIT-I**

**BUILDING BYELAWS AND REGULATIONS:** Introduction - terminology - objectives of building Bye laws - floor area ratio - floor space index - principles under laying building bye laws - classification of buildings - open space requirements - built up area limitations- height of buildings- wall thickness - lightening and ventilation requirements.

**UNIT -II****RESIDENTIAL AND PUBLIC BUILDINGS**

**Residential buildings:** Minimum standards for various parts of buildings -requirements of different rooms and their grouping- characteristics of various types residential buildings.

**Public buildings:** Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

**UNIT-III**

**SIGN CONVENTIONS AND BONDS :** Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

**UNIT- IV**

**DOORS, WINDOWS, VENTILATORS AND ROOFS:** Panelled door, panelled and glassed door, glassed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

**UNIT-V**

**PLANNING AND DESIGNING OF BUILDINGS:** Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram.

**Text /Reference Books:**

1. Y.S. Sane., Planning and Design of buildings, 2010.
2. Gurucharan Singh and Jagadish Singh , Planning, designing and scheduling, 2015.
3. M. Chakravarthi., Building planning and drawing, 2015.
4. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.
5. Shah and Kale , Building drawing, 2013.

OPEN ELECTIVE	L	T	P	C
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19MEXO01: 3D PRINTING				

**COURSE OBJECTIVES:**

- To explore technology used in additive manufacturing
- To acquire knowledge for selecting correct CAD formats in manufacturing process.
- To understand the operating principles and limitations of liquid, solid and laser based additive manufacturing system.
- To understand the operating principles and limitations of laser based additive manufacturing system.
- To acquire knowledge on important process parameters for bio-manufacturing

**COURSE OUTCOMES:** Students are able to

**CO1:** Explain the fundamentals of Additive Manufacturing Technologies for engineering applications. [K2]

**CO2:** Select and use correct CAD formats in the manufacture of a 3D printed part [K2]

**CO3:** Describe the operating principles, capabilities, and limitations of liquid and solid based additive manufacturing system, including fused deposition modeling and stereo lithography [K2]

**CO4:** Describe the operating principles, capabilities and limitations of laser based additive manufacturing system. [K2]

**CO5:** Describe the important process parameters for bio-manufacturing and determine the suitable additive technique for bio-manufacturing, aerospace and manufacturing engineering. [K2]

**UNIT I****INTRODUCTION**

Overview, History, Need, Classification, Additive Manufacturing Technology in product development - Materials for Additive Manufacturing Technology

**UNIT II****REVERSE ENGINEERING**

Basic Concept –3D Scanning Digitization techniques , Model Reconstruction, Data Processing for Additive Manufacturing Technology, Part Orientation and support generation, Model Slicing, Tool path Generation.

**UNIT III****LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS**

Classification, Stereo lithography Apparatus (SLA) - Principle, Process, advantages, Fused Deposition Modeling – principle, process, advantages.

**UNIT IV****LASER BASED ADDITIVE MANUFACTURING SYSTEMS**

Selective Laser Sintering - Principle, Process, advantages, Three Dimensional Printing – Principle, process, advantages, Laser Engineered Net Shaping (LENS).

**UNIT V****APPLICATIONS OF 3D PRINTING**

Customized implants and prosthesis: Design and development, Bio-Additive Manufacturing, Computer Aided Tissue Engineering (CATE), Applications of 3D Printing in Aerospace, Automotive, Manufacturing and Architectural Engineering.

## **TEXT BOOKS**

1. Chua C.K., Leong K.F., and Lim C.S., Rapid prototyping: Principles and applications, Third Edition, World Scientific Publishers, 2016.
2. Gebhardt A, Rapid prototyping, Hanser Gardener Publications, 2017.
3. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications, World Scientific Publishers, Fourth Edition of Rapid Prototyping, 2016.

## **REFERENCES**

1. Liou L.W. and Liou F.W., Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press, 2017.
2. Kamrani A.K. and Nasr E.A., Rapid Prototyping: Theory and practice, Springer, 2016.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2015.

OPEN ELECTIVE	L	T	P	C
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19MEXO02 - FARM MACHINERY				

**COURSE OBJECTIVES:**

- To impart the students to understand the fundamentals of machinery in farming.
- To enable the students to acquire knowledge on tillage and equipment used.
- To introduce the students about various types of earth moving equipment.
- To enable the students to acquire knowledge on seeding and spraying equipment.
- To introduce the fundamentals of transplanting machinery and fertilizer equipment.

**COURSE OUTCOMES:** Students will be able to

CO1. Explain various types of machinery in farming. [K2]

CO2. Illustrate different types of farm operation for crop cultivation with scientific understanding. [K2]

CO3. Explain various types of earth moving equipment. [K2]

CO4. Summarize various seeding methods and sprayer types. [K2]

CO5. Explain transplanting methods and fertilizer equipment. [K2]

**UNIT I**

**Farm Mechanization:** Objectives of Farm Mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. Principles of operation and selection of machines used for production of crops - Field capacities of different implements and their economics. Problems on field capacities and cost of cultivation

**UNIT II**

**Tillage and Equipment:** Classification and types of tillage, Primary tillage implements-Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipment- Disc harrows, implements- Cultivators, and intercultural implements. Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipment, Draft and unit draft related problems.

**UNIT III**

**Earth Moving Equipment:** Earth moving equipment-terminology, Earth moving equipment, construction and their working principles, Earth moving equipment- shovels, Bulldozers, Earth moving equipment- Trenches and elevators.

**UNIT IV****Seed Drills and Sprayer:**

Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Adjustment of Seed Drills - Objectives and uses of plant protection equipment. Types of sprayers and dusters. Sprayer calibration and selection. Constructional features of different components of sprayers and dusters and their adjustments.

**UNIT V**

**Transplanting and Fertilizer:** Transplanting methods, different types of Transplanting machinery and their working principle, adjustments in Transplanting equipment. Fertilizer application equipment – fertilizer metering mechanism calibration of fertilizer equipment.

### **TEXTBOOKS**

1. Triveni Prasad Singh, Farm Machinery. India, Prentice Hall India Pvt., Limited, 2016.
2. Jagadeshwar Sahay, Elements of Agricultural Engineering, Agro Book agency, Patna, 1992.
3. Borshahov Mansurov Sergecy, Land Reclamation Machinery, Mir Publishers, Moscow, 1988.
4. Kepner R A, Bainer R and Barger E L, Principles of Farm Machinery, CBS Publishers and Distrubutors, New Delhi, 1987.
5. Michael A M and Ojha T P, Principles of Agricultural Engineering, Jain Brothers, New Delhi, 1985, Vol.I.
6. Smith H P, Farm Machinery and Equipment, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1971.
7. Stone A A, Farm Machinery, John Wiley & Sons, New York.

### **REFERENCES**

1. Srivastaba A.C, Elements of Farm Machinery, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 1990.
2. Krutz, Gary, Thompson Lester and Claar, Paul, Design of Agricultural Machinery", John Wiley and Sons, 1984.
3. Lal, Radhey and Dutta, A.C. Agricultural Engineering through solved examples, Saroj Prakashan Publishers, Allahabad, 1971

OPEN ELECTIVE	L	T	P	C
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19MEX003 - BIO-MECHANICAL ENGINEERING				

**COURSE OBJECTIVES:**

The student should be made to:

- Explain the principles of mechanics.
- Discuss the mechanics of musculoskeletal system.
- Explain the linear kinetics and angular kinetics
- Illustrate the mathematical models used in the analysis of biomechanical systems

**COURSE OUTCOMES: Students are able to**

**CO1** Infer the introduction of Bio mechanics. [K4]

**CO2** Learn about mechanics of musculoskeletal system. [K2]

**CO3** Relate the concept of kinetics with human motion. [K3]

**CO4** Develop knowledge on mechanical analysis of human motion. [K3]

**CO5** Analyze human movements. [K4]

**UNIT-I****INTRODUCTION TO BIO MECHANICS**

Principles of mechanics in human movement, Qualitative and quantitative Analysis, Key mechanical concepts of mechanics and basic units, Nine fundamentals of biomechanics, Nine principles for application of Biomechanics.

**UNIT-II****MECHANICS OF MUSCULOSKELETAL SYSTEM**

Principles of joint motions, Muscle structures, Mechanical method of muscle action analysis, Tissue loads and forces, Biomechanics of bones and ligaments, Three mechanical characters of muscle, SSC.

**UNIT-III****LINEAR KINETICS AND ANGULAR KINETICS**

Vector analysis of angle of pull and muscle angle pull, Contact forces, Impulse-Momentum Relationship, Force-Time Principle, Work-Energy relationship, Segmental interaction principle, Torque, Equilibrium, Center of gravity and Principle of balance.

**UNIT-IV****MECHANICAL ANALYSIS OF HUMAN MOTION**

Linear kinematics - linear kinematic analysis, position and displacement, velocity and speed, acceleration, differentiation and integration, kinematics of running, kinematics of projectiles, equations of constant acceleration. Angular kinematics - angular motion, measurements of angles, types of angles, representation of angular motion vectors, lower extremity joint angles, relationship between angular and linear motion, angular kinematics of running.

**UNIT-V****APPLICATIONS OF ENGINEERING EDUCATION & MEDICAL REHABILITATION**

Qualitative analysis of Kicking technique, batting, catching, throwing techniques, Injury risk assessment, Equipment design for strength training, Injury mechanics, Injury prevention.



**TEXT BOOKS:**

1. Ronald L.Huston, Principles of Biomechanics,1<sup>st</sup> edition CRC Press, 2019
2. Joseph E.Muscolino, “ Kinesology”, 3rd edition, Mosby, 2016.
3. Subrata Pal, “Textbook of Biomechanics”, 1<sup>st</sup> edition, Springer US, 2016.

**REFERENCE BOOKS:**

1. Duane Knudson, “Fundamentals of Biomechanics”, 2<sup>nd</sup> edition, Springer, 2013.
2. Ajay Bahl, “Basics of Biomechanics”, 1<sup>st</sup> edition, Jaypee Brothers Medical Publishers, 2010.
3. Robert frost, “Applied Kinesiology”, 1<sup>st</sup> edition, North Atlantic Books; 2013
4. David A. Winter, “Biomechanics and Motor Control of Human Movement”, John Wiley & sons,Inc., 2009.

OPEN ELECTIVE	L	T	P	C
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19MEXO04- WASTE TO ENERGY CONVERSION				

**COURSE OBJECTIVES:**

- To enable students to understand of the concept of Waste to Energy.
- To link legal, technical and management principles for production of energy form waste.
- To learn about the best available technologies for waste to energy.
- To facilitate the students in developing skills in the decision making process.

**COURSE OUTCOMES:** Students will be able to

- CO1. Describe of the concept of Waste to Energy, classifications and principles.[K2]  
 CO2. Explain the Technical and management principles for production of energy form waste.[K2]  
 CO3. Explain the best available technologies for waste to energy.[K2]  
 CO4. Describe the Waste to Energy Options Landfill gas, RDF, AFR and energy from Plastics.[K2]  
 CO5. Apply the knowledge in planning and operations of Waste to Energy plants[K3]

**UNIT-I**

**Introduction:** Principles of Waste Management and Waste Utilization, Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle, Waste as a Resource and Alternate Energy source.

**UNIT-2**

**Waste Sources & Characterization:** Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous), Characterization of waste for energy utilization, Waste selection criteria.

**UNIT- 3**

**Technologies for Waste:** Energy Biochemical Conversion – energy production from organic waste through anaerobic digestion and fermentation, Thermo-chemical Conversion – combustion, incineration, heat recovery, pyrolysis, gasification, Plasma Arc Technology, other newer technologies.

**UNIT- 4**

**Waste to Energy Options:** Landfill gas, collection and recovery, Refuse Derived Fuel (RDF) – fluff, briquettes, pellets, Alternate Fuel Resource (AFR) – production and use in cement plants, thermal power plants, Industrial boilers, Conversion of wastes to fuel resources for other useful energy applications, Energy from Plastic Wastes – non-recyclable plastic wastes for energy recovery, Energy recovery from wastes and optimization of its use, benchmarking and standardization, Energy Analysis.

**UNIT-5:****Waste to Energy Plants**

Waste management activities – collection, segregation, transportation and storage requirements, Location and Siting of ‘Waste to Energy’ plants, Industry Specific Applications – In-house use

**Waste to Energy & Environmental Implications:** Environmental standards for Waste to Energy Plant operations and gas clean-up. Savings on non-renewable fuel resources, Carbon Credits- carbon foot calculations, carbon credits transfer mechanisms.

**TEXT BOOKS:**

1. B.T. Nijaguna, Biogas Technology, 1<sup>st</sup> Edition, New Age International Pvt Ltd, 2002.
2. Marc Rogoff Francois Screve, Waste-to-Energy, 3<sup>rd</sup> Edition, William Andrew, 2019.
3. Vishal Prasad, Barkha Vaish, Advances in Waste-to-Energy Technologies, 1<sup>st</sup> Edition, CRC Press, 2019
4. Dev Vrat Kamboj, Manoj Kumar Solanki, Waste to Energy: Prospects and Applications, 1<sup>st</sup> Edition, Springer, 2021

**REFERENCE BOOKS:**

1. Khandelwal, K. C. and Mahdi.S.S, Biogas Technology - A Practical Hand Book, 1<sup>st</sup> Edition, 1986.
2. Challal, D.S, Food Feed and Fuel from Biomass, 1<sup>st</sup> Edition, IBH Publishing Co. Pvt. Ltd, 1991.
3. C. Y. Wereko-Brobby and E. B. Hagan, Biomass Conversion and Technology, 1<sup>st</sup> Edition, John Wiley & Sons, 1996.
4. Desai, Ashok V, Non-Conventional Energy, 1<sup>st</sup> Edition, Wiley Eastern Ltd, 1990

OPEN ELECTIVE	L	T	P	C
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19CSXO01 - INTERNET OF THINGS AND APPLICATIONS				

**Course Outcome:****At the end of the course students are able to**

1. Explain Arduino IDE tool and Arduino Programming concept.
2. Illustrate concept hardware configuration with Firmata protocols.
3. Explain the knowledge Arduino pin configuration.
4. Differentiate various sensors configuration and workflows.
5. Define architecture of IoT.
6. Explain the knowledge in cloud based web application.

**UNIT-I (Introduction to Arduino)**

Introduction to Arduino, history of Arduino, variants, Uno board block diagram, installation of Arduino, Arduino IDE, Arduino programming, functions and statements.

**UNIT-II (Configuration)**

Connecting Arduino board, introducing the Firmata Protocol, uploading a Firmata sketch to the Arduino board, testing the Firmata protocol.

**UNIT-III (Components)**

List of components, software flow design, hardware flow design, hardware prototyping software, designing the hardware prototype, Arduino sketch default functions and custom function, setting Arduino board, pin configuration, working with pins.

**UNIT-IV (Prototype)**

Potentiometer-continuous observation from an analog input connection, Buzzer-generating sound alarm pattern, DC motor-controlling motor speed using PWM, LED- controlling LED brightness using PWM, Servomotor- moving the motor to a certain angle.

**UNIT-V (Networking and cloud)**

Arduino and computer networking, networking fundamentals, Obtaining the IP address, Networking extensions for Arduino with libraries and class, architecture of IoT web applications, IoT cloud platforms, develop cloud-based IoT applications.

**Textbooks:**

1. Python programming for Arduino by Pratik desai, Packt Publishing.
2. Internet of Things with Arduino Cookbook by Marco Schwartz.
3. Introduction to Arduino by Alan G. Smith.

**References**

1. Beginning Arduino by Michael McRoberts, 2e.
2. Getting Started with Arduino Massimo Banzi Second Edition.

OPEN ELECTIVE	L	T	P	C
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19CSXO02 - FOUNDATION TO DATA ANALYTICS				

**COURSE OUTCOMES:**

1. To understand the basics of Excel as business analytics.
2. To use of basic functions and statistical functions in Excel
3. To obtain knowledge about using of pivot tables and charts
4. To understand the advanced business analytics related charts
5. To know about statistical concepts for data analysis and basics of Power BI.

**UNIT – I**

**Introduction to spreadsheets:** reading data, manipulating data. Basic spreadsheet operations and functions.

**Introduction to Business analytics:** Introduction, Types of Analytics, Area of Analytics.

**UNIT – II**

**Spreadsheet Functions to Organize Data:** Conditional formatting, Logical functions: Lookup and reference functions, IF, Nested IF, VLOOKUP, HLOOKUP, MATCH, INDEX and OFFSET functions in Excel.

**Statistical functions:** Introduction, SUMIFS, COUNTIF, PERCENTILE, QUARTILE, STDEV, MEDIAN and RANK Function

**UNIT – III**

**Introduction to Filtering, Pivot Tables, and Charts:** Introduction to the data filtering capabilities of Excel, the construction of Pivot Tables to organize data and introduction to charts in Excel.

**Pivot Table Introduction:** Creating a Pivot Table, Grouping in Pivot Table, Custom Calculated Field and Calculated Item, Slicer Introduction, Creating a Slicer

**UNIT – IV:**

**Advanced Graphing and Charting:** Constructing various Line, Bar and Pie charts. Using the Pivot chart features of Excel. Understanding and constructing Histograms and Scatterplots.

**Business analytics with Excel:** Introduction, Histogram, Data Table, Descriptive Statistics.

**UNIT – V:**

**Data Analysis Using Statistics:** Introduction, Moving Average, Hypothesis Testing, ANOVA, Covariance, Correlation, Regression, Normal Distribution.

**Power BI:** Introduction, Power Pivot, Power View, Power Query, Power Map.

**Reference Books:**

1. Advanced Analytics with Excel 2019: Perform Data Analysis using Excel's Most Popular Features (English Editions), 2020
2. Beginning Excel What-If Data Analysis Tools: Getting Started with Goal Seek, Data Tables, Scenarios, and Solver – Illustrated, Paul Cornell, 2005.

**Website Link for Reference:**

1. <https://www.excel-easy.com/data-analysis.html>

OPEN ELECTIVE	L	T	P	C
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19CSX003 - DATA ENGINEERING				

**COURSE OUTCOMES:**

1. At the end of the course Students will be able to:
2. Apply the skills of data inspecting and cleansing.
3. Determine the relationship between data dependencies using statistics
4. Can handle data using primary tools used for data science in Python
5. Represent the useful information using mathematical skills
6. Can apply the knowledge for data describing and visualization using tools.

**UNIT I INTRODUCTION**

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

**UNIT II DESCRIBING DATA I**

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

**UNIT III PYTHON FOR DATA HANDLING**

Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

**UNIT IV DESCRIBING DATA II**

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of  $r^2$  – multiple regression equations – regression toward the mean

**UNIT V PYTHON FOR DATA VISUALIZATION**

Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using stat models and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh

**TEXT BOOKS:**

1. David Cielien, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

**REFERENCES:**

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

OPEN ELECTIVE	L	T	P	C
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<b>19CSXO04 - MACHINE LEARNING</b>				

**Course outcomes:****At the end of the course students are able to**

1. Define basic concepts of machine learning.
2. Evaluate and compare the performance or, other qualities of regression and logistic regression.
3. Describe concepts of artificial intelligence.
4. Design a supervised or unsupervised learning system.
5. Define the knowledge about SVM.
6. Demonstrate Instance based learning algorithms.

**UNIT I: Introduction**

Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning. Concept learning and the general to specific ordering – Introduction, a concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

**UNIT II: Linear Regression & Logistic Regression**

Predicting numeric values: regression – Finding the best fit lines with linear regression, locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff. Logistic Regression: Classification with logistic regression and the sigmoid function, using optimization to find the best regression coefficients.

**UNIT III: Artificial Neural Networks**

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

**UNIT IV: Evaluation Hypotheses**

Motivation, Estimation hypothesis accuracy, Basics of sampling theory, a general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

**UNIT V: Support vector machines & Dimensionality Reduction techniques**

Separating data with the maximum margin, finding the maximum margin, efficient optimization with SMO algorithm, speeding up optimization with full Platt SMO, Using Kernels for more Complex data. Dimensionality Reduction techniques: Principal Component analysis, Example.

**Instance-Based Learning**

Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

### **TEXT BOOKS**

1. Machine Learning, Tom M. Mitchell, MGH
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

### **REFERENCE BOOKS**

1. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004.



OPEN ELECTIVE	L	T	P	C
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<b>19ECX001: NANO TECHNOLOGY AND APPLICATIONS</b>				

**COURSE OUTCOMES:****Students are able to**

- CO1.** Define Nano materials and Nano Technology with properties  
**CO2.** Explain Synthesis as Fabrication methods of Nano Technology  
**CO3.** Demonstrate Characterization techniques of Nano Materials  
**CO4.** Analyze carbon Nano technology and application of Nano technology.

**UNIT-I**

**INTRODUCTION:** History of nano science, definition of nano meter, nano materials, nano technology, Classification of nano materials, Applications in material science, biology and medicine, surface science, energy and environment, Crystal symmetries, crystal directions, crystal planes, Band structure,

**UNIT-II**

**PROPERTIES OF MATERIALS:** Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

**UNIT-III**

**SYNTHESIS & FABRICATIONMETHODS:** Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography.

**UNIT-IV**

**CHARECTERIZATION TECHNIQUES:** X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

**UNIT-V**

**CARBON NANO TECHNOLOGY:** Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nanocrystalline diamond films, grapheme, applications of carbon nanotubes, carbon nanotubes for nanoelectronics devices.

**TEXT BOOKS:**

1. Nano science and nano technology by M.S Ramachandra Rao, Shubra Singh, Wiley publishers.  
(UNITS-I,II&III)
2. Fundamentals of nano electronics by George W Hanson Pearson publications, India 2008  
(Unit- I, IV&V)

**REFERENCE BOOKS:**

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Principles of Nanotechnology by Phani Kumar, Scitech.

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<b>19ECX002 - GLOBAL POSITIONING AND NAVIGATION SATELLITE SYSTEMS</b>				

**COURSE OUTCOMES:**

Upon completion of this course, the student would be able to

**CO1:** Describe the concepts of GNSS based positioning methods, the core components of a satellite navigation system and their purposes.

**CO2:** Estimate and represent the GPS coordinate frames and GPS orbits.

**CO3:** Analyze the impact of various error sources on the precision of positioning.

**CO4:** Dramatize the examples of their role of goods and services based on the GSP in sustainable development.

**UNIT - I**

Overview of GPS: Basic concept, system architecture, space segment, user segment, services of GPS, applications of GPS.

**UNIT - II**

GPS Signals: Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

**UNIT - III**

GPS coordinate frames, Time references: Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

**UNIT - IV**

GPS orbits and satellite position determination: GPS orbital parameters, description of receiver independent exchange format (RINEX)–Observation data and navigation message data parameters, GPS position determination.

**UNIT - V**

GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

**TEXT BOOKS:**

1. G. S. RAO, Global Navigation Satellite Systems, 2<sup>nd</sup> Edition, McGraw-Hill publications, New Delhi, 2010. (UNIT-I-V)

**REFERENCE BOOKS:**

1. B. Hoffman – Wellenhof, H. Lichtenegger and J. Collins, 'GPS – Theory and Practice', 4<sup>th</sup> Edition, Springer – Wien, New York, 2001. (UNIT-I-III)
2. Sateesh Gopi, "Global Positioning System: Principles and Applications", 3<sup>rd</sup> Edition, TMH, 2005. (UNIT-I-II)
3. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software Approach', 3<sup>rd</sup> Edition, John Wiley & Sons, 2001. (UNIT-IV-V)
4. Elliot D. Kaplan, "Understanding GPS Principles and Applications", 2<sup>nd</sup> edition, Artech House, 2005. (UNIT-I-III)

**E-REFERENCES:**

1. <http://www.unoosa.org/oosa/sk/ourwork/psa/gnss/gnss.html>  
[https://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/techops/navservices/gnss/gps/howitworks/](https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/gps/howitworks/)
2. <https://www.princeton.edu/~alaink/Orf467F07/GNSS.pdf>
3. <https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss>  
<https://www.gps.gov/systems/gnss/>

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19ECXO03 - REMOTE SENSING				

**COURSE OUTCOMES:**

**After Completion of this course, students are able to**

**CO1:** Understand the subject of satellite communication and remote sensing with the core knowledge of space and satellite, communication and the international space laws.

**CO2:** Comprehend different remote sensing signaling techniques, capable of interpreting signature of satellite communication from bodies like soil, vegetation and ocean.

**CO3:** Analyze various components used in satellite communication and remote sensing applications.

**CO4:** Acquire and keep abreast of designing satellite remote sensing system and also analyze the sensor data for drawing inference and conclusions.

**UNIT I**

Introduction: Historical background, International space laws, Advantages of space based observations, Global coverage, Multiscale observation, repeat observation immediate transmission and digital format, Source of information on remote sensing region.

**UNIT II**

Principles of remote sensing: Fundamentals of remote sensing signals, The electromagnetic spectrum, Terms and units of measurements, EM radiation laws, Spectral signature in the solar spectrum, vegetation reflectance, soil reflectance, water in the solar spectrum, The thermal infrared domain, characteristics of EM radiation in thermal infrared, Thermal properties of vegetation, Soils thermal domain, thermal signature of water and snow, The microwave region, Atmospheric interaction.

**UNIT III**

Sensors and remote sensing satellite: Type of sensors, Resolution of sensor systems, spatial, spectral, radiometric, temporal, angular - resolution, passive sensors, photographic cameras, cross and along track - scanners, active sensors, Radar and Lidar, satellite remote missions, Satellite orbits, Landsat programs, SPOT satellites, IRS program, High resolution commercial satellites, Polar orbiting meteorological satellites, Terra Aqua, Geostationary meteorological satellites.

**UNIT IV**

Basis for interpretations of remote sensing images: Constraints in using remote sensing data, types of interpretation, Costs of data acquisitions, end-user requirements, Thematic classification, Generation of biophysical variables, Change detection, spatial patterns, organization of remote sensing project, interpretation phase, presentation of study cases.

**UNIT V**

Characteristic of photographic images, Feature identification, criteria for visual interpretation, Brightness, color, texture, spatial contexts, shadows, spatial patterns, shape and size, stereoscopic view, period of acquisition, elements of visual analysis, Geometric characteristics of satellite image, Color composites, Multitemporal approaches.

**TEXTBOOKS:**

1. Emilio Chuvieco, "Fundamentals of Satellite Remote Sensing", CRC press, Edition, 2009.

**REFERENCES:**

1. C. H. Chen, "Signal Processing for Remote Sensing", CRC press, Edition-2007.

2. R. N Mutagi, "Satellite Communication Principles and Applications", Oxford University press, 2016.

3. Enrico Del Re, and Marina Ruggieri, "Satellite communications and navigation systems", Springer.

OPEN ELECTIVE	L	T	P	C
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<b>19ECX004 - MOBILE COMMUNICATION AND APPLICATIONS</b>				

**COURSE OUTCOMES:****Students are able to**

**CO1.** Design Hexagonal shaped cells and how these are implemented in real world.

**CO2.** Explain different types of antenna systems in mobile communication.

**CO3.** Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation.

**CO4.** Describe the Parameters of Mobile multipath channels, Types of small scale fading.

**UNIT-I****INTRODUCTION :**

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs), A Simplified Reference Model, Applications.

**UNIT-II****ELEMENTS OF MOBILE COMMUNICATIONS:**

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

**UNIT-III****THE MOBILE CONCEPT :**

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring.

**UNIT-IV****MOBILE RADIO PROPAGATION :**

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

**UNIT-V****FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:**

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

**TEXTBOOKS:**

1. Wireless Communications by Theodore S. Rappaport, principles and practice, 2<sup>nd</sup> Editions. (Unit-I, III, IV & V)

2. Mobile Cellular Communication by Gottapu Sasibhushana Rao, Pearson International, 2012.

(UNIT - I, II, III & IV)

3. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006. (UNIT - V & VI)

**REFERENCES:**

1. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.

2. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

OPEN ELECTIVE	L	T	P	C
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19ITXO01 : SOFTWARE ENGINEERING PRINCIPLES				

## COURSE OUTCOMES

After the completion of the course the students are able to

1. Identify, formulate, and solve software engineering problems.(K3)
2. Analyze software requirements with various stakeholders of a software development project.(K4)
3. Develop the techniques for project planning and estimation.(K3)
4. Construct and maintenance of a medium scale software development project.(K3)
5. Evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of models, tools, and techniques.(K5)

## UNIT-I

**Introduction to Software Engineering:** The evolving role of software, Software Characteristics, Changing Nature of Software, Software myths.

**A Generic view of Process:** Software engineering- A layered technology, a Process framework, The Capability Maturity Model Integration (CMMI), Process assessment, Product and Process.

## UNIT-II

**Process models:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

**Software Requirements:** User requirements, System requirements, Functional and non-functional requirements, the Software Requirements Document (SRS).

## UNIT-III

**Requirements Engineering Process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**Project planning and estimation:** Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques: COCOMO, PERT/CPM method.

## UNIT-IV

**Design Engineering:** Design process and Design quality, Design concepts, Software Architecture, Architectural Styles and Patterns.

**Object-Oriented Design:** Objects and object classes, An Object-Oriented design process, Design evolution

## UNIT-V

**Performing User Interface Design:** Golden Rules, User interface analysis and design, interface design steps, Design evaluation.

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Validation testing, System testing, the art of Debugging, Black-Box and White-Box testing.

**Text Books:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6<sup>th</sup> edition, McGrawHill International Edition.
2. Software Engineering- Sommerville , 9th edition, Pearson education.

**References Books:**

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
3. Systems Analysis and Design- ShelyCashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

OPEN ELECTIVE	L	T	P	C
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19ITX002 : CLOUD COMPUTING PRINCIPLES				

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline basics of cloud computing technology. (K2)
2. Illustrate the concept of virtualization and the development of Cloud Computing. (K2)
3. Analyze various cloud services and service providers. (K4)
4. Contrast the uses cloud scalability, security and disaster management. (K4)
5. List out the different cloud platforms and its application. (K4)

**UNIT-I**

**Introduction to Cloud:** Cloud Computing at a Glance, the Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

**UNIT-II**

**Virtualization:** Introduction, Characteristics of Virtualized Environment, Classification of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V.

**Before the Move into the Cloud:** Know Your Software Licenses, The Shift to a Cloud Cost Model, Service Levels for Cloud Applications.

**UNIT-III**

**Cloud Computing Architecture :** Introduction, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance.

**UNIT-IV**

**Defining the Clouds for Enterprise:** Storage as a service, Database as a service, Process as a service, Information as a service, and Integration as a service and Testing as a service. Scaling cloud infrastructure - Capacity Planning, Cloud Scale. Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

**UNIT-V**

**Cloud Applications:** Scientific Applications – Health care, Geo science and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

**Cloud Platforms in Industry:** Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure.

**Text Books:**

1. “Mastering Cloud Computing” by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese “Cloud Application Architectures”, First Edition, O’Reilly Media 2009.



**Reference Books:**

1. Cloud Computing and SOA Convergence in Your Enterprise, *A Step-by-Step Guide* by David S. Linthicum from Pearson 2010.
2. Cloud Computing, 2<sup>nd</sup> Edition by Dr. Kumar Saurabh from Wiley India 2012.
3. Cloud Computing, – web based Applications that change the way you work and collaborate Online – Micheal Miller. Pearson Education.

OPEN ELECTIVE	L	T	P	C
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19ITXO03 : E-COMMERCE				

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Identify the fundamentals E-commerce framework. (K3)
2. Outline the basics of Consumer Oriented Electronic models. (K2)
3. Distinguish different electronic payment systems and their issues. (K4)
4. Illustrate Inter-organizational and intra-organizational electronic commerce. (K2)
5. Summarize the consumer search, resource discovery and key multimedia concepts. (K2)

**UNIT-I**

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

**UNIT-II**

Consumer Oriented Electronic commerce - Mercantile Process models, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

**UNIT-III**

Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

**UNIT-IV**

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

**UNIT-V**

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

**Text Books:**

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

**References Books:**

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, TharamDillon,Elizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
3. Electronic Commerce – Gary P.Schneider – Thomson.
4. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol GuyericoTraver.

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19ITXO04 : WEB TECHNOLOGY PRINCIPLES				

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline the basic Knowledge about World Wide Web(K2).
2. Develop Simple HTML Web Pages(K3)
3. Illustrate Style Sheets for HTML Pages.(K2)
4. Acquire Knowledge about Client – side validation through Java Script.(K4)
5. Summarize basic Knowledge about XML Documents.(K2)

**UNIT-I**

**Introduction to WWW:** Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP.

**Web Design:** Web site design principles, planning the site and navigation.

**UNIT- II**

**HTML5:** Introduction, Basic Formatting Tags, Block and inline elements, Lists, Image, Hyperlink, Table, Iframe, Form Elements, Layout Elements and Miscellaneous.

**UNIT-III**

**CSS3:** Introduction, CSS Syntax, Selectors, Add CSS to HTML : External, Internal and Inline, CSS Styling : Backgrounds, Text, Fonts, Links, Lists, Tables, CSS Box Model.

**UNIT-IV**

Javascript : Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition, Javascript own objects, the DOM and web browser environments, forms and validations.

**UNIT-V**

**XML EXTENSIBLE MARKUP LANGUAGE:** XML- Document type Definition, XML schemas, Document object model.

**TEXT BOOKS:**

1. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
2. Web Technologies – Black Book, Kogent Learning solutions Inc sol. Dreamtech press.

**REFERENCE BOOKS:**

- W3Schools Online Web Tutorials (<https://www.w3schools.com/>)

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<b>19BMXO01 : INNOVATIONS AND ENTREPRENEURSHIP</b>				

**UNIT-I INNOVATION MANAGEMENT:** Concept–Objectives-types of Innovation-process of Innovation- sources of Innovation-Levels of Innovation -barriers of Innovation--Open and Closed Innovation-challenges faced while managing innovation.

**UNIT-II CREATIVE INTELLIGENCE:** Concept of Creativity-Importance-Characteristics-Types of Creativity-Traits Congenial to Creativity- Triarchic theory of Intelligence – Creative thinking –Types-process of creative thinking-Sources and techniques for generating ideas.

**UNIT-III ENTREPRENEURSHIP:** Concept- characteristics-Importance-classification-Theories of Entrepreneurship-entrepreneurship development-entrepreneurial process- challenges-Women Entrepreneurs.

**UNIT-IV PROJECT FORMULATION AND APPRAISAL:** Concept -Need-Significance-steps - Economic Analysis; Financial analysis; Market analysis; Technical feasibility-project Appraisal-techniques of project appraisal.

**UNIT-V INSTITUTIONS PROMOTING SMALL BUSINESS ENTERPRISES:** Central level Institutions; SIDBI, NSIC, KVIC, SSIDC - State level Institutions- DICs – SFC- SSIDC- other financial assistance, Government policy and taxation benefits- government policy for SSIs

#### TEXT BOOKS:

1. Vasanth Desai, —Entrepreneurship, Himalaya Publishing House, New Delhi, 2012
2. Arya Kumar: —Entrepreneurship, Pearson, Publishing House, New Delhi, 2012.
3. Keith Goffin and Rick Mitchell-Innovation Management, Springer, 2016

#### REFERENCES BOOKS:

1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.
2. Vinnie Jauhari, Sudanshu Bhushan, Innovation Management, Oxford Higher Education, 2014

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<b>19BMX002 : INDUSTRIAL SOCIOLOGY AND PSYCHOLOGY</b>				

**UNIT I: Industrial Sociology:** Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social relations in industry.

**UNIT II: Group Dynamics:** Concept- factors influencing individual behavior- Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals, Groups Decision making process-techniques.

**UNIT III Industrial Psychology:** Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory), Cultural Differences in Motivation.

**UNIT IV: Organizational Design and Leadership:** Organizational Design & Structure- organizational design- process, Structural differentiations, factors influencing design of organizations, Leadership-concept, types, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership.

**UNIT V Organizational Conflicts and Change management:** Concept - Causes and Consequences of Conflict-Conflict handling techniques, Managing Change, Forces for change in Organization, Resistance to change.

#### **TEXT BOOKS:**

1. Nelson, Quick and Khandelwal, ORGB: An innovative approach to learning and teaching Organizational Behavior. A South Asian Perspective, Cengage Learning, 2012
2. Luthans, Fred, Organizational Behavior, McGraw Hill, 2008.
3. Stephen P. Robins, Organizational Behavior, PHI Learning / Pearson Education, 11<sup>th</sup> edition, 2008.

#### **REFERENCES BOOKS:**

1. Gisbert Pascal, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 2011.
3. Ivancevich, Konopaske & Maheson, Organisational Behaviour & Management, 7th edition, Tata McGraw Hill, 2008.

OPEN ELECTIVE	L	T	P	C
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19BMXO03 : DIGITAL MARKETING				

**COURSE OUTCOMES**

**After the completion of the course the students are able to**

1. Describe the importance of Digital marketing and its utility in business promotion. (K2)
2. Generalize the meaning and usefulness of Content marketing in analyzing the firm's promotional activity. (K3)
3. Comprehend the methodologies, tools and technologies involved in digital marketing. (K4)
4. Identify different forms of e-mail marketing and mobile marketing and analyze their effectiveness in digital marketing strategy. (K3)
5. Evaluate the importance of conversion and working with social media marketing. (K5)

**UNIT I- Introduction to Digital Marketing:** Concept – scope- importance of digital marketing - Traditional marketing versus digital marketing – Types of digital marketing-marketing mix and its implications for digital marketing--Challenges and opportunities for digital marketing

**UNIT II- Content Marketing:** Understanding Content Marketing, Content Creation Framework, Content marketing strategy and planning- Types of content marketing -Measuring and Analysing Your Content-Viral Marketing-Blog Marketing.

**Unit III- Search Engine Optimization (SEO):** What is SEO? SEO Importance and Its Growth in recent years, Ecosystem of a search Engine , kinds of traffic, Keyword Research & Analysis (Free and Paid tool & Extension), Recent Google Updates

**UNIT IV-Email and Mobile Marketing:** Introduction, process, design, content, email marketing metrics. Mobile Marketing: Concept, Process-tools-opportunities and challenges.

**UNIT V-Social Media Marketing:** Concepts- Process - Tools- Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn- Issues: Credibility, Fake News, Paid Influencers; social media and Hate/ Phobic campaigns.

**TEXT BOOKS:**

1. Puneet Singh Bhatia, “Fundamentals of Digital Marketing”, Pearson Education Publications, 2<sup>nd</sup> edition 2019
2. Seema Gupta, “Digital Marketing”, McGraw Hill Publications”, 2<sup>nd</sup> edition 2020
3. Ryan Deiss, Russ Henneberry, “Digital Marketing For Dummies”, Wiley Publications, 2020

**REFERENCES BOOKS:**

1. Joe Pulizzi, “Epic Content Marketing”, McGraw Hill Education, 2019
2. Puneet Singh Bhatia , “Social Media & Mobile Marketing”, Wiley Publications, 2019

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<b>19BMXO04 : BUSINESS ENVIRONMENT</b>				

**Unit-I Business Environment:** Components and Significance – Economic Scope – Factors Influencing Business Environment – Dimensions of International Business Environment – Challenges.

**Unit-II: Structure of Indian Economy:** Economic systems- Economic planning with special reference to last three plans, public, private joint and cooperative sectors - Industrial Policy - Policy Resolutions of 1991- Economic Reforms-PPP

**Unit-III Indian Business Environment:** Competitiveness, Changes and Challenges, Sustainable Development, Social Responsibilities, Ethics in Business- Competition Act 2002 - Emerging Trend in Indian Business Environment

**Unit-IV: International Trade:** Balance of Payments – Concepts, Disequilibrium in BOP: Methods of Correction - Trade Barriers and Trade Strategy - Free Trade vs. Protection -World Financial Environment: Foreign Exchange Market Mechanism, Exchange Rate Determination, and Euro Currency.

**Unit-V: Globalisation:** International Economic Integration, Country Evaluation and Selection, Foreign Market Entry Methods, International Trading Blocks – WTO Origin, Objectives, Organisation, Structure and Functioning – WTO and India.

#### TEXT BOOKS:

1. Chidambaram, Indian Business Environment, Vikas, New Delhi
2. Suresh Bedi: Business Environment, Excel, New Delhi.
3. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sultan Chand Publishers, Delhi.

#### REFERENCES BOOKS:

1. Pandey G.N., Environmental Management, Vikas Publishing House.
2. Sundaram & Black, International Business Environment – The Text and Cases, Prentice Hall of India.
3. Ghosh PK., Business Environment, Sultan Chand & Sons, New Delhi
4. Daniel John D and Redebough, Lee. H., International Business, Addison Wesley India
5. Saleem, Business Environment, Pearson, New Delhi.
6. Bhalla, V.K., & S. Sivaramu, International Business Environment and Business, Annual Publications

OPEN ELECTIVE	L	T	P	C
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19MAXO01 : OPERATIONS RESEARCH				

**COURSE OBJECTIVES:**

1. Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machines etc) more effectively.
2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

**UNIT—I****LINEAR PROGRAMMING:**

Introduction-General formulation LPP- Formulation of LP problems - Graphical solution –Slack and Surplus and Artificial variables-simplex method (simple problems) - artificial variable techniques – two phase method, Big-M-method(simple problems) –Concept of Duality-general rules for converting any primal into its dual.

**UNIT – II****TRANSPORTATION PROBLEM:**

Introduction-mathematical formulation-Feasible, Basic Feasible and Optimum solution -Methods for initial basic feasible solution to transportation problem-optimal Test by u, v method (MODI)-Degeneracy in Transportation problems –.Unbalanced Transportation problems

**UNIT – III****SEQUENCING PROBLEM:**

Introduction –Johnson’s Algorithm for n jobs 2 machines- Optimal Solution for processing n jobs through two machines- processing n jobs through three machines - processing n jobs through m machines - processing two jobs through m machines

**UNIT – IV****REPLACEMENT PROBLEMS:**

Introduction – replacement policy for items whose maintenance cost increases with time, and money value is constant – Money value, present worth Factor and Discount Rate- replacement policy when maintenance cost increases with time and money value changes with constant rate – Individual Replacement Policy-group replacement of items that fail completely.

**UNIT – V****WAITING LINES:**

Introduction- transient and steady states-Probability Distributions in Queuing systems-Kendall’s notation for Representing Queuing models- Single channel-Poisson arrivals Exponential service times-with infinite population model (M/M/1: FIFO/ $\infty/\infty$ )

**INVENTORY:**

Introduction – types of inventory models – Costs involved in Inventory problems-Variables in inventory problem-Classification of Inventory Models-Concept of EOQ-The EOQ model without shortage – Quantity Discounts-purchase inventory models with one price break - purchase inventory models with two price breaks- purchase inventory models with any number of price breaks-shortages are not allowed

**COURSE OUTCOMES:** Students can able to

**CO1: Formulate** the resource management problem and identify appropriate methods to solve them. [K3]

**CO2: Apply** transportation model to optimize the industrial resources. [K3]

**CO3: Solve** sequencing problems using operation research techniques. [K3]

**CO4: Apply** the replacement model to increase the efficiency of the system. [K3]

**CO5: Apply** the inventory and queuing model to increase the efficiency of the system. [K4]



**TEXT BOOKS:**

1. Operations Research / S.D.Sharma, Ramnath co,Meerut
2. Operations Research, P.K.Gupta, D.S.Hira,S.Chand

**REFERENCE BOOKS:**

1. Operations Research /A.M.Natarajan, P.Balasubramani, A.Tamilarasi/Pearson Education.
2. Operations Research / R. Pannerselvam, PHI Publications.

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19MAXO02 : OPTIMIZATION MODELS				

**COURSE OBJECTIVES:**

1. Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machines etc.) more effectively.
2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

**UNIT—I****INTRODUCTION TO LINEAR PROGRAMMING:**

Introduction-Linear programming problem formulation – General formulation of Linear programming problem- formulation of LP problems - Graphical solution – simplex method (simple problems) - artificial variable techniques – two phase method, Big-M-method – general rules for converting any primal into its dual.

**UNIT – II****ASSIGNMENT MODELS:**

Formulation –mathematical formulation of assignment problem – Hungarian method for assignment problem-Unbalanced assignment Problems-variations in the assignment problem-Travelling Salesman problem.

**UNIT – III****THEORY OF GAMES:**

Introduction – minimax (maxmin) criterion and optimal strategy –solution of games with saddle points – rectangular games without saddle points –reduce game by dominance —graphicmethod for  $m \times 2$  &  $2 \times n$  games-arithmetic method for finding optimum strategies and game value.

**UNIT – IV****DECISION THEORY:**

Introduction –decision making environments - decision making under conditions of certainty- decision making under conditions of uncertainty-Maximax criterion-maximin criterion-minimax regret criterion-Hurwitz criterion-Laplace criterion-decision making under conditions of risk-expected value criterion-expected opportunity loss criterion-expected value of perfect information.

**UNIT-V****PROJECT MANAGEMENT:**

Phases of project management-network logic-numbering the events (Fulkerson's rule)- – identifying critical path – probability of completing the project within given time- Project Evaluation and Review Technique.

**COURSE OUTCOMES:** Students are able to

**CO1: Apply** linear programming techniques to solve industrial optimization problems. [K3]

**CO2: Solve** assignment problems using operation research techniques. [K3]

**CO3: Analyze** game theory and apply them for optimization. [K4]

**CO4: Solve** the decision theory problem through the applications of game theory. [K4]

**CO5: Scheduling** the production and manage the project [K4]

**TEXT BOOKS:**

1. Operations Research / S.D.Sharma, Ramnath co, Meerut
2. Operations Research / R.Pannerselvam, PHI Publications

**REFERENCE BOOKS:**

1. Operations Research /A.M.Natarajan, P.Balasubramani, A.Tamilarasi/Pearson Education.
2. Operations Research, P.K.Gupta, D.S.Hira, S.Chand

OPEN ELECTIVE	L	T	P	C
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19BSXO01 : QUANTUM COMPUTING				

**Pre-requisite:** Basics of Quantum Mechanics and Computer Science

**Objective of the course:** The objective of this course is to provide the students an introduction to quantum computation. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.

### Unit – I

**Background Mathematics, Physics and Introduction to Quantum Computation:** Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis, Quantum bits, Bloch sphere representation of a qubit, multiple qubits. **(8 Hours)**

### Unit – II

**Quantum Circuits:** Single Qubit gates, multiple qubit gates, design of quantum circuits. **(8Hours)**

### Unit – III

**Quantum Information and Cryptography:** Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem. **(8 Hours)**

### Unit – IV

**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Data base Search, FFT and prime factorization, Deutsch's Algorithm. **(8 Hours)**

### Unit – V

**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation, Physical implementation of quantum computers. **(8 Hours)**

### Text Books:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press (2002).
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific (2004).
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms (2000).

OPEN ELECTIVE	L	T	P	C
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19BSX002 : OPTOELECTRONICS				

**COURSE OBJECTIVES:**

A deep understanding of the fundamentals of optoelectronics including Optical emission from semiconductors, quantum efficiency, hetero junction, quantum well, Optoelectronic modulators. Be familiar with recent trends in optoelectronics.

**COURSE OUTCOME:**

Students who successfully complete this course will have an

- ability to understand the fundamental concepts of Optoelectronics;
- ability to understand the concept of optoelectronic modulators
- ability to design single-mode junction lasers at different wavelengths to meet specs;
- ability to incorporate heterostructures and quantum wells to improve device performance;
- ability to design junction & avalanche photodiodes to meet specs

**UNIT – I****Electronic properties of Semiconductors:**

Effect of temperature on band gap, density of carriers in intrinsic and extrinsic semiconductors, conduction processes in semiconductors, electron-hole pair formation and recombination, PN junction, carrier recombination and diffusion, Injection efficiency, heterojunction, internal quantum efficiency, double heterojunction, quantum well and super lattices.

**UNIT – II**

**Opto Electronic Modulators:** Basic principles, Polarization, birefringence. Electro-optic Modulators-electro optic effect, integrated optical modulator, EO materials. Kerr modulators, scanning and switching.

**Magneto Optic Modulators:** Faraday effect, Accusto-optic Modulators, Magneto-optic modulators.

**UNIT – III**

**Opto-electronic devices:** Injection luminescence and LED, LED structures, LED-Materials, Power and efficiency, heterostructure LED. Laser: Basic concepts, Optical emission from semiconductors- Hetero junction lasers. Semiconductor Injection Lasers, Injection laser structures- gain guided lasers, index guided lasers, Distributed Feedback Lasers.

**UNIT – IV**

**Opto-electronic Display devices:** Photo luminescence, cathode luminescence, Electro luminescence, CRT, Plasma panel display, LCD and LED displays- liquid crystals, properties, Numeric displays

**UNIT – V**

**Optoelectronic detectors:** Thermal detectors, Photon devices- Photo emissive detectors, Photo conductive detectors, Photomultipliers (PMT), Image intensifiers, Photo diodes- PIN & APD, photo transistors.

**Design of detector arrays:** CCD, Solar cells.

**Text Books:**

1. Opto electronics - An introduction - J Wilson and J F B Hawkes. (PHI)
2. Optical fiber communication - J M Senior (Pearson, 2nd Ed )
3. Fiber Optics and Optoelectronics – R P Khare, (Oxford University Press, 4th Ed)

**References:**

1. Solid State Electronic Devices - Ben G Streetman, Sanjaykumar Banerjee, PHI, 6th Ed, 2006)
2. Fundamentals of Photonics- B E A Saleh and M C Teich, (John Wiley, 2007)