

# **NATIONAL ENGINEERING COLLEGE**

*(An Autonomous Institution Affiliated to Anna University Chennai & Accredited by NAAC)*

**K.R.NAGAR, KOVILPATTI – 628 503**

[www.nec.edu.in](http://www.nec.edu.in)

## **REGULATIONS – 2015 & CURRICULUM & SYLLABUS**

**B. Tech. – INFORMATION TECHNOLOGY**

**Accredited by NBA**

**REGULATIONS – 2015**  
**B.E. / B.Tech. DEGREE PROGRAMMES**

## **VISION**

- Transforming lives through quality Education and research with human values.

## **MISSION**

- To maintain excellent infrastructure and highly qualified and dedicated faculty.
- To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit.
- To promote the values of ethical behavior and commitment to the society.
- To partner with academic, industrial and government entities to attain collaborative research.

## REGULATIONS – 2015

### OUTCOME BASED EDUCATION & CHOICE BASED CREDIT SYSTEM

#### Common to all B.E. / B.Tech. Degree Programmes (8 – Semester)

The following Regulations shall be applicable for all the U.G. Degree Programmes offered at National Engineering College, K.R. Nagar, Kovilpatti from the academic year **2015 – 2016** onwards.

#### 1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

1. “**Programme**” means under graduate degree programme. i.e., B.E. / B.Tech. Degree Programme.
2. “**Specialization**” means a discipline of B.E. / B.Tech. Degree Programme, like Mechanical Engineering, Information Technology, etc.,
3. “**Course**” means a Theory / Integrated or Practical course that is normally studied in a semester, like Engineering Graphics, Fundamentals of Computing and Programming, etc.,
4. “**Controller of Examinations**” means the authority of the Institution who is responsible for all the activities of the End Semester Examinations of this Institute.
5. “**Dean (Academic)**” means the authority of the Institution who is responsible for initiating all the academic activities for the implementation of relevant rules and regulations.
6. “**Head of the Institution**” means the Principal of the College / Institution.
7. “**Head of the Department**” means Head of the Department concerned.
8. “**University**” means **ANNA UNIVERSITY, CHENNAI**.

## **2.0 QUALIFICATIONS FOR ADMISSION**

### **2.1 Admission to First Semester**

The candidates seeking admission for the first semester of the eight semester B.E. / B.Tech. degree programme:

- i. Shall be required to have a pass in Higher Secondary Examinations of (10+2) in the academic stream with Mathematics, Physics and Chemistry as main courses of study conducted by the Government of Tamilnadu or an examination accepted by the syndicate of Anna University as equivalent there to.

**(OR)**

- ii. Shall be required to have a pass in Higher Secondary Examination of Vocational Stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

### **2.2 Lateral Entry Admission**

- i. The candidates who possess the Diploma in Engineering / Technology awarded by the State Board of Technical Education, Tamil Nadu or its equivalent are eligible to apply for admission to the third semester of B.E. / B.Tech. programme corresponding to the branch of study.

**(OR)**

- ii. The candidates who possess the Degree in Science (B.Sc.) (10+2+3 stream) with mathematics as a course at the B.Sc. level are eligible to apply for admission to the third semester of B.E. / B.Tech. Such candidates shall undergo two additional Engineering courses in the third or fifth and fourth or sixth semesters respectively as prescribed by the respective Chairman of Board of Studies.

- 2.3** They should also satisfy other eligibility rules as prescribed by the Anna University and Director of Technical Education, Government of Tamil Nadu, Chennai, from time to time.

## **3.0 UG PROGRAMMES OFFERED**

1. B.E. - Mechanical Engineering
2. B.E. - Electronics and Communication Engineering
3. B.E. - Computer Science and Engineering

4. B.E. - Electrical and Electronics Engineering
5. B.E. - Electronics and Instrumentation Engineering
6. B.E. - Civil Engineering
7. B.Tech. - Information Technology

#### 4.0 STRUCTURE OF THE PROGRAMME

The Curriculum and Syllabi under Regulations 2015 is designed keeping in mind the Outcome Based Education (OBE) and Choice Based Credit System (CBCS). The course content of each course shall be fixed in accordance with the Program Educational Objectives (PEOs), Program Outcomes (POs) and Course Outcomes (COs).

The CBCS enables the students to earn credits across programmes and provides flexibility for slow and fast learners in registering the required number of credits in a semester. The CBCS facilitates transfer of credits earned in different departments / Centers of other recognized / accredited universities or institutions of higher education in India and abroad either by studying directly or by online method.

The curriculum of every programme is designed with total number of credits ranging from **168 to 176 (125 to 133** for Lateral entry) [Refer **Annexure-I**].

#### 4.1 Categorization of Courses

Every B.E./B.Tech Degree Programme will have a curriculum with Syllabi consisting of theory and Practical courses that shall be categorized as given in **Table-1**.

**TABLE-1 CATEGORY OF COURSES**

| <b>Course Category</b> | <b>Range of Total credits (%) as per AICTE</b> |
|------------------------|--|
| Foundation Courses     | 30 – 40%                                       |
| Programme Core         | 40 – 55%                                       |
| Programme Elective     | 10 -15%  |
| Open Elective          | 05 -10%  |
| Mandatory              | 05 -10%  |

- i. **Foundation courses** are classified into Common and Specific courses.  
**Common Foundation Courses (CFC)** include Mathematics, Basic Sciences, Engineering Sciences and Skill Based Courses.  
**Specific Foundation Courses (SFC)** include the basic courses specific to a programme of study.
- ii. **Programme Core Courses (PCC)** include the core courses relevant to the chosen programme of study and the Employability Enhancement courses such as Project, Seminar and Inplant training/ Internship.
- iii. **Programme Elective Courses (PEC)** include the elective courses relevant to the chosen programme of study.
- iv. **Open Elective Courses (OEC)** include Inter-disciplinary and Trans-disciplinary courses. The students shall study Inter-disciplinary courses offered in other Engineering/Technology Programmes through regular mode and Trans-disciplinary courses through self study mode.
- v. **Mandatory courses (MAC)** include the courses recommended by the regulatory bodies such as AICTE, UGC etc as given in **Table-2**.

**TABLE-2 MANDATORY COURSES**

| <b>Course Title</b>                      | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|----------|----------|----------|----------|
| Technical English / Professional English | 3        | 0        | 0        | 3        |
| Professional Ethics and Human Values     | 3        | 0        | 0        | 3        |
| Environmental Science and Engineering    | 3        | 0        | 0        | 3        |
| Communication Skills Laboratory          | 0        | 0        | 2        | 1        |

- vi. Every student shall undergo one Interdisciplinary and one Transdisciplinary course.

#### **4.2 One Credit Non CGPA Courses**

In addition, the students shall enroll, in any one of the one credit Non CGPA courses in each category listed in **Table-3** and earn a minimum of two credits (one from each category) for the award of the degree. The details for assessing these activities are given in **Annexure-II**.

TABLE – 3

## CATEGORY OF ONE CREDIT NON – CGPA COURSES

| Category                              | Code  | Courses                                 | Credit |
|---------------------------------------|-------|---|--------|
| Personality and Character Development | NCG11 | Sports                                  | 1      |
|                                       | NCG12 | Yoga for youth empowerment              |        |
|                                       | NCG13 | National Cadet Corps                    |        |
|                                       | NCG14 | National Service Scheme                 |        |
|                                       | NCG15 | YRC                                     |        |
| Allied Skills                         | NCG21 | CO/Extra Curricular Activities          | 1      |
|                                       | NCG22 | English Proficiency Certification       |        |
|                                       | NCG23 | Soft Skills                             |        |
|                                       | NCG24 | Foreign / Vernacular Languages          |        |
|                                       | NCG25 | Aptitude Proficiency Certification      |        |
|                                       | NCG26 | Globally accepted Certification Courses |        |
|                                       | NCG27 | Socially Responsible Activities         |        |

## 4.3 Number of Courses per Semester

Curriculum of semester (vide **Clause 5.2**) shall normally have a blend of 2 to 7 theory / integrated courses and laboratory courses not exceeding 5. Each course may have credits as per **Clause 4.4**.

## 4.4 Credit System

In credit system, one credit refers to

- One period of lecturing per week for a theory course.
- Two periods per week for *Tutorial / Drawing / Lab / Workshop practice / project*.
- The contact periods per week for Tutorials and Practical can only be in multiples of 2.

The length of the semesters shall be 18 to 20 weeks. Credit for a course shall vary from 1 to 4. The L:T:P pattern that shall be followed for various courses is given in **Table-4**.

TABLE – 4

| Type of course | Lectures (Periods/ week) | Tutorials (Periods/ week) | Practical work (Periods/ week) | Credits (L:T:P) | Total credits | Total (Periods/ week) |
|----------------|--------------------------|---------------------------|--------------------------------|-----------------|---------------|-----------------------|
| 1 Credit       | 1                        | 0                         | 0                              | 1:0:0           | 1             | 1                     |
|                | 0                        | 0                         | 2                              | 0:0:1           | 1             | 2                     |



| Type of course | Lectures (Periods/ week) | Tutorials (Periods/ week) | Practical work (Periods/ week) | Credits (L:T:P) | Total credits | Total (Periods/ week) |
|----------------|--------------------------|---------------------------|--------------------------------|-----------------|---------------|-----------------------|
| 2 Credit       | 2                        | 0                         | 0                              | 2:0:0           | 2             | 2                     |
|                | 1                        | 0                         | 2                              | 1:0:1           | 2             | 3                     |
| 3 Credit       | 3                        | 0                         | 0                              | 3:0:0           | 3             | 3                     |
|                | 2                        | 2                         | 0                              | 2:1:0           | 3             | 4                     |
|                | 2                        | 0                         | 2                              | 2:0:1           | 3             | 4                     |
|                | 0                        | 0                         | 6                              | 0:0:3           | 3             | 6                     |
| 4 Credit       | 2                        | 2                         | 2                              | 2:1:1           | 4             | 6                     |
|                | 3                        | 2                         | 0                              | 3:1:0           | 4             | 5                     |
|                | 3                        | 0                         | 2                              | 3:0:1           | 4             | 5                     |

#### 4.5 Industrial Training/Internship

The students may undergo Industrial Training for a period as specified in the curriculum during summer / winter vacation. The number of credits shall be assigned as detailed in **Table-5**.

The students may undergo internship at research organization / university for the period prescribed in the curriculum. The number of credits shall be assigned as detailed in **Table-5**.

In such cases Industrial Training / Internship needs to be undergone continuously from one organization only. The student is allowed to undergo maximum of 3 months during the entire duration of study.

**TABLE – 5**

| Duration of Training / Internship | Credits |
|-----------------------------------|---------|
| 2 Weeks                           | 1       |
| 4 Weeks                           | 2       |
| 6 Weeks                           | 3       |
| 8 or more Weeks                   | 4       |

#### 4.6 Online Courses/Self Study Courses

**4.6.1** Students may be permitted to earn credit through online courses (which are provided with certificate) with the approval of Head of the Department and Dean academic subject to a maximum of three credits. The Student needs to obtain certification to become eligible for writing end semester examination to be conducted by the Institution under autonomous status. In case of credits earned through on line mode from a university with approval of Head of the Department and Dean Academic, the credit may be transferred with the due approval procedures from the **Performance Analysis Committee**.

**4.6.2** The student shall study Transdisciplinary courses prescribed in the curriculum through self study mode with the approval of Head of the Department. The student shall study on their own under the guidance of a faculty member nominated by the Head of the Department. No formal lectures need to be delivered. The evaluation methodology shall be the same as that of a theory course.

**4.6.3** If a student has a publication in SCI listed journals as first author, he / she shall be exempted from one elective course.

#### **4.7 One Credit Courses**

One credit elective course shall be offered by the department itself or in collaboration with the industry / research organizations / higher learning institutions. If more number of such one credit courses is offered by any department, three elective courses of 1 credit shall replace a 3 credit elective course **as given below**.

| Number of one credits earned |                             | Eligible to replace |     |
|------------------------------|-----------------------------|---------------------|-----|
| Core Electives               | Interdisciplinary Electives | PEC                 | OEC |
| 3                            | 0                           | 1                   | -   |
| 2                            | 1                           | 1                   | -   |
| 1                            | 2                           | -                   | 1   |
| 0                            | 3                           | -                   | 1   |

#### **4.8 Industrial Visit**

Every student is required to go for one Industrial visit every year starting from the second year of the programme. The Heads of the Departments shall ensure that the necessary arrangements made in this regard.

#### **4.9 Medium of Instruction**

The medium of instruction shall be English for all the courses, examinations, seminar, presentations and project / thesis / dissertations reports.

### **5.0 DURATION OF THE PROGRAMMES**

**5.1** The minimum and maximum periods for completion of the UG programmes are given below.

TABLE – 6

| Programme                    | Minimum No. of semesters | Maximum No. of semesters |
|------------------------------|--------------------------|--------------------------|
| B.E. / B.Tech.               | 8                        | 16                       |
| B.E. / B.Tech. Lateral Entry | 6                        | 14                       |

Each semester normally consists of 90 working days. In any contingent situation, the number of working days per semester shall not be less than 65 days. The Principal is given the discretionary powers to decide the number of working days in such contingencies. The Principal shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

**5.2** For the purpose of regulations, the academic year has been divided into two semesters, the Odd semester normally spanning from June to November and the Even semester from December to May.

**5.3** The First semester of B.E. / B.Tech. Degree Programme normally spans from August to December and Second semester from January to May.

**5.4** The total duration of the programme reckoned from the commencement of the first semester to which the student was admitted, shall not exceed the maximum duration specified in **clause 5.1** irrespective of the period of break of study (**vide clause 20.1**) or prevention (**vide clause 7.4**) in order that the student may be eligible for the award of the degree (**vide clause 17.0**)

## **6.0 REGISTRATION**

**6.1** Each student, on admission shall be assigned to a Faculty Advisor / Tutor (**vide clause 8**) who shall advise her/him about the academic programs and counsel on the choice of courses considering the academic background and student's career objectives. With the advice and consent of the Faculty Advisor the student shall register for a set of courses he/she plans to take up for the Semester.

**6.2** Every student shall enroll for the courses of the succeeding semester during the last week of the current semester. However, the student shall confirm the enrollment by registering for the courses within first five working days after the commencement of the concerned semester.

- 6.3** If a student is prevented from writing end semester examination (ESE) of a course due to lack of attendance, the student has to register for that course again, when offered next, attend the classes and fulfill the attendance requirements as per **clause 7**.
- 6.4** If the theory course in which the student has failed / has been prevented from writing end semester examination due to lack of attendance is a programme elective course or an open elective, then the student may register for the same or any other professional elective or open elective course respectively in the subsequent semesters.
- 6.5** If a student finds that he/she has registered for more courses than his/her capability to study in a semester, he/she can withdraw one or more of courses before the end of 2<sup>nd</sup> week of the semester.
- 6.6** The information on the list of all the courses offered in every department specifying the credits, the prerequisites, a brief description of syllabus or list of topics, the instructor who is offering the course and the time slot shall be made available in the college website.
- 6.7** In any department, the preference for registration shall be given to the students of that department for whom the course is a programme core course.
- 6.8** The registration for any course shall be on first come first served basis, provided the student fulfills prerequisites for that course, if any. Every effort shall be made by the Department / Centre to accommodate as many students as possible.
- 6.9** No course shall be offered by a department unless a minimum of **5** students are registered for that course.
- 6.10 Flexibility to Add or Drop Courses**
- 6.10.1** A student has to earn the total number of credits specified in the curriculum of the respective programme of study in order to be eligible to obtain the degree. However, if the student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum of the student's programme.
- 6.10.2** From the third to eighth semester, the student has the option of registering for additional courses or dropping existing courses. Total number of credits of such courses cannot exceed 6. However, the student

shall register for a minimum of 16 credits and a **maximum of 30 credits in a semester.**

- 6.10.3** The student shall register for the Project work in the VIII semester only.
- 6.10.4** The student shall register for the Product Development Laboratory in the **V / VI semester**. The evaluation methodology shall be the same as that of a **Project work**.
- 6.10.5** A student can earn maximum of 2 one credit courses per semester.

## **7.0 REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE**

A student who has fulfilled the following conditions (**vide Clauses 7.1 - 7.2**) shall be deemed to have satisfied the requirements for appearing for End semester examination of a particular course.

- 7.1** Ideally every student is expected to attend all periods and earn 100% attendance in all the courses. However, he/she shall secure not less than 75% attendance in each course in that semester.
- 7.2** If student secures attendance of 65% and above but less than 75% in any course in the current semester due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the Principal / competent authority, the student shall be given exemption from the prescribed attendance requirement and he/she shall be permitted to appear for the semester examinations of that course.
- 7.3** A candidate shall normally be permitted to appear for the End Semester Examination of the course if he/she has satisfied the attendance requirements (**subject to clause 7.1 - 7.2**) and has registered for examination in those courses of that semester. A candidate who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades.
- 7.4** Those students who have not satisfied the conditions specified in **clauses 7.1 - 7.2** and who secure **less than 65%** attendance in a course will not be permitted to write the End Semester Examination of that course. The student has to register and repeat this course in a subsequent semester when it is offered next subject to provisions under **clause 6.10.2**

## **8.0 FACULTY ADVISER (TUTOR)**

Facilitating the students in choosing their courses of study and for general advice on the academic programme, the Head of the Department will allocate a fixed number of students to a teaching faculty of the department who shall function as Tutor for them throughout their period of study. Tutors shall advise the students in registering of courses, monitor their attendance and progress and counsel them periodically. If necessary, the tutor may also discuss with or inform the parents about the progress of the students through concerned Head of the Department.

- 8.1** Every student will be under the care and guidance of a faculty who is appointed as his / her tutor. About 20 students will be assigned to each tutor who will also act as their local guardian and assist them in all matters of academic as well as other activities.
- 8.2** Student counseling plays a vital role in a student's life. Hence, the students are advised to meet their tutor frequently and discuss their problems freely with them. They should also take care to see that all information concerning their progress and achievements in the college is duly entered in the record sheet.
- 8.3** The tutor will maintain a Record Sheet for each of his/her wards. The record sheet will contain all information concerning the students' attendance, grades obtained in the End Semester Examinations, monthly tests, achievements if any in Curricular, Co-curricular and Extra-curricular activities and disciplinary proceedings if any taken against the student.

## **9.0 CLASS COMMITTEE**

- 9.1** A Class Committee consists of all teachers handling courses of the concerned class, student representatives - cross section of students (academically good, average, poor) and a chairperson who is a faculty not handling any course for the class. The overall goal of the Class Committee is to improve the teaching-learning process. The functions of the Class Committee include:
  - Solving problems experienced by students in the classroom and in the laboratories.
  - Clarifying the regulations of the degree programme and the details of rules therein.
  - Informing the student representatives about the academic schedule including the date of assessments (Tests & Assignments) and the

syllabus coverage for each assessment.

- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any
- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

**9.2** The class committee for a class under a particular programme is normally constituted by the Head of the department. However, if the students of different programmes are mixed in a class (like the first semester which is generally common to all programmes), the class committee is to be constituted by the Head of the Department concerned.

**9.3** The class committee shall be constituted in the first week of commencement of any semester.

**9.4** At least 6 student representatives (usually 3 boys and 3 girls) shall be included in the class committee.

**9.5** The chairperson of the class committee may invite the Tutor(s) and the Head of the Department to the meeting of the class committee.

**9.6** The Principal may participate in any class committee meeting.

**9.7** The chairperson is required to prepare the minutes of every meeting, submit the same to HOD within two working days after the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the head of the institution.

**9.8** The class committee shall meet at least twice in a semester:

- The first meeting, a week after the first test results.
- The second meeting, a week after the third test results.

**9.9** During these meetings, the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of other students of the class to improve the effectiveness of the teaching-learning process.

## **10.0 COURSE COMMITTEE FOR COMMON COURSES**

Each common theory course offered to more than one group of students shall have a “Course Committee” comprising all the teachers teaching the

common course with one of them nominated as Course Coordinator. The nomination of the course Coordinator shall be made by the Head of the Department/Head of the Institution depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course committee' shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the course committee may also prepare a common question paper for the assessment test(s). Guidelines for the evaluation of CO attainment and continuous assessment shall be given by the Coordinator of common course committee.

## 11.0 SYSTEM OF EXAMINATION AND ASSESSMENT PROCEDURE

- 11.1 Performance in each course of study shall be evaluated based on (i) continuous internal assessment throughout the semester and (ii) End Semester Examinations (ESE) at the end of the semester.
- 11.2 Each course, both theory / integrated and practical including project work shall be evaluated for a maximum of 100 marks. For all theory / integrated and practical courses including the project work, the continuous internal assessment shall carry 40% and 50% marks respectively while the End Semester Examinations shall carry 60% and 50% marks respectively. **i.e.** Each course shall be evaluated for a maximum of 100 marks as detailed in **Table-7**.

**TABLE – 7**

| S. No | Category of Course          | Continuous Assessment | End Semester Examinations |
|-------|-----------------------------|-----------------------|---------------------------|
| 1.    | Theory / Integrated Courses | 40 marks              | 60 Marks                  |
| 2.    | Laboratory Courses          | 50 Marks              | 50 Marks                  |
| 3.    | Project work                | 50 Marks              | 50 Marks                  |

- 11.3 The End Semester Examination (Theory / Integrated & Practical) of 3 hours duration shall ordinarily be conducted between November and January during the odd semesters and between April and June during the even semesters. **The end semester question pattern shall mention Blooms Taxonomy levels and pattern type.** Further, in line with Course outcomes (COs), the end semester question pattern can be of different types as detailed in **Table-8** and it shall be mentioned in the curriculum itself.



**TABLE – 8**

| Question pattern | 1 mark | 2 marks | 4 marks      | 10 marks                                 | 12 marks                                 | 16 marks                                 | 20 marks                                 | Total |
|------------------|--------|---------|--------------|--|--|--|--|-------|
| A                | --     | --      | --           | --                                       | --                                       | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | 100   |
| B                | --     | 10      | --           | --                                       | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | 100   |
| C                | 10     | --      | 10 out of 12 | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | --                                       | 100   |
| D                | 10     | 10      | 5 out of 6   | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | --                                       | 100   |
| E                | --     | 10      | 5 out of 6   | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | 100   |
| F                | --     | --      | --           | --                                       | --                                       | --                                       | 5 out of 8                               | 100   |
| G                | --     | 5       | --           | 2 Qns (either or type)                   | --                                       | --                                       | --                                       | 30    |

**11.3.1** For one credit courses, the End Semester Examination of 1 hour duration shall be conducted as and when the course is completed (if necessary). Further, the end semester question pattern shall be **G type** as detailed in **Table – 8**.

**11.4 Integrated Courses (Theory Courses with Laboratory Component)**

The End Semester Examination for the integrated courses shall be evaluated only based on the theory component. The practical component shall be evaluated as one of the continuous assessments based on the weightage assigned to the practical component in the course outcome.

**11.5** The End Semester Examination for the project work shall consist of evaluation of the final report submitted by the student or students of the project group (of not exceeding 4 students) by an external examiner followed by a viva-voce examination conducted separately for each student by a committee consisting of the **External examiner, Internal examiner and Guide**.

**11.6** The End Semester Examinations of practical courses shall be evaluated by *Internal Examiners*.

- 11.7** The End Semester Theory Examinations shall be conducted by Chief Superintendent appointed by the Principal. The Hall Superintendents from the college shall invigilate the halls during theory examinations.
- 11.8** Students involved in malpractice during end semester examinations shall appear before the enquiry committee and the punishment will be given by the committee as per the college norms.
- 11.9** Scribes may be appointed for conducting examination for a student with disabilities on request to Principal through Head of the department concerned with necessary documents. Based on the request and genuinity, the Principal may appoint the scribe for the disabled student as per the norms.

**11.10 Product Development Laboratory**

The End Semester Examination for the Product Development Laboratory shall consist of evaluation of the final report submitted by the student or students of the group (of not exceeding 4 students) by the panel of examiners consisting of faculty coordinator, Guide and a common examiner from other programme nominated by the COE.

**12.0 PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT**

For all the courses, the continuous assessment (CA) shall be made through CO attainment of the individual student. Each course shall have a set of Course Outcomes (COs) ranging from 3 to 8. For each course, the continuous assessment shall be carried out based on the attainment of all COs by the students (either absolute or relative basis). The evaluation of each CO attainment by the student shall be carried out by the faculty based on the predefined assessment procedure approved by the domain expert and Head of the department. Continuous assessment shall be evaluated based on the attainment of all COs by the student assigning appropriate weightage to each CO and the total attainment by the student shall be reduced to 40 marks for theory / integrated courses and 50 marks for practical courses including project work.

**12.1 Theory / Integrated Courses**

Continuous assessment for each theory / integrated course shall be evaluated through tests and other appropriate assessment tools like Quiz, Seminar, Open book test etc as per the discretion of the course instructor /

course co-ordinator to evaluate the attainment of Course Outcomes by the student. The guidelines for the evaluation of continuous assessment marks in theory / integrated courses shall be implemented as given in **Table-9**.

**TABLE – 9**

| CO                          | Test  |      | Tool 1 |      | Tool 2 |      | Course End survey |      | Attainment |      | Total Attainment for CO |
|-----------------------------|-------|------|--------|------|--------|------|-------------------|------|------------|------|-------------------------|
|                             | Marks | Wtg. | Marks  | Wtg. | Marks  | Wtg. | Marks             | Wtg. | Marks      | Wtg. | Marks                   |
| 1.                          |       |      |        |      |        |      |                   |      |            |      |                         |
| 2.                          |       |      |        |      |        |      |                   |      |            |      |                         |
| :                           |       |      |        |      |        |      |                   |      |            |      |                         |
| N.                          |       |      |        |      |        |      |                   |      |            |      |                         |
| TOTAL ATTAINMENT OF ALL COS |       |      |        |      |        |      |                   |      |            |      |                         |

Wtg. – weightage;

Tools: Assignment / Open book test / Quiz / Seminar/etc.

## 12.2 Practical Courses

Continuous assessment for practical course shall be evaluated through CO attainment of the student by assessing the student performance during the laboratory class, student's records maintained, model examination and oral examination. The appropriate weightages shall be given to each assessment tool based on the importance of the tool being used to assess actual attainment of COs. Broad guidelines for the evaluation of COs is given in **Table – 10**.

**TABLE – 10**

| CO                          | Experiment work |      | Model Exam |      | Rubrics for oral |      | Attainment |      | Total Attainment for CO |
|-----------------------------|-----------------|------|------------|------|------------------|------|------------|------|-------------------------|
|                             | Marks           | Wtg. | Marks      | Wtg. | Marks            | Wtg. | Marks      | Wtg. | Marks                   |
| 1.                          |                 |      |            |      |                  |      |            |      |                         |
| 2.                          |                 |      |            |      |                  |      |            |      |                         |
| :                           |                 |      |            |      |                  |      |            |      |                         |
| N.                          |                 |      |            |      |                  |      |            |      |                         |
| TOTAL ATTAINMENT OF ALL COS |                 |      |            |      |                  |      |            |      |                         |

Wtg. – weightage

## 12.3 Project Work

Project work may be assigned to a single / group of students not exceeding 4 per group. The Head of the Department concerned shall constitute a review committee for each programme. The review committee shall conduct three review meetings per semester. The student shall make

presentation on the progress made to a three member review committee. The project Guide will be one of the members of the review committee.

- 12.3.1** The continuous assessment for the project shall be evaluated through CO attainment of the student by assessing presentation made by the students in the review meetings. For assessing the CO attainment, the review committee shall frame the rubrics with the approval of Head of the Department. The CO attainment of the student shall be reduced to 50 marks and rounded to the nearest integer. The continuous assessment and End semester examination marks for project work and the viva voce examination will be distributed as indicated below.

**TABLE – 11**

| Internal (50 Marks) |           |            | External (50 Marks) |                |          |       |
|---------------------|-----------|------------|---------------------|----------------|----------|-------|
| Review I            | Review II | Review III | Project Report (25) | Viva-voce (25) |          |       |
|                     |           |            | External            | Internal       | External | Guide |
| 15                  | 15        | 20         | 25                  | 10             | 10       | 5     |

- 12.3.2** The Project Report prepared by the student according to the approved guidelines and duly signed by the Guide and Head of the Department shall be submitted to the Head of the Department.
- 12.3.3** The End semester examination of the project work will be based on the evaluation of the project report submitted by the student(s) followed by a Viva-Voce Examination by a team consisting of a common internal examiner (other than the guide), External Examiner and Guide. The common internal examiner and the external examiner shall be appointed by the Controller of Examinations for evaluation from the panel of examiners submitted by the Head of the Department concerned **with the approval of the Board of Studies.**
- 12.3.4** If a student fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the project work and shall re-enroll for the same in a subsequent semester. If he/she fails in the viva-voce examination of Project work, he/she shall resubmit the project report within 30 days from the date of declaration of the results. For this purpose, the same Internal and External examiner shall evaluate the re-submitted report.

## 12.4 Open Elective Courses (Trans Disciplinary / Inter Disciplinary Elective)

The student shall undergo one Open Elective Course (Trans disciplinary elective) from the courses given in **curriculum** through self study mode / online in any semester during 5<sup>th</sup> – 8<sup>th</sup> semesters in addition to the other electives. The continuous assessments and End Semester Examination will be conducted as per the procedure stipulated for theory courses.

**12.4.1** Students shall undergo online courses (which are provided with Certificate) with the approval of Department & Dean (Academic) subject to a maximum of 3 credits. This online course of 3 credits / three one credit courses can be considered instead of one elective course (Inter disciplinary / Programme Core Elective). The departmental committee constituted by the Principal consisting of HOD and two senior faculties will take a decision on the evaluation methodology for the online courses. The committee can decide whether to evaluate the online course through continuous assessment and End semester Examination or only by End semester Examination.

## 12.5 Comprehension

Comprehensive examination shall be conducted to evaluate the analytical ability and the comprehensive knowledge gained by the students in all the courses he/she had undergone till then. Comprehension of a student shall be evaluated in the form of a written test or viva voce or online exam as decided by the class committee.

## 12.6 Seminar/Research Paper/Patent Review

The seminar/case study is to be considered as purely Internal (with 100% Internal marks only). Every student is expected to present seminar on a research paper/patent in their specialization. A three member committee appointed by **Head of the Department** will evaluate the seminar. The evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).

## 12.7 Internship / Industrial Training / Mini Project

The Industrial/Practical Training, Internship shall carry 100 marks and shall be evaluated through Internal assessment only. At the end of Industrial / Practical training/ Internship, the candidate shall submit a certificate from the organization where he/she has undergone training and a brief report. The evaluation will be made based on the report and a viva-voce

examination conducted internally by a three member Departmental Committee constituted by the **Head of the Department**. The certificate (issued by the organization) submitted by the students shall be attached to the mark list and sent to the Controller of Examinations. The details for assessing those courses are given in **Annexure – III**.

### **12.8 One Credit Courses**

The one credit course shall carry 100 marks (40% of continuous assessment & 60% of End semester Examination) and shall be evaluated through continuous assessment and End Semester Examination. Two continuous assessments shall be conducted during the semester by the department. The continuous assessment shall be evaluated through CO attainment of the student for that course as detailed for the theory courses. The end semester examination shall be conducted for 1 hour duration for 30 marks.

### **13.0 ACADEMIC AUDIT**

Each Staff member shall maintain an “*ATTENDANCE AND ASSESSMENT RECORD*” for every semester which consists of attendance marked in each Lecture / Practical / Project work class, the assessment marks and the record of class work (topic covered), separately for each course. This should be submitted to the Head of the Department periodically (at least three times in a semester). The Head of the Department will verify the details given by the Staff member. At the end of the semester, the record should be verified by the Principal who will keep this document in safe custody (for five years). The Academic Audit Committee appointed by the Principal may inspect the records of attendance and assessment for both current and previous semesters.

### **14.0 PASSING REQUIREMENTS**

- i. A student shall be deemed to have passed a theory course, if the total marks secured by him/her (CA+ESE put together) is at least  $(\mu - 1.8 \sigma)$  or 50%, whichever is lower, where  $\mu$  is the average mark of the students registered for the course and  $\sigma$  is the corresponding standard deviation. However, the student has to secure a minimum of 60% of  $\mu$  in the End Semester Examination (ESE).
- ii. A student is deemed to have passed a Laboratory Course, Industrial Training, In-plant Training, Internship, Mini Project and Project Work, if the

total mark secured by him/her is at least 50%. However, the student has to secure a minimum of 50% in the End semester Examination.

- iii. A student is deemed to have passed a laboratory course consisting of two parts (Part A & Part B), if he/she secures 50% of marks in each part in the End Semester Examination.
- iv. If a student appears in a course conducted exclusively as arrear examination, then his / her grade in that course will be based on the grade range allotted for the same score in that course in the immediate preceding regular examination.
- v. If a student appears in a course as arrear examination which is being conducted as a regular examination for other batch of regular students, then his / her grade in that course will be based on the grade range allotted to the same score in that course applicable to the above batch of regular students.
- vi. A student, who is absent for the end semester examination or withdraws from final examination or secures a letter grade RA in any course, has to register for arrear examinations for all such courses at the next available opportunity and complete them. Grades for the arrear examinations will be decided based on the original grade ranges of the class to which he/she belongs.
- vii. The internal assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts till the candidate secures a pass. However, from the third attempt onwards if a candidate fails to obtain pass marks (Internal Assessment + End Semester Examination) as per **clause 14.1**, then the candidate shall be declared to have passed the examination if he/she secures at least  $(\mu - 1.8 \sigma)$  or 50 marks whichever is less in the end semester examination.

## 15.0 AWARD OF LETTER GRADES

**15.1** All assessments of a course will be done on absolute mark basis. Each student based on his/her performance will be awarded a final letter grade and grade point, based on the performance of the student relative to others who have registered for that particular course **if the class strength is greater than or equal to 30**. However, if the class strength is less than 30, then the grading system shown in **Table-13** of clause 15.1 (ii) will be followed.

- i. The letter grade and the grade point to each student studying theory / integrated courses (Internal and End semester examinations) are generally

awarded based on the statistical parameters, Mean ( $\mu$ ) and Standard Deviation ( $\sigma$ ) of the distribution of marks as detailed in **Table-12**.

**TABLE – 12**

| Range of Marks in %<br>(CA+ESE)                          | Letter<br>Grade | Relative Grade<br>Point |
|--|-----------------|-------------------------|
| $M \geq [(\mu + 1.65\sigma)]$                            | O               | 10                      |
| $\mu + 1.65\sigma > M \geq \mu + 0.85\sigma$             | A <sup>+</sup>  | 9                       |
| $\mu + 0.85\sigma > M \geq \mu$                          | A               | 8                       |
| $\mu > M \geq \mu - 0.9\sigma$                           | B <sup>+</sup>  | 7                       |
| $\mu - 0.9\sigma > M \geq \mu - 1.8\sigma$               | B               | 6                       |
| $M < \mu - 1.8\sigma$ (or) $M < 50$<br>Whichever is less | RA              | 0                       |
| Shortage of Attendance                                   | SA              | 0                       |
| Absent   | AB              | 0                       |
| Withdrawal from examination                              | W               | 0                       |

RA - Reappearance in a Course

Where,

- M – Marks secured (CA+ESE)

- $\mu = \frac{1}{n} \sum_{j=1}^n M_j$       and

$$\sigma = \sqrt{\frac{\sum_{j=1}^n (M_j - \mu)^2}{n}}$$

$M_i$  - total mark secured (CA+ESE) by the 'i' <sup>th</sup> student in the course

n – no. of students who appeared for the examination in that particular course

- ii. The letter grade and grade point for all the courses other than theory / integrated courses including Elective courses (having strength less than 30) Laboratory courses, Industrial Training, Internship, In Plant Training, One credit courses, Mini Project and Project work shall be awarded by converting the marks obtained in that course in to a grade based on the guidelines detailed in clause 14 (ii) & Table-13.



TABLE – 13

| Range of Marks in %             | Letter Grade   | Relative Grade Point |
|---------------------------------|----------------|----------------------|
| $M > (X - k)$                   | O              | 10                   |
| $(X - k) \geq M > (X - 2k)$     | A <sup>+</sup> | 9                    |
| $(X - 2k) \geq M > (X - 3k)$    | A              | 8                    |
| $(X - 3k) \geq M > (X - 4k)$    | B <sup>+</sup> | 7                    |
| $(X - 4k) \geq M \geq (X - 5k)$ | B              | 6                    |
| $M < 50$                        | RA             | 0                    |
| Shortage of Attendance          | SA             | 0                    |
| Absent                          | AB             | 0                    |
| Withdrawal from examination     | W              | 0                    |

RA - Reappearance in a Course

Where,

- M – Marks secured (CA+ESE)
- X – maximum marks secured in a class
- k – class interval

The class intervals (k) shall be evaluated for the purpose of awarding the grades by dividing the difference between highest mark secured (X) in a Course and the minimum pass mark by the total number of grades (O, A<sup>+</sup>, A, B<sup>+</sup> and B).

$$k = \frac{X - 50}{5}$$

- iii. The **Performance Analysis Committee** chaired by the Principal consisting of the Dean (Academic), Controller of Examinations and all the Heads of the Departments will by collective wisdom, normalize the marks secured by the students in each course and finalize the grade range for that course so as to ensure that the clustering and grading decisions have been made in a reasonably balanced manner.

## 15.2 Grade Sheet

After the results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The College Name and Affiliated University.
- The list of courses enrolled during the semester and the grades scored.

- The Grade Point Average (GPA) for the semester.
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA for a semester is the ratio of the sum of the products of the credits assigned to each course and the grade point obtained for that course to the sum of the total number of credits acquired in the semester.

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester to last semester rounded up to 2 decimal points. "RA", "SA" and "AB" grades will be excluded for calculating GPA and CGPA.

$$GPA / CGPA = \frac{\sum_{i=1}^n C_i GP_i}{\sum_{i=1}^n C_i}$$

where  $C_i$  - is the Credits assigned to the course

$GP_i$  - is the point corresponding to the grade obtained for each Course

$n$  - is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA

## 16.0 REVALUATION AND REVIEW

### 16.1 Revaluation

A candidate can apply for revaluation of his/her semester examination answer script in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Department.

A candidate can apply for Revaluation of answer scripts for not exceeding 5 courses at a time either directly or by getting Xerox copy of the answer scripts.

The revaluation results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses, seminars, practical training and for project work.

## 16.2 Review

Candidates not satisfied with Revaluation can apply for Review of his/her examination answer paper in a theory course, within the prescribed date on payment of a prescribed fee through proper application to Controller of Examination through the Head of the Institution.

Candidates applying for Revaluation are alone eligible to apply for Review.

## 16.3 Examination Reforms for Transparency

A candidate can verify the end semester answer script for randomly chosen subjects. Before the publication of End Semester results, the students are allowed to verify the answer script of a subject which is randomly selected by Performance Analysis Committee. Consequently, the application for revaluation of those subjects are not permitted.

## 17.0 ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the award of the Degree only when he/she has

- i. Successfully gained the required number of total credits **168 to 176 credits (125 to 133 credits for Lateral entry)** as specified in the curriculum corresponding to his/her Programme within the stipulated time.
- ii. Successfully completed the B.E./B.Tech. Degree programme within 8 (EIGHT) years (SIXTEEN consecutive semesters) from the date of admission to the first semester of the programme and 7 (SEVEN) years (FOURTEEN consecutive semesters) for the lateral entry candidates from the date of admission to the third semester of the programme.
- iii. Successfully completed any additional courses prescribed by the Dean (Academic), whenever any candidate is readmitted under Regulations other than R – 2015.
- iv. Successfully undergone Two Non-CGPA courses.
- v. Successfully completed the field visit / industrial training, if any, as prescribed in the curriculum.
- vi. No disciplinary action is pending against him/her.

- vii. The award of the Degree must have been approved by the syndicate of the University.

## **18.0 CLASSIFICATION OF THE DEGREE AWARDED**

### **18.1 First Class with Distinction**

A candidate who satisfies the following conditions shall be declared to have passed the examination in First Class with Distinction.

- Should have passed the End Semester Examination in all the courses of all the eight semesters (six semesters in the case of lateral entry) in his/her First Appearance within five years (four years in the case of lateral entry) which includes authorized break of study of one year. Withdrawal from examination (vide **clause 19.0**) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50
- Should not have been prevented from writing end semester examination due to lack of attendance in any of the courses

### **18.2 First Class**

A candidate who satisfies the following conditions shall be declared to have passed the examination in First Class.

- Should have passed the End Semester Examination in all the courses of all the eight semesters (six semesters in the case of lateral entry) within five years (four years in the case of lateral entry). One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of five years (four years in the case of lateral entry) for award of First Class.
- Should have secured a CGPA of not less than **7.00**.

### **18.3 Second Class**

All other candidates (not covered in **clauses 18.1 and 18.2**) who qualify for the award of degree (**vide clause 17.0**) shall be declared to have passed the examination in second class.

- 18.4** A candidate who is absent in semester examination in a course/project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification. (Subject to **clause 19.0 & 20.0**)

## **19.0 PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION**

- 19.1** A candidate may be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination for valid reasons and on prior application.
- 19.2** Such withdrawal shall be permitted only once during the entire period of study.
- 19.3** Withdrawal application is valid only if the student is otherwise eligible to write the examination (**clause 7**) and if it is made within TEN working days prior to the commencement of the end semester examination in that course or courses and also recommended by the HOD and approved by the Principal.
- 19.4** Notwithstanding the requirement of mandatory TEN working days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.
- 19.5** Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.
- 19.6** Withdrawal from the End semester examination is NOT applicable to arrear courses of previous semesters.
- 19.7** The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.
- 19.8** Withdrawal is permitted for the end semester examinations in the final semester, only if, the period of study of the student concerned does not exceed five years as per **clause 18.1**.

## **20.0 PROVISION FOR AUTHORISED BREAK OF STUDY**

- 20.1** Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based

on the merits of the case provided he / she applies to the Director, Academic Courses, Anna University, Chennai, in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Principal stating the reasons therefore and the probable date of rejoining the programme.

- 20.2** The student is permitted to rejoin the programme after the break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining. If the Regulation is changed, then, those candidates may have to do additional courses as prescribed by the Dean (Academic).
- 20.3** The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. However, additional break of study granted will be counted for the purpose of classification.
- 20.4** The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in **clause 5.1** irrespective of the period of break of study in order that he/she may be eligible for the award of the degree.
- 20.5** If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted "Break of Study" or "Withdrawal" is not applicable for this case.

#### **21.0 DISCIPLINE**

Every student is required to decently dress to observe discipline and decorum both inside and outside the college and not to indulge in any activity which affects the prestige of the college/university.

#### **22.0 REVISION OF REGULATIONS AND CURRICULUM**

The curriculum and syllabi under this regulation will be for **four years**. However, the Academic Council of the College reserves the right to revise or change or amend the regulations, the scheme of examinations, the curriculum and the syllabi from time to time if found necessary.

#### **23.0 SPECIAL CASES**

In the event of any clarification in the interpretation of the above rules and regulations, they shall be referred to the Standing Committee. The Standing Committee will offer suitable interpretations / clarifications /

amendments required for special case on such references and get them ratified in the next meeting of the Academic Council. The decision of the Academic Council will be final.

## ANNEXURE - I

### MINIMUM TOTAL CREDITS FOR B.E. / B.Tech. DEGREE PROGRAMMES OFFERED IN THE INSTITUTION

| Sl. No. | Name of the Programme                            | Minimum Total Credits* |
|---------|--|------------------------|
| 1.      | B.E. Mechanical Engineering                      | 171                    |
| 2.      | B.E. Electronics and Communication Engineering   | 173                    |
| 3.      | B.E. Computer Science and Engineering            | 169                    |
| 4.      | B.E. Electrical and Electronics Engineering      | 173                    |
| 5.      | B.E. Electronics and Instrumentation Engineering | 171                    |
| 6.      | B.E. Civil Engineering                           | 176                    |
| 7.      | B.Tech. Information Technology                   | 168                    |

\* Minimum Total Credits to be earned by the student admitted to the particular UG Programme to become eligible for the award of Degree under **Clause 4.0** of Regulations 2015 (UG).

**ANNEXURE – II****NCG11****SPORTS****CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | -  |
| 2. | Detail of Course Content / Syllabus       | As prescribed by the Physical Education department   |
| 3. | Duration of the Course                    | 50 Hours per Year<br>Minimum contact hours required – 38 Hours per Year  |
| 4. | Assessment Procedure                      | As decided by the Physical Education department  |
| 5. | Criteria for allocation of credit         | Participation in Ties /Zone/Inter Zone / Open Tournament or representation in intramural Sports & Games with 75% attendance in ground practice / Pass on Examination conducted by Physical Education department. |
| 6. | In case of failure                        | (If the student score less than 50 marks in the above criteria) Repeat the course  |

**NCG12****YOGA FOR EMPOWERMENT****CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | As prescribed by Yoga class practitioners                                     |
| 2. | Detail of Course Content / Syllabus       |   |
| 3. | Duration of the Course                    | 60 Hours per Year.<br>Minimum contact hours required – 45 Hours per Year      |
| 4. | Assessment Procedure                      | -   |
| 5. | Criteria for allocation of credit         | Completion certificate issued by the NEC Yoga Club / Yoga class practitioners |
| 6. | In case of failure                        | -   |

**NCG13****NATIONAL CADET CORPS (NCC)****CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | Student should be a citizen of India. He / She should have the minimum physical fitness as per NCC wing requirement |
|----|---|---|



|    |                                     |   |
|----|-------------------------------------|---|
| 2. | Detail of Course Content / Syllabus | Norms as prescribed by NCC wing                               |
| 3. | Duration of the Course              |   |
| 4. | Assessment Procedure                |   |
| 5. | Criteria for allocation of credit   | 80% parade attendance in both I & II year NCC training period |
| 6. | In case of failure                  | -   |

**NCG14 NATIONAL SERVICE SCHEME (NSS) CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | -  |
| 2. | Detail of Course Content / Syllabus       | -  |
| 3. | Duration of the Course                    | 2 years  |
| 4. | Assessment Procedure                      | -  |
| 5. | Criteria for allocation of credit         | Attend one orientation programme and active participation certificate for 120 contact hours / year or active participation certificate in 5 activities |
| 6. | In case of failure                        | -  |

**NCG15 YRC CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | -  |
| 2. | Detail of Course Content / Syllabus       | Periodical meetings, Blood Donation Camp, Orphanage visit, Awareness Programmes, Test related to YRC (Multiple Choice Questions) |
| 3. | Duration of the Course                    | One year   |
| 4. | Assessment Procedure                      | Evaluation will be based on attending periodical meetings (Attendance) / Camp / Orphanage visit / Test / Awareness Programmes    |
| 5. | Criteria for allocation of credit         | Active participation certificate with good conduct in YRC club activities  |
| 6. | In case of failure                        | -  |

**NCG21 CO / EXTRA-CURRICULAR ACTIVITIES CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | -  |
| 2. | Detail of Course Content / Syllabus       | Activities as decided by the respective club convener / coordinator  |
| 3. | Duration of the Course                    | Minimum requirements as specified by the club convener / Coordinator   |
| 4. | Assessment Procedure                      |  |
| 5. | Criteria for allocation of credit         | Active participation certificate with good conduct in Fine arts / Rotract / Junior JAYCEE / RRC / Youth welfare Association / Quiz / Science / Mathematics / Literary Associates / IAS academy and all other approved clubs. |
| 6. | In case of failure                        | -  |

**NCG22 ENGLISH PROFICIENCY CERTIFICATION CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | As prescribed by the certifying authority   |
| 2. | Detail of Course Content / Syllabus       |   |
| 3. | Duration of the Course                    |   |
| 4. | Assessment Procedure                      |   |
| 5. | Criteria for allocation of credit         | A certificate for attending BEC course / Minimum score in TOFEL iBT / GRE / IELTS |
| 6. | In case of failure                        | Repeat the course   |

**NCG23 SOFT SKILLS CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | Completion of 2 <sup>nd</sup> semester   |
| 2. | Detail of Course Content / Syllabus       | As prescribed by Placement Cell  |
| 3. | Duration of the Course                    | -  |
| 4. | Assessment Procedure                      | -  |
| 5. | Criteria for allocation of credit         | Successful completion of Soft skill Training Certificate with minimum 20 contact hours |
| 6. | In case of failure                        | -  |

**NCG24 FOREIGN / VERNACULAR LANGUAGES CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | -   |
| 2. | Detail of Course Content / Syllabus       | As prescribed by the course conducting Universities / Schools |
| 3. | Duration of the Course                    |   |
| 4. | Assessment Procedure                      |   |
| 5. | Criteria for allocation of credit         | Pass certificate issued by the competing authority            |
| 6. | In case of failure                        | Repeat the course   |

**NCG25 APTITUDE PROFICIENCY CERTIFICATION CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | As prescribed by the course coordinator                           |
| 2. | Detail of Course Content / Syllabus       |   |
| 3. | Duration of the Course                    | 40 periods with minimum 70% of attendance                         |
| 4. | Assessment Procedure                      | As prescribed by the course coordinator                           |
| 5. | Criteria for allocation of credit         | Pass in End Examination / Minimum score in GMAT / CAT / NAC / MAT |
| 6. | In case of failure                        | Repeat the course   |

**NCG26 GLOBALLY ACCEPTED CERTIFICATION COURSES CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | Prior permission from the HOD is must  |
| 2. | Detail of Course Content / Syllabus       | As prescribed by the certifying authority  |
| 3. | Duration of the Course                    |  |
| 4. | Assessment Procedure                      |  |
| 5. | Criteria for allocation of credit         | Proof for the successful completion of the course provided by the globally accepted certifying agencies like HPATA / Microsoft / National Instruments (Lab View) / Oracle / IBM / CISCO Networking Academy / ADOBE / REDHAT / Sun Micro systems / JAVA / Softwares related to Mechanical and Civil Engineering |
| 6. | In case of failure                        | -  |

**ANNEXURE – III****INDUSTRIAL TRAINING****CREDIT: 1**

|    |   |   |
|----|---|---|
| 1. | Pre – requisites / Eligibility Conditions | After completion of the third semester. The student may undergo Industrial training in reputed organization after getting prior permission from HOD   |
| 2. | Detail of Course Content / Syllabus       | Inplant training in any organization like BSNL, TTPS, BHEL, NLC etc related to their programmes   |
| 3. | Duration of the Course                    | One to two weeks  |
| 4. | Assessment Procedure                      | <ol style="list-style-type: none"> <li>1. Student has to submit a report.</li> <li>2. Evaluation Committee will be constituted by the respective department HOD to assess the report based on the following criteria's. <ul style="list-style-type: none"> <li>• Evaluation of report given by the student (40%)</li> <li>• Student's presentation (40%)</li> <li>• Oral Examination (20%)</li> </ul> </li> </ol> |
| 5. | Criteria for allocation of credit         | Satisfactory completion certificate issued by the respective department HOD based on the performance of the student and a certificate from the organization concerned.  |
| 6. | In case of failure                        | -   |

**INTERNSHIP****CREDIT: 1**

|    |   |  |
|----|---|--|
| 1. | Pre – requisites / Eligibility Conditions | After completion of the third semester. The student may undergo intensive training after getting prior permission from HOD   |
| 2. | Detail of Course Content / Syllabus       | Internship Training in R & D organization like CSIR, DRDO, IITs and IISC etc related to their programmes   |
| 3. | Duration of the Course                    | One to two weeks   |
| 4. | Assessment Procedure                      | <ol style="list-style-type: none"> <li>1. Student has to submit a report for Internship</li> <li>2. Evaluation Committee will be constituted by the respective department HOD to assess the report based on the following criteria's.</li> </ol> |

|    |                                   |   |
|----|-----------------------------------|---|
|    |                                   | <ul style="list-style-type: none"><li>• Internship Report (40%)</li><li>• Student's presentation (40%)</li><li>• Oral Examination (20%)</li></ul>                           |
| 5. | Criteria for allocation of credit | Satisfactory completion certificate issued by respective department HOD based on the performance of the student and a certificate obtained from the organization concerned. |
| 6. | In case of failure                | -   |



**B.Tech. – INFORMATION TECHNOLOGY**  
**CURRICULUM AND SYLLABUS**

## DEPARTMENT OF INFORMATION TECHNOLOGY

### VISION

To produce technically competent and value based IT Professionals to meet the current challenges of the modern IT industry.

### MISSION

- Imparting quality education with innovative components in teaching learning process.
- Conducting student centric programme to enhance communication, team spirit, leadership skills and self learning.
- Motivating the students to realize the need of ethics and human values.
- Developing a conducive environment for collaborative research.

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Programme Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve:

1. Excel in IT, ITES industries and higher education by applying the principles and practices of computing.
2. Maintain professionalism and adapt to emerging technologies.



## PROGRAM OUTCOMES (POs)

At the time of graduation, our IT graduates are expected to have:

1. Apply knowledge of mathematics, physics, chemistry, biological sciences, Engineering fundamentals and Software Development Fundamentals, Information Management and Security, Networking and web Systems to the solution of complex engineering problems in Information Technology.
2. Identify, formulate, research literature and analyze complex Information Technology problems in Software Engineering, Data Mining, Mobility Engineering, Analytic Computing, Network Management and security, reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Design solutions for complex Information Management and Security, Networking and web System problems and design systems, components or processes that meet specified needs with appropriate considerations for environment, culture, society, public health and safety.
4. Conduct investigations of complex Information Management and Security, Networking and web System problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems in Emerging technologies, Networking and web Systems with an understanding of the limitations.
6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice in Healthcare and Banking and solutions to complex engineering problems in Networking and Web Systems and Emerging Technologies.
7. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Information Technology problems in societal and environmental contexts.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of Computer Ethics in engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

## PREAMBLE OF THE CURRICULUM & SYLLABI

The Curriculum and Syllabi under Regulations 2015 is designed keeping in mind the Outcome Based Education (OBE) and Choice Based Credit System (CBCS). The course content of each course shall be fixed in accordance with the Program Educational Objectives (PEOs), Program Outcomes (POs) and Course Outcomes (COs).

The CBCS enables the students to earn credits across programmes and provides flexibility for slow and fast learners in registering the required number of credits in a semester. The CBCS facilitates transfer of credits earned in different departments / Centers of other recognized / accredited universities or institutions of higher education in India and abroad either by studying directly or by online method.

The curriculum of **IT programme** is designed with total number of credits **168 (125 for Lateral entry)** and shall have the following category of courses in the curriculum.

### 1. Foundation courses

- a. **Common Foundation Courses (CFC)** include Mathematics, Basic Sciences, Engineering Sciences and Skill Based Courses.
- b. **Specific Foundation Courses (SFC)** include the basic courses specific to a programme of study.

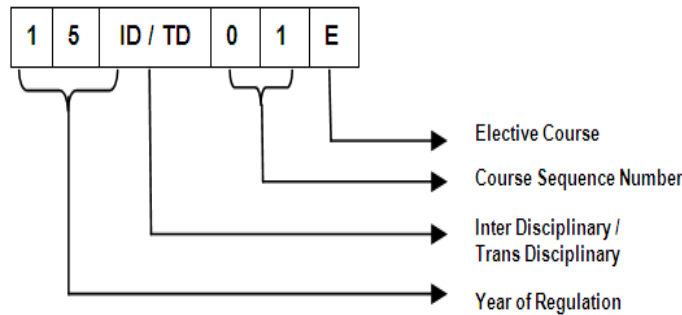
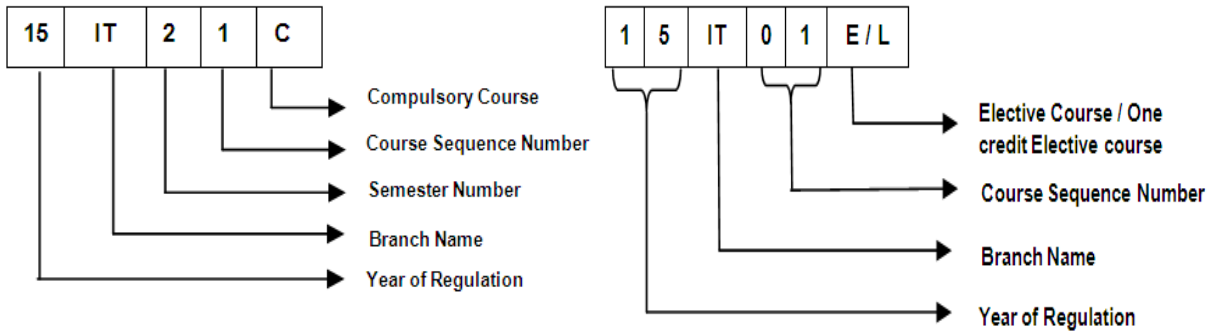
2. **Programme Core Courses (PCC)** include the core courses relevant to the chosen programme of study and the Employability Enhancement courses such as Project, Seminar and Inplant training/ Internship.
3. **Programme Elective Courses (PEC)** include the elective courses relevant to the chosen programme of study.
4. **Open Elective Courses (OEC)** include Inter-disciplinary and Trans-disciplinary courses. The students shall study Inter-disciplinary courses offered in other Engineering/Technology Programmes through regular mode and Trans-disciplinary courses through self study mode.
5. **Mandatory courses (MAC)** include the courses recommended by the regulatory bodies such as AICTE, UGC etc as given below:
  - a. Technical English / Professional English
  - b. Professional Ethics and Human Values
  - c. Environmental Science and Engineering
  - d. Communication Skills Laboratory
6. Every student shall undergo one Interdisciplinary and one Transdisciplinary course.

Performance in each course of study shall be evaluated based on Continuous Assessment throughout the semester and end semester examination at the end of the programme. Keeping in mind the content of the courses and delivery methods, different question paper patterns are suggested.

### QP - Question Pattern

| Question pattern | 1 mark | 2 marks | 4 marks      | 10 marks                                 | 12 marks                                 | 16 marks                                 | 20 marks                                 | Total |
|------------------|--------|---------|--------------|--|--|--|--|-------|
| A                | --     | --      | --           | --                                       | --                                       | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | 100   |
| B                | --     | 10      | --           | --                                       | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | 100   |
| C                | 10     | --      | 10 out of 12 | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | --                                       | 100   |
| D                | 10     | 10      | 5 out of 6   | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | --                                       | 100   |
| E                | --     | 10      | 5 out of 6   | --                                       | 1 Qn Compulsory & 4 Qns (either or type) | --                                       | --                                       | 100   |
| F                | --     | --      | --           | --                                       | --                                       | --                                       | 5 out of 8                               | 100   |
| G                | --     | 5       | --           | 2 Qns (either or type)                   | --                                       | --                                       | --                                       | 30    |

### FORMAT FOR COURSE CODE



CURRICULUM AND SYLLABUS

SEMESTER – I

| S. No            | Course Category | Course Code | COURSE TITLE  | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|---|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |   |           |          |          |           |    |
| 1.               | MAC             | 15SH11C     | Technical English*  | 3         | 0        | 0        | 3         | B  |
| 2.               | CFC             | 15SH12C     | Mathematical Foundations for Engineers*                   | 3         | 2        | 0        | 4         | B  |
| 3.               | CFC             | 15SH13C     | Engineering Physics*                                      | 3         | 0        | 0        | 3         | B  |
| 4.               | CFC             | 15SH14C     | Engineering Chemistry*                                    | 3         | 0        | 0        | 3         | B  |
| 5.               | CFC             | 15SH15C     | Introduction to Engineering*                              | 2         | 0        | 0        | 2         | A  |
| 6.               | CFC             | 15SH16C     | Engineering Graphics*                                     | 2         | 0        | 2        | 3         | A  |
| <b>PRACTICAL</b> |                 |             |   |           |          |          |           |    |
| 7.               | CFC             | 15SH17C     | Engineering Physics and Engineering Chemistry Laboratory* | 0         | 0        | 2        | 1         | -  |
| 8.               | CFC             | 15SH18C     | Engineering Practice Laboratory*                          | 0         | 0        | 2        | 1         | -  |
| <b>TOTAL</b>     |                 |             |   | <b>16</b> | <b>2</b> | <b>6</b> | <b>20</b> |    |

SEMESTER – II

| S. No            | Course Category | Course Code | COURSE TITLE   | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |          |           |    |
| 1.               | MAC             | 15IT21C     | Professional English*  | 3         | 0        | 0        | 3         | B  |
| 2.               | SFC             | 15IT22C     | Probability and Statistics <sup>\$</sup>                             | 3         | 2        | 0        | 4         | B  |
| 3.               | SFC             | 15IT23C     | Physics of Solid State Devices <sup>\$</sup>                         | 3         | 0        | 0        | 3         | B  |
| 4.               | SFC             | 15IT24C     | Digital Systems  | 3         | 2        | 0        | 4         | B  |
| 5.               | CFC             | 15IT25C     | C Programming for Engineers*   | 3         | 0        | 0        | 3         | B  |
| 6.               | MAC             | 15IT26C     | Environmental Science and Engineering*                               | 3         | 0        | 0        | 3         | A  |
| <b>PRACTICAL</b> |                 |             |  |           |          |          |           |    |
| 7.               | SFC             | 15IT27C     | Applied Physics and Environmental Chemistry Laboratory <sup>\$</sup> | 0         | 0        | 2        | 1         | -  |
| 8.               | CFC             | 15IT28C     | C Programming Laboratory*  | 0         | 0        | 2        | 1         | -  |
| 9.               | SFC             | 15IT29C     | Digital Laboratory   | 0         | 0        | 2        | 1         | -  |
| <b>TOTAL</b>     |                 |             |  | <b>18</b> | <b>4</b> | <b>6</b> | <b>23</b> |    |

MAC - Mandatory Course, CFC - Common Foundation Course, SFC - Specific Foundation Course,  
PCC – Programme Core Course, XEC - X Stands for P or O (PEC – Programme Elective Course,  
OEC – Open Elective Course) \*Common to all B.E. / B.Tech., Programmes, \$Common to CSE and IT

**SEMESTER – III**

| S. No            | Course Category | Course Code | COURSE TITLE                           | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |          |           |    |
| 1.               | SFC             | 15IT31C     | Discrete Mathematics                   | 3         | 2        | 0        | 4         | B  |
| 2.               | PCC             | 15IT32C     | Data Structures and Algorithms         | 3         | 0        | 0        | 3         | E  |
| 3.               | PCC             | 15IT33C     | Object Oriented Programming            | 3         | 0        | 0        | 3         | C  |
| 4.               | SFC             | 15IT34C     | Principles of Data Communication       | 3         | 0        | 0        | 3         | B  |
| 5.               | PCC             | 15IT35C     | Computer Architecture                  | 3         | 0        | 0        | 3         | C  |
| 6.               | MAC             | 15IT36C     | Professional Ethics and Human Values*  | 3         | 0        | 0        | 3         | A  |
| <b>PRACTICAL</b> |                 |             |  |           |          |          |           |    |
| 7.               | PCC             | 15IT37C     | Object Oriented Programming Laboratory | 0         | 0        | 2        | 1         | -  |
| 8.               | PCC             | 15IT38C     | Data Structures Laboratory             | 0         | 0        | 2        | 1         | -  |
| 9.               | MAC             | 15IT39C     | Communication Skills Laboratory*       | 0         | 0        | 2        | 1         | =  |
| <b>TOTAL</b>     |                 |             |  | <b>18</b> | <b>2</b> | <b>6</b> | <b>22</b> |    |

**SEMESTER – IV**

| S. No            | Course Category | Course Code | COURSE TITLE                                   | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |          |           |    |
| 1.               | SFC             | 15IT41C     | Applied Mathematics for Information Technology | 2         | 2        | 0        | 3         | B  |
| 2.               | PCC             | 15IT42C     | C# and .Net framework                          | 3         | 0        | 0        | 3         | E  |
| 3.               | PCC             | 15IT43C     | Operating Systems                              | 3         | 0        | 0        | 3         | C  |
| 4.               | PCC             | 15IT44C     | Database Management Systems                    | 3         | 0        | 0        | 3         | C  |
| 5.               | PCC             | 15IT45C     | Software Engineering                           | 3         | 0        | 0        | 3         | B  |
| 6.               | MAC             | 15IT46C     | Green IT                                       | 3         | 0        | 0        | 3         | B  |
| <b>PRACTICAL</b> |                 |             |  |           |          |          |           |    |
| 7.               | PCC             | 15IT47C     | Operating Systems Laboratory                   | 0         | 0        | 2        | 1         | -  |
| 8.               | PCC             | 15IT48C     | Database Management Systems Laboratory         | 0         | 0        | 2        | 1         | -  |
| 9.               | PCC             | 15IT49C     | C# and .Net framework Laboratory               | 0         | 0        | 2        | 1         | =  |
| <b>TOTAL</b>     |                 |             |  | <b>17</b> | <b>2</b> | <b>6</b> | <b>21</b> |    |

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PCC – Programme Core Course, XEC - X Stands for P or O (PEC – Programme Elective Course,  
OEC – Open Elective Course) \*Common to all B.E. / B.Tech., Programmes, \$Common to CSE and IT

### SEMESTER – V

| S. No            | Course Category | Course Code | COURSE TITLE                           | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |          |           |    |
| 1.               | SFC             | 15IT51C     | Embedded Systems                       | 3         | 0        | 0        | 3         | B  |
| 2.               | PCC             | 15IT52C     | Internet and Web Technology            | 3         | 0        | 0        | 3         | E  |
| 3.               | PCC             | 15IT53C     | Computer Networks                      | 3         | 0        | 0        | 3         | E  |
| 4.               | PCC             | 15IT54C     | Multimedia Computing                   | 3         | 0        | 0        | 3         | B  |
| 5.               | MAC             | 15IT55C     | Project Management and Finance*        | 3         | 0        | 0        | 3         | B  |
| 6.               | XEC             |             | Elective-I                             | 3         | 0        | 0        | 3         | B  |
| <b>PRACTICAL</b> |                 |             |  |           |          |          |           |    |
| 7.               | PCC             | 15IT56C     | Internet and Web Technology Laboratory | 0         | 0        | 2        | 1         | -  |
| 8.               | PCC             | 15IT57C     | Networking Laboratory                  | 0         | 0        | 2        | 1         | -  |
| 9.               | PCC             | 15IT58C     | Multimedia Laboratory                  | 0         | 0        | 2        | 1         | -  |
| <b>TOTAL</b>     |                 |             |  | <b>18</b> | <b>0</b> | <b>6</b> | <b>21</b> |    |

### SEMESTER – VI

| S. No            | Course Category | Course Code | COURSE TITLE                             | L         | T        | P        | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |          |           |    |
| 1.               | PCC             | 15IT61C     | Software Project Management              | 3         | 0        | 0        | 3         | B  |
| 2.               | PCC             | 15IT62C     | Enterprise Mobility                      | 3         | 0        | 0        | 3         | E  |
| 3.               | PCC             | 15IT63C     | Data Analytics and Business Intelligence | 3         | 0        | 0        | 3         | B  |
| 4.               | PCC             | 15IT64C     | Cryptography and Network Security        | 3         | 2        | 0        | 4         | B  |
| 5.               | PCC             | 15IT65C     | Cloud Computing                          | 3         | 2        | 0        | 4         | B  |
| 6.               | XEC             |             | Elective-II                              | 3         | 0        | 0        | 3         | B  |
| <b>PRACTICAL</b> |                 |             |  |           |          |          |           |    |
| 7.               | PCC             | 15IT66C     | Data Analytics Laboratory                | 0         | 0        | 2        | 1         | -  |
| 8.               | PCC             | 15IT67C     | Mobile Technologies Laboratory           | 0         | 0        | 2        | 1         | -  |
| 9.               | PCC             | 15IT68C     | Product Development Laboratory*          | 0         | 0        | 4        | 2         | -  |
| <b>TOTAL</b>     |                 |             |  | <b>18</b> | <b>4</b> | <b>8</b> | <b>24</b> |    |

MAC - Mandatory Course, CFC - Common Foundation Course, SFC - Specific Foundation Course, PCC – Programme Core Course, XEC - X Stands for P or O (PEC – Programme Elective Course, OEC – Open Elective Course) \*Common to all B.E. / B.Tech., Programmes, \$Common to CSE and IT

## SEMESTER – VII

| S. No            | Course Category | Course Code | COURSE TITLE                               | L         | T        | P         | C         | QP |
|------------------|-----------------|-------------|--|-----------|----------|-----------|-----------|----|
| <b>THEORY</b>    |                 |             |  |           |          |           |           |    |
| 1.               | XEC             |             | Elective-III                               | 3         | 0        | 0         | 3         | B  |
| 2.               | XEC             |             | Elective-IV                                | 3         | 0        | 0         | 3         | B  |
| 3.               | XEC             |             | Elective-V                                 | 3         | 0        | 0         | 3         | B  |
| 4.               | XEC             |             | Elective-VI                                | 3         | 0        | 0         | 3         | B  |
| 5.               | XEC             |             | Elective-VII                               | 3         | 0        | 0         | 3         | B  |
| <b>PRACTICAL</b> |                 |             |  |           |          |           |           |    |
| 6.               | XEC             |             | Elective Laboratory                        | 0         | 0        | 2         | 1         | -  |
| 7.               | PCC             | 15IT71C     | Mini Project                               | 0         | 0        | 8         | 4         | -  |
| 8.               | PCC             | 15IT72C     | Research Paper and Patent Review – Seminar | 0         | 0        | 2         | 1         | -  |
| 9.               | PCC             | 15IT73C     | Comprehension                              | 0         | 0        | 2         | 1         | -  |
| <b>TOTAL</b>     |                 |             |  | <b>15</b> | <b>0</b> | <b>14</b> | <b>22</b> |    |

## SEMESTER – VIII

| S. No            | Course Category | Course Code | COURSE TITLE                  | L        | T        | P         | C         | QP |
|------------------|-----------------|-------------|-------------------------------|----------|----------|-----------|-----------|----|
| <b>THEORY</b>    |                 |             |                               |          |          |           |           |    |
| 1.               | XEC             |             | Elective-VIII                 | 3        | 0        | 0         | 3         | B  |
| <b>PRACTICAL</b> |                 |             |                               |          |          |           |           |    |
| 2.               | PCC             | 15IT81C     | Project Work                  | 0        | 0        | 20        | 10        | -  |
| 3.               | PCC             | 15IT82C     | Internship / Inplant Training | 0        | 0        | 4         | 2         | -  |
| <b>TOTAL</b>     |                 |             |                               | <b>3</b> | <b>0</b> | <b>24</b> | <b>15</b> |    |

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PCC – Programme Core Course, XEC - X Stands for P or O (PEC – Programme Elective Course,  
OEC – Open Elective Course) \*Common to all B.E. / B.Tech., Programmes, \$Common to CSE and IT



### PROGRAMME ELECTIVE COURSES (PEC)

| S. No                                      | Course Category | Course Code | COURSE TITLE                       | L | T | P | C | QP |
|--|-----------------|-------------|------------------------------------|---|---|---|---|----|
| <b>INFORMATION MANAGEMENT AND SECURITY</b> |                 |             |                                    |   |   |   |   |    |
| 1.   | PEC             | 15IT01E     | Distributed Databases              | 3 | 0 | 0 | 3 | B  |
| 2.   | PEC             | 15IT02E     | Advanced database systems          | 3 | 0 | 0 | 3 | B  |
| 3.   | PEC             | 15IT03E     | Knowledge Management               | 3 | 0 | 0 | 3 | B  |
| 4.   | PEC             | 15IT04E     | Information Storage and Management | 3 | 0 | 0 | 3 | B  |
| 5.   | PEC             | 15IT05E     | Biometrics                         | 3 | 0 | 0 | 3 | B  |
| 6.   | PEC             | 15IT06E     | Bio informatics                    | 3 | 0 | 0 | 3 | B  |
| 7.   | PEC             | 15IT07E     | Analytic Computing                 | 3 | 0 | 0 | 3 | B  |
| 8.   | PEC             | 15IT08E     | Information Security               | 3 | 0 | 0 | 3 | B  |
| 9.   | PEC             | 15IT09E     | Big data Analytics                 | 3 | 0 | 0 | 3 | B  |
| 10.  | PEC             | 15IT10E     | Cyber Forensics                    | 3 | 0 | 0 | 3 | B  |
| 11.  | PEC             | 15IT11E     | Digital Signal Processing          | 3 | 0 | 0 | 3 | B  |
| <b>SOFTWARE DEVELOPMENT FUNDAMENTALS</b>   |                 |             |                                    |   |   |   |   |    |
| 12.  | PEC             | 15IT12E     | Software Testing                   | 3 | 0 | 0 | 3 | B  |
| 13.  | PEC             | 15IT13E     | Advanced Java                      | 3 | 0 | 0 | 3 | B  |
| 14.  | PEC             | 15IT14E     | Software Quality Assurance         | 3 | 0 | 0 | 3 | B  |
| 15.  | PEC             | 15IT15E     | Internet of Things                 | 3 | 0 | 0 | 3 | B  |
| 16.  | PEC             | 15IT16E     | Natural Language Processing        | 3 | 0 | 0 | 3 | B  |
| 17.  | PEC             | 15IT17E     | Embedded and Real Time Systems     | 3 | 0 | 0 | 3 | B  |
| <b>NETWORKING AND WEB SYSTEMS</b>          |                 |             |                                    |   |   |   |   |    |
| 18.  | PEC             | 15IT18E     | Network Management                 | 3 | 0 | 0 | 3 | B  |
| 19.  | PEC             | 15IT19E     | Game Programming                   | 3 | 0 | 0 | 3 | B  |
| 20.  | PEC             | 15IT20E     | High Performance Networks          | 3 | 0 | 0 | 3 | B  |
| 21.  | PEC             | 15IT21E     | Social Networking                  | 3 | 0 | 0 | 3 | B  |
| 22.  | PEC             | 15IT22E     | Service Oriented Architecture      | 3 | 0 | 0 | 3 | B  |
| 23.  | PEC             | 15IT23E     | M-Commerce                         | 3 | 0 | 0 | 3 | B  |
| 24.  | PEC             | 15IT24E     | Digital Communication              | 3 | 0 | 0 | 3 | B  |
| <b>ELECTIVE LABORATORY</b>                 |                 |             |                                    |   |   |   |   |    |
| 25.  | PEC             | 15IT25E     | Big data Analytics Laboratory      | 0 | 0 | 2 | 1 | -  |
| 26.  | PEC             | 15IT26E     | Software Testing Laboratory        | 0 | 0 | 2 | 1 | -  |
| 27.  | PEC             | 15IT27E     | Advanced Java Laboratory           | 0 | 0 | 2 | 1 | -  |
| 28.  | PEC             | 15IT28E     | Case Tools Laboratory              | 0 | 0 | 2 | 1 | -  |

**ONE CREDIT ELECTIVE COURSES (PEC)**

| S. No                                 | Course Category | Course Code | COURSE TITLE                           | L | T | P | C | QP |
|---------------------------------------|-----------------|-------------|--|---|---|---|---|----|
| <b>INDUSTRY COLLOBORATIVE COURSES</b> |                 |             |  |   |   |   |   |    |
| 1.                                    | PEC             | 15IT01L     | Agile Development Process              | 1 | 0 | 0 | 1 | G  |
| 2.                                    | PEC             | 15IT02L     | Microsoft Analytics                    | 1 | 0 | 0 | 1 | G  |
| 3.                                    | PEC             | 15IT03L     | HTML5and CSS3 mobile programming       | 0 | 0 | 2 | 1 | -  |
| 4.                                    | PEC             | 15IT04L     | Web services for mobile programming    | 0 | 0 | 2 | 1 | -  |
| 5.                                    | PEC             | 15IT05L     | E-Learning Platform                    | 0 | 0 | 2 | 1 | -  |
| <b>OTHER COURSES</b>                  |                 |             |  |   |   |   |   |    |
| 6.                                    | PEC             | 15IT06L     | Computer Hardware and Trouble Shooting | 0 | 0 | 2 | 1 | -  |
| 7.                                    | PEC             | 15IT07L     | PHP Programming                        | 0 | 0 | 2 | 1 | -  |
| 8.                                    | PEC             | 15IT08L     | Programming in python                  | 1 | 0 | 0 | 1 | G  |
| 9.                                    | PEC             | 15IT09L     | Theory of Computation                  | 1 | 0 | 0 | 1 | G  |
| 10.                                   | PEC             | 15IT10L     | Basics of Compiler Design              | 1 | 0 | 0 | 1 | G  |
| 11.                                   | PEC             | 15IT11L     | Virtualization                         | 1 | 0 | 0 | 1 | G  |
| 12.                                   | PEC             | 15IT12L     | Programming in Ruby                    | 0 | 0 | 2 | 1 |    |
| 13.                                   | PEC             | 15IT13L     | Social Media Application Development   | 1 | 0 | 0 | 1 | G  |
| 14.                                   | PEC             | 15IT14L     | iOS Development with swift 2.0         | 1 | 0 | 0 | 1 | G  |
| 15.                                   | PEC             | 15IT15L     | E-Commerce Security                    | 1 | 0 | 0 | 1 | G  |
| 16.                                   | PEC             | 15IT16L     | Computer Animation                     | 0 | 0 | 2 | 1 | -  |
| 17.                                   | PEC             | 15IT17L     | Hadoop Architecture and Installation   | 0 | 0 | 2 | 1 | -  |
| 18.                                   | PEC             | 15IT18L     | Microcontroller and Raspberry Pi       | 1 | 0 | 0 | 1 | G  |

**Open Elective Course (OEC)**  
**Group – I** (Inter-disciplinary courses)

| S. No  | Course Category | Course Code | COURSE TITLE                   | L | T | P | C | QP                                 |
|--|-----------------|-------------|--------------------------------|---|---|---|---|------------------------------------|
| <b>Any one of the following course is compulsory</b> |                 |             |                                |   |   |   |   |                                    |
| 1.   | OEC             | 15ID01E     | Product Design and Development | 3 | 0 | 0 | 3 | A                                  |
| 2.   | OEC             | 15ID02E     | Disaster Management            | 3 | 0 | 0 | 3 | A                                  |
| 3.   | OEC             | 15ID03E     | Energy Engineering             | 3 | 0 | 0 | 3 | A                                  |
| 4.   | OEC             | --          | Other Programme Courses        | 3 | 0 | 0 | 3 | As specified for the Chosen Course |

**Group-II** (Trans-disciplinary courses) - Self Study Course

| S. No  | Course Category | Course Code | COURSE TITLE                           | L | T | P | C | QP |
|--|-----------------|-------------|--|---|---|---|---|----|
| <b>Any one of the following course is compulsory</b> |                 |             |  |   |   |   |   |    |
| 1.   | OEC             | 15TD01E     | Indian Business Laws                   | 0 | 0 | 0 | 3 | F  |
| 2.   | OEC             | 15TD02E     | Leadership and Personality Development | 0 | 0 | 0 | 3 | F  |
| 3.   | OEC             | 15TD03E     | International Business Management      | 0 | 0 | 0 | 3 | F  |
| 4.   | OEC             | 15TD04E     | Basics of Marketing                    | 0 | 0 | 0 | 3 | F  |
| 5.   | OEC             | 15TD05E     | Retailing and Distribution management  | 0 | 0 | 0 | 3 | F  |
| 6.   | OEC             | 15TD06E     | International Economics                | 0 | 0 | 0 | 3 | F  |
| 7.   | OEC             | 15TD07E     | Indian Economy                         | 0 | 0 | 0 | 3 | F  |
| 8.   | OEC             | 15TD08E     | Rural Economics                        | 0 | 0 | 0 | 3 | F  |
| 9.   | OEC             | 15TD09E     | International Trade                    | 0 | 0 | 0 | 3 | F  |
| 10.  | OEC             | 15TD10E     | Global Challenges and issues           | 0 | 0 | 0 | 3 | F  |
| 11.  | OEC             | 15TD11E     | Indian Culture and Heritage            | 0 | 0 | 0 | 3 | F  |
| 12.  | OEC             | 15TD12E     | Indian History                         | 0 | 0 | 0 | 3 | F  |
| 13.  | OEC             | 15TD13E     | Sustainable Development and Practices  | 0 | 0 | 0 | 3 | F  |
| 14.  | OEC             | 15TD14E     | Women in Indian Society                | 0 | 0 | 0 | 3 | F  |
| 15.  | OEC             | 15TD15E     | Indian Constitution                    | 0 | 0 | 0 | 3 | F  |
| 16.  | OEC             | 15TD16E     | Bio Mechanics in Sports                | 0 | 0 | 0 | 3 | F  |

15SH11C

**TECHNICAL ENGLISH**

L T P C

(Common to all B.E. / B.Tech. Degree Programmes)

3 0 0 3

**COURSE OUTCOMES**

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

CO1: acquire the basics of English communication skills. (K3)

CO2: apply the basic language skills to understand various aspects of technical writing. (K3)

CO3: understand main ideas, specific details and implied meaning while listening and develop the factual & imaginative information. (K2, S4)

CO4: coordinate and communicate in a wide range of situation. (K3, S4)

CO5: integrate and apply the acquired skills in real life situation. (K2, S4)

**UNIT I****9**

Parts of Speech - Sentence Structure (SV/SVO/SVC/SVIO DO)- Identifying the kinds of sentences (Statement, Interrogative, Imperative, Exclamatory & Negative) - Informal writing (Diary writing & letter to friend / parent / siblings) - Self Introduction -Listening for general information.

**UNIT II****9**

Transformation of words into different grammatical forms- Converting one kind of sentence into another sentence (Statement, Interrogative, Imperative, Exclamatory & Negative) - Technical Vocabulary - Tense Usage (Present tense- Past tense - Future tense - Writing passages in all tenses) -Letter writing (Permission letter & Requisition letter) - Listening for specific information.

**UNIT III****9**

Personality Adjective - Concord - Letter Writing: Invitation / Acceptance letters - Itinerary Writing (with valued points/ situation) - Phonetics (Vowels - Consonants - Diphthongs) - Listening and filling up the information - Process Description (with valued points).

**UNIT IV****9**

IF Conditionals - British & American Vocabulary - Letter Writing (Declining / Thanking letters) - Email writing (with valued points) - Instruction Writing - Listening and giving opinion on the pictures.

**UNIT V****9**

Reading comprehension - Error Spotting (Article, Preposition, Modals and Concord) - Presenting article based on newspaper reading- Situational Conversation - Listening and writing dialogues – Checklists.

**L: 45 TOTAL: 45 PERIODS**

**Suggested Activity:** Each student should read the suggested fiction for oral assignment

### TEXT BOOKS

1. Rizvi. M. Ashraf, "Effective Technical Communication", 1<sup>st</sup> Edition, The Mc Graw Hill Education Private Limited, New Delhi, 2005.
2. Dutt P. K., Rajeevan G. and Prakash C.L.N., "A Course in Communication Skills", 1<sup>st</sup> Edition, Cambridge University Press, India, 2007.

### REFERENCES

1. John Sinclair, "Collins Cobuild English Grammar", 3<sup>rd</sup> Edition, Collins Publishers, London, 2011.
2. Jan Svartvik, Sidney Greenbaum, Geoffery Leech, Randolph Quirk "A Comprehensive Grammar of the English Language", 2<sup>nd</sup> Edition, Longman Inc., Newyork, 2014.
3. Micheael Vince, Peter Sunderland, "Advanced Language Practice with Key", 3<sup>rd</sup> Edition, Macmillan Publishers Limited, Italy, 2003.

**Listening files:** Audio files from net sources,  
Softwares: ODLL, Globerena.

**15SH12C                    MATHEMATICAL FOUNDATIONS FOR ENGINEERS                    L T P C**  
**(Common to all B.E. / B.Tech. Degree Programmes)                    3 2 0 4**

### COURSE OUTCOMES

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

- CO 1: make use of orthogonal transformation. (K3)
- CO 2: use the basic concepts of three dimensional geometry in engineering. (K2)
- CO 3: obtain maxima and minima of real valued functions. (K3)
- CO 4: solve ordinary differential equations. (K3)
- CO 5: solve partial differential equations. (K3)

### UNIT I                    MATRICES                    15

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Independency and dependency of Eigen vectors – Properties of Eigen values and Eigen vectors (excluding proofs) - Diagonalisation of a matrix by orthogonal transformation- Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation and its nature.

### UNIT II                    THREE DIMENSIONAL ANALYTICAL GEOMETRY                    15

Direction cosines and Direction ratios- Planes and Lines - Equations of plane and line - Intersection of two planes - Shortest distance between two lines - Equation of a sphere - Plane section of a sphere - Tangent Plane - Orthogonal spheres.

### UNIT III                    FUNCTIONS OF SEVERAL VARIABLE                    15

Euler's theorem on homogeneous functions of two variables - Taylor's Series - Jacobians - Maxima and Minima - Constrained Maxima and Minima by the method of Lagrange multipliers.

**UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 15**

Solutions of higher order linear differential equations with constant coefficients - Cauchy's and Legendre's linear equations - Solutions of simultaneous first order linear equations with constant coefficients - Method of variation of parameters.

**UNIT V PARTIAL DIFFERENTIAL EQUATIONS 15**

Formation of partial differential equations - Lagrange's linear equations - Solutions of standard types of first order partial differential equations - Solutions of homogeneous linear partial differential equations of second and higher order with constant coefficients.

**L: 45 T: 30 TOTAL: 75 PERIODS**

**TEXT BOOKS**

1. Grewal.B.S. "Higher Engineering Mathematics", 42<sup>nd</sup> Edition, Khanna Publications, Delhi, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> Edition, Wiley India, 2011.

**REFERENCES**

1. Bali.N.P. and Manish Goyal, "A Text book of Engineering Mathematics", 8<sup>th</sup> Edition, Laxmi Publications Private Limited, 2011.
2. George B.Thomas, Jr. Ross L.Finney, "Calculus and Analytic Geometry", 9<sup>th</sup> Edition, Dorling Kindersley Private Limited, 2010.
3. Sharma.G.S and Sarna.I.J.S, "Engineering Mathematics", 10<sup>th</sup> Edition, CBS Publishers and Distributors, New Delhi, 2005.
4. James C. Robinson, "An Introduction to Ordinary Differential Equations", Cambridge University Press, 2004.
5. Anthony Croft, Robert Davison, Martin Hargreaves James Flint, "Engineering Mathematics: A Foundation for Electronic, Electrical, Communications and System Engineers", 4<sup>th</sup> Edition, Pearson Education Private Limited, 2013.

**15SH13C****ENGINEERING PHYSICS****L T P C****(Common to all B.E. / B.Tech. Degree Programmes)****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: summarize the properties and structures of solids. (K2)
- CO 2: define the principles of acoustics and ultrasonics and apply the ultrasonic methods for industrial and medical field. (K2)
- CO 3: choose the appropriate Laser technique for industrial and medical applications. (K3)
- CO 4: describe the different types, fabrication, losses of optical fibers and their applications in communication and instrumentation. (K2)
- CO 5: explain the physical properties of photons & electrons and their applications in different electron microscopes. (K3)



15SH14C

**ENGINEERING CHEMISTRY**  
(Common to all B.E. / B.Tech. Degree Programmes)

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

**COURSE OUTCOMES**

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

- CO 1: identify suitable water treatment techniques for industrial and domestic purpose. (K3)
- CO 2: explain the type of corrosion and corrosion control methods. (K3)
- CO 3: select the polymer for specific application. (K2)
- CO 4: explain the preparation, properties and applications of nano materials. (K2)
- CO 5: outline the principle and instrumentation of various analytical techniques. (K2)

**UNIT I WATER TREATMENT 9**

Types of water - hardness - estimation of hardness of water – disadvantages of using hard water in boiler – oils and silica in water; water softening – internal conditioning – external conditioning – domestic water treatment – desalination.

**UNIT II CORROSION AND ITS CONTROL 9**

Chemical corrosion – electrochemical corrosion – mechanism – different types of electrochemical corrosion – factors influencing corrosion – corrosion control methods.

**UNIT III ENGINEERING POLYMERS 9**

Polymers – polymerization – free radical mechanism – plastics – thermo plastics and thermosetting plastics – processing and moulding of plastics – special polymers: fire retardant, conducting, photonic and electro luminescent polymer; composites – polymer matrix composites.

**UNIT IV NANO MATERIALS 9**

Nanoparticles – synthesis of CNT – precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation – toxic effect of nano materials- properties and applications.

**UNIT V ANALYTICAL TECHNIQUES 9**

Principle, instrumentation and applications of UV-Visible and IR spectroscopy; chromatography: instrumentation and working of gas chromatography and HPLC; conductivity measurements – pH measurements – applications.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Jain P.C. and Jain. M., "Engineering Chemistry", 16<sup>th</sup> Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2013.
2. Dara S.S. and Umare S.S., "A text book of Engineering Chemistry", S.Chand and Company Limited, New Delhi, 2013.
3. Chawla.S, "A text book of Engineering Chemistry", 16<sup>th</sup> Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2015.



## REFERENCES

1. Ahmed Z., "Principles of corrosion engineering and corrosion control", Butterworth Heinemann, 2006.
2. Ebewele R.O., "Polymer science and Technology", CFC Press, Newyork, 2000.
3. Charless P. P. and Frank O. J. , "Introduction to nano technology" John Wiley & Sons, 2008
4. Skoog D.A., James H. F. and Crouch S.R., "Instrumental Analysis", Cengage Learning India Private Limited, New Delhi, 2011
5. Mc Cash E.M. and Banwell C.N., "Fundamentals of molecular spectroscopy", 5<sup>th</sup> Edition, McGraw Hill Education (India) Private Limited, 2013.

15SH15C

**INTRODUCTION TO ENGINEERING**  
(Common to all B.E./B.Tech. Degree Programmes)

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

## COURSE OUTCOMES

Upon Completion of this course, the students will be able to

- CO 1: recognize the history of engineering through various engineering wonders in past and identify the engineering profession. (K2)
- CO 2: recognize and analyse various engineering career paths and preparing for an engineering career. (K3)
- CO 3: understand the profile of engineers in various fields. (K3)
- CO 4: understand the OBE concepts and its components. (K2)
- CO 5: understand learning components and creativity. (K3)

### **UNIT I HISTORY OF ENGINEERING AND INTRODUCTION TO ENGINEERING PROFESSION 7**

**History of Engineering:** Definition of Engineering, The Beginnings of Engineering, Overview of ancient Engineering, Traveling through the Ages, A case study of two historic Engineers – Lionardo da Vincy, Gutenberg.

**Introduction to Engineering Profession:** Engineering work is all around you - Engineering as a profession and common traits of Good Engineers – History of Engineering Disciplines – Functions of Engineering.

### **UNIT II CAREER PATHS OF ENGINEER AND PREPARING FOR AN ENGINEERING CAREER 8**

**Career Paths for Engineers:** The corporate ladder, The independent entrepreneur, Employment Opportunities in Government, The military, Engineering and social service abroad, The Engineering Professor, Graduate work outside of engineering, A mix of two or more of the first six options.

**Preparing for an Engineering Career:** Making the Transition from High School to College - Budgeting Your Time - Daily Studying and Preparation - Getting Involved with an Engineering Organization - Your Graduation Plan - Other Considerations.



CO 5: identify and draw the surface areas of simple solids. (K3, S3, A3)

CO 6: draw perspective views of simple solids and draw the orthographic views of simple objects. (K3, S3, A3)

**UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES 12**

Drawing Instruments- IS specifications on lines- drawing sheets- Printing letters and dimensioning- scales - First angle projection. (Not for examination).

Projections of points and straight lines located in the first quadrant- Determination of true lengths and true inclinations. Projections of regular polygonal surfaces and circular lamina inclined to both reference planes

**UNIT II PROJECTION OF SOLIDS 12**

Projections of simple solids - axis inclined to one reference plane - change of position method.

**UNIT III SECTION OF SOLIDS 12**

Sectioning of simple solids - cutting planes inclined to one reference plane and perpendicular to the other.

**UNIT IV DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS 12**

Development of lateral surfaces of simple and truncated solids - Principles of isometric projection and view of simple solids - truncated prism and pyramids.

**UNIT V PERSPECTIVE PROJECTIONS AND ORTHOGRAPHIC PROJECTIONS 12**

Perspective projection of cube, prisms and pyramids by visual ray method and vanishing point method. Orthographic projection – simple objects with straight and curved surfaces.

**L: 30 P: 30 TOTAL: 60 PERIODS**

**TEXT BOOKS**

1. Bhatt N.D, "Engineering Drawing", 53<sup>rd</sup> Edition, Charotar Publishing House, 2014.
2. Natrajan K.V, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

**REFERENCES**

1. Kumar M.S, "Engineering Graphics", D.D. Publications, 2007.
2. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International Private Limited, 2008.
3. Shah M.B and Rana B.C, "Engineering Drawing", Pearson Education, 2005.
4. Gopalakrishna K.R, "Engineering Drawing", 32<sup>nd</sup> Edition, Subhas Publications, 2005.
5. Dhananjay Jolhe A, "Engineering Drawing with an Introduction to AutoCAD", Tata McGraw Hill Publishing Company Limited, 2008.
6. Basant Agarwal and Agarwal C.M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

15SH17C

**ENGINEERING PHYSICS AND ENGINEERING  
CHEMISTRY LABORATORY**  
(Common to all B.E./B.Tech. Degree Programmes)

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

**PART A – ENGINEERING PHYSICS LABORATORY**

**COURSE OUTCOMES**

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

- CO1: demonstrate the properties of light waves. (K3, S3)
- CO2: interpret the production of ultrasounds and how the velocity of ultrasounds varies with respect to medium.(K3, S3)
- CO3: illustrate the mechanical and electrical properties of materials. (K3, S3)

**LIST OF EXPERIMENTS**

1. Determination of thickness of a thin wire – Air wedge method.
2. Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
3. Determination of Dispersive power of a prism using Spectrometer.
4. Determination of Young's modulus – Uniform bending method.
5. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.
6. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7. Calibration of voltmeter / ammeter using potentiometer.
8. Determination of Frequency of A.C. mains using Sonometer.
9. Determination of the angular divergence of a laser beam using He-Ne laser or diode laser.
10. Determination of temperature coefficient of resistance.

**P:15 TOTAL: 15 PERIODS**

**PART B - ENGINEERING CHEMISTRY LABORATORY**

**COURSE OUTCOMES**

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

- CO 1: estimate the amount of hardness of the water sample (K5, S3)
- CO 2: determine the rate of corrosion (K5, S3)
- CO 3: synthesize a polymer and to determine molecular weight of the polymer (K6, S3)
- CO 4: synthesize silver nano particles (K6,S3)
- CO 5: quantify different ions by different analytical techniques (K5,S3)

**LIST OF EXPERIMENTS**

1. Estimation of hardness of water sample by EDTA method
2. Rate of corrosion- weight loss method
3. Synthesis of urea-formaldehyde resin



## REFERENCES

1. Ramesh Babu V, "Engineering Practices Laboratory Manual", Revised Edition, VRB Publishers Private Limited, Chennai, 2014.
2. Jeyachandran K, Natarajan S. and Balasubramanian S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
3. Jeyapooan T, Saravanapandian M. and Pranitha S, "Engineering Practices Lab Manual", Vikas Publishing House Private Limited, 2006.
4. Rajendra Prasad A and Sarma PMMS, "Workshop Practice", Sree Sai Publication, 2002
5. Kannaiah P and Narayana KL, "Manual on Workshop Practice", Scitech Publications, 1999.

## PART – B ELECTRICAL AND ELECTRONICS LABORATORY

### COURSE OUTCOMES

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

- CO 1: develop simple residential wiring circuits. (K6)
- CO 2: calculate the basic electrical quantities. (K4)
- CO 3: identify the value of resistance using appropriate methods. (K4, A4)
- CO 4: realize the fundamentals of Boolean algebra using digital logic gates. (A4)
- CO 5: practice soldering to design PCB for electronic circuits. (A5)

### I. ELECTRICAL ENGINEERING PRACTICE

8

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair-case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

### II. ELECTRONICS ENGINEERING PRACTICE

7

1. Study of Electronic components and equipments – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO
2. Study of logic gates AND, OR, XOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

**P: 15 TOTAL: 15 PERIODS**

### REFERENCES

1. Jeyachandran K, Natarajan S and Balasubramanian S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.

2. Jeyapoovan T, Saravanapandian M and Pranitha S, "Engineering Practices Lab Manual", Vikas Publishing House Private Limited, 2006.
3. Bawa H.S, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A and Sarma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002.
5. Kannaiah P and Narayana K.L, "Manual on Workshop Practice", Scitech Publications, 1999.

**15IT21C**

**PROFESSIONAL ENGLISH**

**L T P C**

(Common to all B.E. / B.Tech. Degree Programmes)

**3 0 0 3**

**COURSE OUTCOMES**

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

CO 1: contribute the lingual power to frame sentences in different context. (K2, A2)

CO 2: write effectively in any Professional context. (K3, A2)

CO 3: acquire the skills related to Group discussion. (K3, A2)

CO 4: communicate and respond in different social and professional contexts. (K3, A3)

CO 5: recall the acquired skills in solving competitive exam. (K2, S3)

**UNIT I**

**9**

Phrasal Verbs (Based on root words: call, come, get, look, put, run, and take) - Foreign Words and Phrases (from the given list) - Listening to audio files and finding the technical words and framing different sentences - Channel conversion- Descriptive writing on various charts.

**UNIT II**

**9**

Idioms and Phrases (with animal names from the given list) - Report writing (types-structure- stages in report writing- model report) - Job Application Letter with curriculum vitae.

**UNIT III**

**9**

One word substitution (from the list given) Group Discussion (Why is GD a part of selection process? - Structure of GD – Strategies in GD – Team Work - Body Language - Video Samples-GD).

**UNIT IV**

**9**

Choosing a suitable connotation (from the given list) - Note making – Preparing Circular and Minutes of meeting – Listening to TED Talks – Giving opinion on the given TED Talks and interviewing the TED talkers.

**UNIT V**

**9**

Error Spotting (Tense, Relative Pronouns, Conjunctions, Sentence Structure, Adverb Placement) Sentence Completion - Reading comprehension.

**L: 45 TOTAL: 45 PERIODS**

**Activity:** Each student should read the suggested fiction for oral assignment.

### TEXT BOOK

1. Tyagi Kavita and Padma Misra, "Advanced Technical Communication", 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi, 2011.

### REFERENCES

1. Smith-Worthington, Darlene & Sue Jefferson. "Technical Writing for Success", 1<sup>st</sup> Edition, Cengage Mason, USA, 2007.
2. Bovee, Courtland L., John V.Thill. "Business Communication Today", 12<sup>th</sup> Edition, Pearson Education, New Delhi, 2013.
3. Anderson, Paul V. "Technical Communication: A Reader - Centered Approach", 8<sup>th</sup> Edition, Cengage, New Delhi, 2013.

**Listening files:** Audio files from net sources and softwares: ODLL, Globarena.

**15IT22C**

**PROBABILITY AND STATISTICS**

(Common to CSE and IT)

**L T P C**

**3 2 0 4**

### COURSE OUTCOMES

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

- CO 1: grasp the basic concepts of probability and random variables. (K2)
- CO 2: find the correlation and regression of two dimensional random variables. (K2)
- CO 3: characterize the phenomena which evolve with respect to time in a probabilistic manner. (K2)
- CO 4: calculate the various measures of dispersion. (K3)
- CO 5: apply the concepts of estimation and hypothesis testing. (K3)

|   |   |           |
|---|---|-----------|
| <b>UNIT I</b>   | <b>PROBABILITY AND RANDOM VARIABLES</b> | <b>15</b> |
| Permutations and Combinations (Simple Problems)-Basics of Probability-Rules of Probability-Conditional probability- Discrete and continuous random variables – Binomial, Poisson, Uniform and Normal distributions. |   |           |
| <b>UNIT II</b>  | <b>TWO DIMENSIONAL RANDOM VARIABLES</b> | <b>15</b> |
| Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression-Central Limit Theorem.   |   |           |
| <b>UNIT III</b>   | <b>RANDOM PROCESSES</b>                 | <b>15</b> |
| Definitions and Classifications - Markov Process and Markov Chain - Counting Processes - Poisson and Renewal Processes.   |   |           |
| <b>UNIT IV</b>  | <b>STATISTICS</b>                       | <b>15</b> |
| Mean – Median- Mode - Moments- Skewness- Kurtosis – Correlation - Single and bivariate frequency distributions - Regression lines.  |   |           |



## UNIT V SAMPLING THEORY

15

Large samples - Tests on means and proportions for large samples - Test for single variance and equality of variances - Small samples- t- test- F- test - Chi square test.

**L: 45 T: 30 TOTAL: 75 PERIODS**

### TEXT BOOKS

1. Oliver C. Ibe, "Markov Processes for Stochastic Modeling", 2<sup>nd</sup> Edition, Elsevier, Reprint 2013.
2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics: A Modern approach", 10<sup>th</sup> Edition, Sultan Chand & Sons, Delhi.

### REFERENCES

1. Richard Arnold Johnson, Irwin Miller, John E Freund, "Miller and Freund's Probability and Statistics for Engineers", 8<sup>th</sup> Edition, Pearson Education Private Limited, 2013.
2. Ronald E.Walpole, Raymond H.Myres, Sharon L.Myres, Keying E. Ye, "Probability and Statistics for Engineers and Scientists", 9<sup>th</sup> Edition, Pearson Education Private Limited, 2011.
3. Robert V.Hogg, Joseph W.Mckean, Allen Thornton Craig, "Introduction to Mathematical Statistics", 6<sup>th</sup> Edition, Pearson Education Private Limited, 2005.

15IT23C

## PHYSICS OF SOLID STATE DEVICES

(Common to CSE and IT)

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

### COURSE OUTCOMES

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

- CO 1: infer the electrical properties of conducting and superconducting materials. (K2)
- CO 2: explain the basics of semiconductors. (K2)
- CO 3: describe the operation and characteristics of semiconductor diodes. (K2)
- CO 4: express the properties and applications of the optical materials. (K2)
- CO 5: classify the magnetic materials and demonstrate their applications in storage devices. (K2)

## UNIT I CONDUCTING MATERIALS AND SUPERCONDUCTORS

9

### Conductors:

Band theory of solids - Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann Franz law, Quantum free electron theory– Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

### Superconductors:

BCS Theory, Properties - Meissner effect – Isotopic effect, Types of superconductors – Type I and Type II superconductors; Applications of superconductors – Cryotron, SQUID, Magnetic levitation.

**UNIT II SEMICONDUCTORS 9**

Intrinsic semiconductor – carrier concentration – determination of bandgap energy -  
Extrinsic semiconductors – carrier concentration - Hall effect.

**UNIT III SEMICONDUCTOR DIODES 9**

Theory of PN junction diode - Energy Band Structure - Biasing of PN Junction - Forward bias and Reverse bias - current equation - Space charge and diffusion capacitances – effect of temperature and breakdown mechanism, Zener diode and its characteristics, Applications – Half wave and Full wave rectifiers.

**UNIT IV OPTICAL MATERIALS 9**

Optical properties of metals, insulators and semiconductors - Liquid crystal display – LED – Thermography - Solar cell.

**UNIT V MAGNETIC MATERIALS AND STORAGE DEVICES 9**

Types and Properties of magnetic materials - Domain theory of ferro magnetic materials – Ferrites - structure and applications, magnetic recording and readout – storage of magnetic data – tapes, floppy, Hard disk, HD DVD and Flash memory.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. Charles Kittel, "Introduction to Solid State Physics", 7<sup>th</sup> Edition, John Wiley and Sons, Singapore, 2007.
2. David A. Bell, "Fundamentals of Electronic Devices and Circuits", 5<sup>th</sup> Edition, Oxford University Press, 2009.

**REFERENCES**

1. Donald A. Neamen, "Semiconductor Physics and Devices", 4<sup>th</sup> Edition, Tata McGraw Hill Publication, New Delhi, 2012.
2. Salivahanan S, Suresh kumar N and Vallavaraj A, "Electronic Devices and Circuits", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2011.
3. Robert T. Paynter, "Introductory Electronic Devices and Circuits", 7<sup>th</sup> Edition, Pearson Education, 2009.
4. Calister, "Material Science and Engineering: An Introduction", 7<sup>th</sup> Edition, John Wiley and Sons, 2006.

**15IT24C****DIGITAL SYSTEMS****L T P C****3 2 0 4****COURSE OUTCOMES**

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

- CO 1: define the basics of Boolean algebra and illustrate the Boolean functions by logic gates. (K1,S2,A1)
- CO 2: explain and design different types of combinational circuits. (K2,S3)
- CO 3: illustrate the basics of synchronous sequential logic and Registers. (K1,S2)

CO 4: analyze and design asynchronous sequential logic circuits. (K4,S2,A2)

CO 5: classify and explain different types of memories. (K1,S1,A1)

**UNIT I                    BOOLEAN ALGEBRA AND LOGIC GATES                    15**

Review of binary number systems - Binary arithmetic - Binary codes - Boolean algebra and theorems - Boolean functions - Simplifications of Boolean functions using Karnaugh map and tabulation methods - Logic gates.

**UNIT II                    COMBINATIONAL LOGIC                    15**

Design procedure, Half adder, Full Adder, Half subtractor, Full subtractor Parallel binary adder, parallel binary Subtractor, Fast Adder, Carry Look Ahead adder, Serial Adder/Subtractor, BCD adder, Binary Multiplier, Binary Divider, Introduction to Hardware Description Language (HDL).

**UNIT III                    SYNCHRONOUS SEQUENTIAL LOGIC                    15**

Sequential circuits - Latches – Flip-Flops - Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure.

Registers – Shift Registers – Ripple counters – Synchronous Counters.

**UNIT IV                    ASYNCHRONOUS SEQUENTIAL LOGIC                    15**

Introduction – Analysis Procedure – Circuit with Latches – Design Procedure – Reduction of State and Flow Tables – Race-Free state Assignment – Hazards.

**UNIT V                    MEMORY AND PROGRAMMABLE LOGIC                    15**

Memory – Introduction – Random-Access Memory – Memory Decoding – Read only memory. Programmable Logic Array – Programmable Array Logic - Sequential Programmable Devices.

**L: 45 T: 30 TOTAL: 75 PERIODS**

**TEXT BOOKS**

1. Morris Mano M., "Digital Design", 3<sup>rd</sup> Edition, Pearson Education, 2007.
2. Salivahanan S. and Arivazhagan S., "Digital Circuits and Design", 3<sup>rd</sup> Edition, Vikas Publishing House Private Limited, New Delhi, 2006.

**REFERENCES**

1. Thomas L. Floyd, "Digital Fundamentals", 10<sup>th</sup> Edition, Prentice Hall, 2008.
2. Donald P Leach, Albert Paul Malvino, Goutam Saha, "Digital Principles and Applications", 6<sup>th</sup> Edition, Tata McGraw Hill, 2008.
3. Jr. Charles H. Roth and Larry L Kinney, "Fundamentals of Logic Design" (with Companion CD-ROM), 6<sup>th</sup> Edition, Thomson Learning, 2009.
4. Raj Kamal, "Digital Systems: Principles and Design", 1<sup>st</sup> Edition, Prentice Hall, 2009

15IT25C

**C PROGRAMMING FOR ENGINEERS**

(Common to all B.E. / B.Tech. Degree Programmes)

**L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: recognize the system fundamentals and the role of hardware components of the Computer. (K3)
- CO 2: apply the basic concepts and solve simple problems by analyzing the logics of conditional statements and looping constructs. (K3)
- CO 3: handle similar types of data using array and utilize their functionality. (K3)
- CO 4: appreciate the call by value and call by reference features in functions. (K5)
- CO 5: design programs involving their own derived data types, pointers, memory allocation concepts. (K4)
- CO 6: handle the file contents with access permissions. (K3)

**UNIT I COMPUTER FUNDAMENTALS 10**

Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – Classification of Computers – Basic Computer organization – Number Systems – Problem Analysis – Algorithms – Flow charts – Computer Software – Types of Software.

**UNIT II BASIC C PROGRAMMING 9**

Overview of C Program – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operations – Decision Making and Branching – Decision making and Looping.

**UNIT III ARRAYS AND FUNCTIONS 9**

Arrays: One dimensional arrays – Two dimensional arrays – Multi dimensional arrays. Character arrays and Strings: Declaring and initializing String Variables – Comparison of two strings – String handling functions. User defined Functions: Definition – Declaration – Function calls – Category of Functions – Recursion - Storage Classes.

**UNIT IV STRUCTURES AND POINTERS 9**

Structures and Unions: Definition – Declaration – Accessing structures – Initialization of structures – Arrays of structures – Arrays within Structure – Structures within Structures - Structures and functions - Unions. Pointers: Initialization – Pointers and arrays- Array of pointers – Pointers as function arguments – Pointers to functions – Pointers and Structure.

**UNIT V FILES AND DYNAMIC MEMORY ALLOCATION 8**

File management in C – Defining and opening a file – closing a file - Input and Output operations on file – Error handling during IO operations – Random access to files – Command line Arguments. Dynamic memory allocation: Allocating a block of memory - Allocating a multiple block of memory – Releasing the used space – Altering the size of a block.

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOKS

1. Ashok.N.Kamthane, "Computer Programming", Pearson Education, India, 2008.
2. E. Balagurusamy, "Programming in ANSI C", 6<sup>th</sup> Edition Multicolor, 2013.

### REFERENCES

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1<sup>st</sup> Edition, Oxford University Press, 2009
2. Stephen G.Kochan, "Programming in C", 3<sup>rd</sup> Edition, Pearson Education, India, 2005.
3. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., 2005.

15IT26C

**ENVIRONMENTAL SCIENCE AND ENGINEERING**

(Common to all B.E. / B.Tech. Degree Programmes)

**L T P C**

**3 0 0 3**

### COURSE OUTCOMES

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

- CO 1: explain the structure and function of ecosystem. (K2)
- CO 2: recognize the values of biodiversity and natural resources and the ways to protect the biodiversity of his /her locality. (K2)
- CO 3: explain the causes and effects of pollution. (K2)
- CO 4: describe social issues related to the environment and the environment act. (K2)
- CO 5: identify the nutrients in food and impact of metals on human health. (K2)

### UNIT I ENVIRONMENT AND ECOSYSTEMS

9

Scope and importance of environment – need for public awareness – ecosystem – structure and function of an ecosystem – energy flow in the ecosystem – forest and aquatic ecosystems – Field study of simple ecosystems – pond and forest.

### UNIT II BIODIVERSITY AND NATURAL RESOURCES

9

Biodiversity: genetic, species and ecosystem diversity – threats to biodiversity – endangered and endemic species in India – conservation of biodiversity; forest resources: use and over-exploitation – deforestation - dams and their effects on forests and tribal people – water resources: use and overutilization of surface and ground water – role of an individual in conservation of natural resources.

### UNIT III ENVIRONMENTAL POLLUTION

9

Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution and nuclear hazards – solid waste management – e-waste – toxic substances in e-waste – risks related to toxic substances – role of an individual in prevention of pollution.

### UNIT IV SOCIAL ISSUES, HUMAN POPULATION AND ENVIRONMENTAL LAW

9

Water conservation – rain water harvesting – climate change – global warming, acid rain, ozone layer depletion – population growth – population explosion – family welfare programme; environment laws: the water (prevention and control pollution) act, 1974-the

air (prevention and control of pollution) act, 1981-environmental (protection) act,1986-the wild life (protection) act 1972.

**UNIT V FOOD AND HUMAN HEALTH 9**

Carbohydrates, amino acids, proteins, lipids and vitamins in balanced diet food; disease caused by deficiency of carbohydrates, amino acids, proteins, lipids and vitamins - food adulteration - simple test for food adulterants; environmental toxicology: metals in environment- impacts of lead, arsenic, cadmium, mercury and chromium on human health.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Miller G. and Spoolman S, "Environmental Science", 14<sup>th</sup> Edition, Brooks/Cole Publishing Co., 2012.
2. Maczulak A.E., "Environmental Engineering", Facts on file Inc., 2009
3. Han D, "Concise Environmental Engineering", PhD & Ventus Publishing ApS, 2012

**REFERENCES**

1. Weller K. "Environmental Science and Biological Engineering", 1<sup>st</sup> Edition, WIT Press, 2015
2. Strange C. "Environmental Science and production" Nason Trest Publisher, 2010

|                |   |                                  |
|----------------|---|----------------------------------|
| <b>15IT27C</b> | <b>APPLIED PHYSICS AND ENVIRONMENTAL<br/>CHEMISTRY LABORATORY</b><br>(Common to CSE and IT) | <b>L T P C</b><br><b>0 0 2 1</b> |
|----------------|---|----------------------------------|

**PART A – APPLIED PHYSICS LABORATORY**

**COURSE OUTCOMES**

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

- CO 1: demonstrate the properties of optical materials.(K2, S3)
- CO 2: analyze the characteristics of semiconducting materials and diodes and their applications. (K3, S3)
- CO 3: analyze the thermal properties of materials. (K3,S3)

**LIST OF EXPERIMENTS**

1. (a) Determination of wave length of Laser source.  
(b) Particle size determination using Diode Laser.  
(c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2. Determination of Band Gap of a semiconductor material.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. V - I Characteristics of PN junction diode.
5. Half Wave and Full Wave Rectifiers.
6. V - I Characteristics of Zener diode.
7. Zener diode as Voltage Regulator.

8. Characteristics of LED/LCD.

**P:15 TOTAL: 15 PERIODS**

### **PART – B ENVIRONMENTAL CHEMISTRY LABORATORY**

#### **COURSE OUTCOMES**

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

- CO 1: quantify the amount of acidity, alkalinity, DO and COD present in water sample. (K5,S3)
- CO 2: analyse the ions present in the soil. (K4, S3)
- CO 3: quantify the amount of chloride ion in water sample. (K5, S3)
- CO 4: identify the adulteration in food samples. (K1, S3)
- CO 5: estimate the amount of metal ions in water sample. (K5, S3)

#### **LIST OF EXPERIMENTS**

1. Estimation of acidity of Water sample.
2. Estimation of alkalinity of Water sample.
3. Determination of Dissolved Oxygen (DO) in water sample (Winkler's method).
4. Determination of COD in water sample.
5. Soil Analysis: Determination of pH, nitrate, phosphate, chloride and sulphate ions.
6. Soil analysis: Estimation of Na/K/Ca in soil.
7. Estimation of chloride ion in water sample by argentometric method.
8. Simple adulteration test in food samples.
9. Estimation of copper in water sample by EDTA method.
10. Estimation of nickel in water sample.

**P:15 TOTAL: 15 PERIODS**

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.

#### **REFERENCES**

1. Harris D.C. "Quantitative Chemical Analysis: International Edition", 8<sup>th</sup> Edition, W.H.Freeman, 2010.
2. Mendham J. "Vogel's Quantitative Chemical Analysis", 6<sup>th</sup> Edition, Pearson Publisher, 2009.
3. Vogel A.I., "Vogel's Textbook of Quantitative Chemical Analysis", 5<sup>th</sup> Edition, Longman scientific & Technical, 1989.

**15IT28C**

**C PROGRAMMING LABORATORY**

(Common to all B.E. / B.Tech. Degree Programmes)

**L T P C**

**0 0 2 1**

#### **COURSE OUTCOMES**

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

- CO 1: solve the given problem using the syntactical structures of C language. (K3)
- CO 2: develop, execute and document computerized solution for various logic based problems using the flow control features of C language. (K3)

CO 3: enhance the programming skills in C by discriminating constants, variables and arrays and the functionality. (K3)

CO 4: learn about the connection between function return values and variables. (K5)

CO 5: develop programs using string manipulation and file manipulation functions. (K3)

#### Simple programs

1. Solve problems such as temperature conversion, student grading, interest calculation.
2. Solving the roots of a quadratic equation
3. Designing a simple arithmetic calculator. (Use switch statement)
4. Given distance traveled by a vehicle as  $d = ut + \frac{1}{2}at^2$ , where 'u' and 'a' are the initial velocity and acceleration. Calculate the distance traveled for different time intervals

#### Programs using different control structures

5. Performing the following operations:
  - a. Generate Pascal's triangle.
  - b. Construct a Pyramid of numbers.
6. Generation of the first 'n' terms of the Fibonacci sequence and prime sequence.
7. Computing Sine series and Cosine series.
8. Finding the 2's complement of a binary number.

#### Programs using arrays

9. Performing the following operations:
  - a. Matrix addition.
  - b. Transpose of a matrix.
  - c. Matrix multiplication by checking compatibility.

#### Programs using string manipulation

10. Performing the following operations to a string:
  - a. To insert a sub-string into main string at a given position.
  - b. To delete 'n' characters from a given position in a string.
  - c. To replace a character of string either from beginning or ending or at a specified location.

#### Programs using functions

11. Performing the following operations: (Use recursive functions)
  - a. To find the factorial of a given integer.
  - b. To find the GCD (Greatest Common Divisor) of two given integers.
  - c. To solve Towers of Hanoi problem.

#### Programs using files

12. Performing the Student Information Processing using Structures and File handling concepts.

**P: 30 TOTAL: 30 PERIODS**



**15IT29C**

**DIGITAL LABORATORY**

**L T P C**

**0 0 2 1**

**COURSE OUTCOMES**

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

- CO 1: design and implement various applications using gates.
- CO 2: simulate various combinational circuits using VHDL/PSPICE.

**LIST OF EXPERIMENTS**

1. Verification of Boolean theorems using digital logic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices.
4. Design and implementation of parity generator / checker using basic gates and MSI devices
5. Design and implementation of magnitude comparator.
6. Design and implementation of application using multiplexers/Demultiplexers.
7. Design and implementation of Shift registers.
8. Design and implementation of Synchronous and Asynchronous counters.
9. Simulation of combinational circuits using Hardware Description Language (VHDL/ Verilog HDL software required).
10. Simulation Experiments using PSPICE Software.

**P: 30 TOTAL: 30 PERIODS**

**15IT31C**

**DISCRETE MATHEMATICS**

**L T P C**

**3 2 0 4**

**COURSE OUTCOMES**

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

- CO 1: check the validity of the arguments. (K2)
- CO 2: understand the concepts of Sets, Relations and Functions. (K2)
- CO 3: perform the principles of counting and solve recurrence relations. (K3)
- CO 4: interpret the basic concepts of graphs. (K2)
- CO 5: find the Minimum Spanning Tree and Shortest Distance of a graph. (K3)

**UNIT I LOGIC AND PROOFS**

**18**

Propositional Logic – Equivalences and Implications – Normal forms- Predicates and Quantifiers – Nested Quantifiers – Rules of inference – Proof methods and Strategy.

**UNIT II SETS, RELATIONS AND FUNCTIONS**

**15**

Basic Definitions-Set operations –Laws of set theory-Partitions-Relations –Properties of relations-Matrices of relations-Closure of relations –Partial order relation- Functions- Compositions of functions – Bijective functions.

**UNIT III COMBINATORICS 15**

Mathematical induction- Strong induction and well ordering-The basics of counting –The pigeonhole principle-Permutations and combinations –Recurrence relations-Solving Linear recurrence relations –Generating functions-Inclusion and exclusion principle.

**UNIT IV GRAPH THEORY 15**

Graphs and graph models-Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism-connectivity-Euler and Hamiltonian graphs.

**UNIT V ALGORITHMS IN GRAPHS 12**

Basic definition of Trees – Spanning Trees - Dijkstra's and Floyd's algorithms – Prim's algorithms and Kruskal's algorithms

**L: 45 T: 30 TOTAL: 75 PERIODS**

**TEXT BOOKS**

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications (with Combinatorics and Graph Theory)", Sixth Edition, Special Indian Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi (Fifth Edition Reprint, 2008).
2. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Publishers, 2014.
3. Santanu Saha Ray, "Graph Theory with Algorithms and its Applications in Applied Science and Technology", Springer India 2013.

**REFERENCES**

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, 2002.
2. Tremblay J.P and Manohar. R. "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Company Limited, New Delhi, Thirty Fifth Edition Reprint 2008.
3. J.A.Bondy U.S.R.Murty, "Graph Theory", Springer 2008.

**15IT32C DATA STRUCTURES AND ALGORITHMS**

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

**COURSE OUTCOMES**

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

- CO 1: analyze the asymptotic performance of algorithms. (K3)
- CO 2: explain linear data structures for solving computing problems. (K2)
- CO 3: choose the concepts and algorithms of tree structure for solving problems.(K2)
- CO 4: implement algorithms of various sorting and hashing techniques. (K3)
- CO 5: solve computing problems using graph data structures. (K3)

**UNIT I ANALYSIS OF ALGORITHMS 9**

Introduction – Fundamentals of the Analysis of Algorithm Efficiency – Exhaustive Search – Strassen's Matrix Multiplication – Dynamic Programming – Greedy Technique – Backtracking – Branch and Bound.

**UNIT II                  LINEAR DATA STRUCTURES                  9**

Introduction – Abstract Data Types (ADTs) – Array ADT – Singly linked list – Doubly linked list – Stack ADT – Queue ADT – Circular Queue – Applications of linear data structures.

**UNIT III                  TREES                  9**

Tree Terminologies – Binary trees – Expression tree – Binary Search tree – Threaded binary tree - AVL tree – Splay tree – B Tree – Binary Heap - Applications of Binary Heap.

**UNIT IV                  HASHING AND SORTING                  9**

Hashing – Separate chaining – Open Addressing – Rehashing – Insertion sort – Selection sort – Shell sort – Heap sort – Merge Sort – Quick sort - Applications.

**UNIT V                  GRAPHS                  9**

Graph terminologies – Topological sort –traversal – Shortest path algorithms – Network flow problems – Minimum spanning tree – Biconnectivity.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2012.
2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Third Edition, Pearson Education, 2012.

**REFERENCES**

1. D. Samanta, "Classic Data Structures", Second Edition, Prentice Hall, 2012.
2. A.K. Sharma, "Data Structures using C", Second Edition, Pearson, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman, "Data Structures and Algorithms", Pearson Education, 2012.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, MIT Press, 2009.
5. R Krishnamoorthy, "Data Structures Using C", Tata McGraw-Hill Education, 2010.
6. Richard Gilberg, Behrouz Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, Cengage Learning, 2004.

**15IT33C**

**OBJECT ORIENTED PROGRAMMING**

**L T P C**

**3 0 0 3**

**COURSE OUTCOMES**

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

- CO 1: describe the concepts of oop using C++. (K2)
- CO 2: demonstrate the principles of oop using C++. (K3)
- CO 3: explain expressions, branching and looping statements in java. (K2)
- CO 4: develop class and object for real time applications. (K3)
- CO 5: illustrate exception handling, threading and file handling. (K4)

|  |                            |          |
|--|----------------------------|----------|
| <b>UNIT I</b>  | <b>OOP USING C++</b>       | <b>9</b> |
| OOP concepts: Class and Objects – Data encapsulation and abstraction – Inheritance – Polymorphism - C++ fundamentals: Tokens – Expressions – Control Structures – Arrays – Functions |                            |          |
| <b>UNIT II</b>   | <b>PROGRAMMING IN C++</b>  | <b>9</b> |
| Classes and objects – Constructors and Destructors - Operator overloading – Inheritance - Virtual functions – Polymorphism - Templates   |                            |          |
| <b>UNIT III</b>  | <b>JAVA INTRODUCTION</b>   | <b>9</b> |
| Overview of java - Constants - Data types - Variables – Operators – Expressions – Branching and Looping statements – simple programs   |                            |          |
| <b>UNIT IV</b>   | <b>PROGRAMMING IN JAVA</b> | <b>9</b> |
| Class, Objects and Methods – Arrays – Strings – Vectors - case study: Stack class and queue class.   |                            |          |
| <b>UNIT V</b>  | <b>FEATURES OF JAVA</b>    | <b>9</b> |
| Interfaces: Multiple inheritance – Packages – Multithreaded Programming – Managing Errors and Exceptions – Managing Input / output Files in java                                     |                            |          |

**L: 45 TOTAL: 45 PERIODS**

#### **TEXT BOOKS**

1. Balagurusamy.E., "Object Oriented Programming with C++", Sixth Edition, TMH, 2013.
2. Balagurusamy.E., "Programming with Java", Fourth Edition, TMH,2009.

#### **REFERENCES**

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003.
2. Herbert Schildt, "Java the Complete Reference" Ninth Edition, Oracle Press, TMG Education, 2014.

|                |   |                |
|----------------|---|----------------|
| <b>15IT34C</b> | <b>PRINCIPLES OF DATA COMMUNICATION</b> | <b>L T P C</b> |
|                |   | <b>3 0 0 3</b> |

#### **COURSE OUTCOMES**

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

- CO 1: describe the basic concepts of Analog Communications. (K1)
- CO 2: analyze and compare various digital modulation schemes. (K4)
- CO 3: describe the concepts of data communications standards and connectionless protocols. (K1)
- CO 4: illustrates and list the data communication codes mechanisms. (K2)
- CO 5: illustrates the design considerations for access and multiple Spectrum techniques. (K2)

**UNIT I                    FUNDAMENTALS OF ANALOG COMMUNICATION                    9**

Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation, Frequency analysis of angle modulated waves. Bandwidth requirements for Angle modulated waves.

**UNIT II                    DIGITAL COMMUNICATION                    9**

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying - binary phase shift keying - QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery - squaring loop, Costas loop, DPSK.

**UNIT III                    INTRODUCTION TO DATA COMMUNICATION                    9**

Introduction – History of Data communications, Standards Organizations for data communication – Layered Network architecture- data communication circuits – Serial and Parallel Data Transmission –Data Communication Network.

**UNIT IV                    DATA COMMUNICATION CODES                    9**

Introduction –Data communication codes, Bar codes – Error control – Error Detection – Error correction-Data Communication Hardware- Line control Unit – serial Interface –Data Communication modems.

**UNIT V                    SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES                    9**

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and CDMA in wireless communication systems, source coding of speech for wireless communications.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Wayne Tomasi, "Advanced Electronic Communication Systems", Sixth Edition, Pearson Education, 2007.
2. Simon Haykin, "Communication Systems", Fourth Edition, John Wiley & Sons. 2001.

**REFERENCES**

1. H.Taub, D L Schilling, G Saha, "Principles of Communication", Third Edition, 2007.
2. B.P.Lathi, "Modern Analog And Digital Communication systems", Third Edition, Oxford University Press, 2007
3. B.Sklar, "Digital Communication Fundamentals and Applications", Second Edition, Pearson Education, 2007.
4. Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.
5. Martin S.Roden, "Analog and Digital Communication System", Third Edition, PHI, 2002.

15IT35C

**COMPUTER ARCHITECTURE****L T P C****3 0 0 3****COURSE OUTCOMES**

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

CO1: discuss the internal structure and operation of digital computer. (K2)

CO2: apply pipelining technique to improve the performance. (K3)

CO3: classify various types of memory. (K2)

CO4: explain different input and output mechanisms. (K1)

**UNIT I BASIC STRUCTURE OF COMPUTER AND INSTRUCTIONS 9**

Computer Types -Functional units – Basic operational concepts – Bus structures – Software- Performance –Memory location and addressing- Instructions and instruction sequencing – Addressing modes–Assembly language-Basic I/O Operation.

**UNIT II BASIC PROCESSING AND ARITHMETIC UNIT 9**

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control –Addition and subtraction of signed numbers – design of fast adders – Multiplication of positive numbers – signed operand multiplication – Integer division.

**UNIT III PIPELINING 9**

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations –Super scalar operation- Performance considerations.

**UNIT IV MEMORY SYSTEM 9**

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Secondary storage devices.

**UNIT V I/O ORGANIZATION 9**

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processors.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2011.

**REFERENCES**

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Third Edition, Elsevier, 2005.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw- Hill, 1998.
4. V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", Second Edition, Pearson Education, 2004.

15IT36C

**PROFESSIONAL ETHICS AND HUMAN VALUES**

(Common to all Programmes)

**L T P C**

**3 0 0 3**

**COURSE OUTCOMES**

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

CO1: Recognize the core human values that shape the ethical behavior of an engineer. (K2)

CO2: Expose awareness on professional ethics. (K2)

CO3: Analyze the engineering ethical breach from past study. (K2)

CO4: Distinguish and apply safety, responsibility and rights in workplaces. (K2)

CO5: Discuss about the global issues with regard to ethics. (K2)

**UNIT I HUMAN VALUES 9**

Morals, Values and Ethics - Integrity - Work Ethics - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment - Empathy - Self-Confidence - Character – Spirituality.

**UNIT II ENGINEERING ETHICS 9**

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

**UNIT V GLOBAL ISSUES 9**

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors - Moral leadership - sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

**L:45; TOTAL:45 PERIODS**

**TEXT BOOKS**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. GovindarajanM, Natarajan S andSenthil Kumar VS, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

**REFERENCES**

1. Charles D and Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford 2001.

**15IT37C****OBJECT ORIENTED PROGRAMMING LABORATORY****L T P C****0 0 2 1****COURSE OUTCOMES**

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

CO1: implement object oriented programming features using C++/java. (K3)

CO 2: develop a project using C++/java features. (K6)

**LIST OF EXPERIMENTS****C++**

1. Programs Using Functions
  - Functions with default arguments
  - Implementation of Call by Value, Call by Address and Call by Reference
2. Simple Classes for understanding objects, member functions and Constructors
  - Classes with primitive data members
  - Classes with arrays as data members
  - Classes with constant data members
  - Classes with static member functions
3. Compile time Polymorphism
  - Operator Overloading including Unary and Binary Operators.
  - Function Overloading
4. Runtime Polymorphism
  - Inheritance
  - Virtual functions
  - Templates

**JAVA**

5. Simple Java applications
  - for understanding reference to an instance of a class (object), methods
  - Handling Strings in Java
6. Simple Package creation.
  - Developing user defined packages in Java



7. Interfaces
  - Developing user-defined interfaces and implementation
  - Use of predefined interfaces
8. Threading
  - Creation of thread in Java applications
  - Multithreading
9. Exception Handling Mechanism in Java
  - Handling pre-defined exceptions
  - Handling user-defined exceptions
10. Develop a java program for file handling

### Mini Project

Employee payroll calculation, Hospital Management, Bank Management, Library Management, Attendance Calculation, Grade sheet Calculation, Railway Reservation System, Electricity Bill generation, Inventory Control System, ATM System etc

**P: 30 TOTAL: 30 PERIODS**

**15IT38C**

**DATA STRUCTURES LABORATORY**

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

### COURSE OUTCOMES

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

- CO 1: identify and apply appropriate data structure for solving a given problem. (K3)
- CO 2: develop and implement solutions for application of data structures. (K3)

### LIST OF EXPERIMENTS

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Convert infix to postfix expression using Stack.
4. Implement a double-ended queue (dequeue) where insertion and deletion operations are possible at both the ends.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement insertion in AVL trees.
8. Implement priority queue using binary heap.
9. Implement hashing with open addressing.
10. Implement sorting algorithms such as Merge sort, Quick sort, and Heap sort and analyze its complexities.
11. Implement Dijkstra's algorithm to find the shortest path.
12. Implement Prim's algorithm and Kruskal's Algorithm using priority queues to find MST of an undirected graph.

**P: 30 TOTAL: 30 PERIODS**

15IT39C

**COMMUNICATION SKILLS LABORATORY****L T P C**

(Common to all B.E. / B.Tech., Programmes)

**0 0 2 1****COURSE OUTCOMES:**

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

CO 1: interpret any passage after listening and interact at different situations fluently (K2, S3)

CO2: excel appropriately in competitive and professional contexts. (K3, S3)

CO3: acquire the sub-skills required for paper presentations and group discussions which will help them to excel in their workplace. (K3, S3)

**Unit I**

*Lab session:*

- i) Listening to audio files :
  - Conversations
  - Speech
  - TED Talks
  
- ii) Listening and responding to any audio files:
  - Drawing the map
  - Picture completing task
  - Transferring data to Graph.

*Practice session:* On the spot Speaking activities: Just a minute speech, Picture description.

**Unit II**

*Lab session:* Read and understand the comprehension passages given in competitive examinations.

*Practice session:* Giving opinions and suggestions, analyzing a social issue.

**Unit III**

*Lab session:* Listening to audio files related to soft skills.

*Practice session:* Practicing Power point presentation, Group discussion and Interview skills.

**P: 30 TOTAL: 30 PERIODS****REFERENCES**

1. Rizvi.M.Ashraf, "Effective Technical Communication", First Edition, The MC Graw Hill Education Private Limited, Companies, New Delhi, 2010.
2. Sangeetha Sharma and Binod Mishra, "Communication Skills for Engineers and scientists", PHI Learning Private Limited, Delhi, 2009.

**15IT41C APPLIED MATHEMATICS FOR INFORMATION TECHNOLOGY L T P C**  
**2 2 0 3**

**COURSE OUTCOMES**

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

- CO 1: Acquire the basic concepts of Number theory. (K2)
- CO 2: Apply various theorems on congruences. (K3)
- CO 3: Interpret the basic characteristic features of Markovian queues.(K3)
- CO 4: Utilize the concepts of Non Markovian queues. (K3)
- CO 5: Make use of the concepts of queuing theory in Networks. (K3)

**UNIT I FUNDAMENTAL THEOREM OF ARITHMETIC 12**

Introduction – Divisibility- Greatest common divisor - Prime numbers - The fundamental theorem of arithmetic - The series of reciprocals of the primes - The Euclidean algorithm - The greatest common divisor of more than two numbers.

**UNIT II CONGRUENCES 12**

Definition and basic properties of congruences - Residue classes and complete residue systems - Linear congruences - Reduced residue systems and Euler-Fermat theorem - Polynomial congruences modulo  $p$  - Chinese remainder theorem - Applications of Chinese remainder theorem.

**UNIT III MARKOVIAN QUEUEING MODELS 12**

Birth and Death Processes – Single server queuing models (M/M/1)- Multiple server queuing models (M/M/c).

**UNIT IV NON - MARKOVIAN QUEUEING MODELS 12**

General Service and single server queuing models (M/G/1) - General Service and multiple server queuing models (M/G/c)-General Input (G/M/1, G/M/c).

**UNIT V NETWORKS 12**

Series Queues-Open Jackson Networks-Closed Jackson Networks - Cyclic Queues.

**L : 30 T :30 TOTAL: 60 PERIODS**

**TEXT BOOKS**

1. Tom M. Apostol, "Introduction to Analytic Number Theory", Springer – Verlag, New York, Heidelberg, Berlin, Fifth Edition, 1998.
2. Donald Gross, John F.Shortle, James M.Thompson, Carl M.Harris "Fundamentals of Queueing Theory "Wiley India Pvt. Ltd, Fourth Edition, 2013.

**REFERENCES**

1. George E Andrews, "Number Theory", Dover Publications, INC. Newyork, 1995.
2. K.S.Trivedi, "Probability and Statistics with reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2<sup>nd</sup> edition, 2002.

15IT42C

**C# AND .NET FRAMEWORK****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO1: explain the fundamentals of c# and .net. (K2)
- CO2: implement OOPs concepts using c#. (K3)
- CO3: design web Applications using various web based GUI tools. (K3)
- CO4: build Web Applications with ADO.NET. (K3)
- CO5: outline the importance of Web Services. (K2)

**UNIT I INTRODUCTION TO C# AND .NET 8**

C# and the .NET framework - Basics programming with C# - Arrays, Strings, Structures, Enumerations, Classes, Objects.

**UNIT II OBJECT ORIENTED ASPECTS OF C# 10**

Inheritance – Polymorphism – Interfaces - Operator Overloading – Delegates – Events - Errors and Exceptions - Assemblies – Appdomains – Reflection - .NET Remoting - .NET Remoting Architecture - .NET Remoting Features.

**UNIT III WEB APPLICATION DEVELOPMENT 9**

ASP.NET Introduction - Programming Web applications with Web Forms - Web Controls – Master Pages - State management: Session data – Cookies - ASP.NET AJAX.

**UNIT IV ADO.NET 9**

ADO.NET Architecture – ADO.NET Connected and Disconnected Models – XML and ADO.NET – Simple and Complex Data Binding – Data Grid View Class.

**UNIT V WEB SERVICE AND .NET COMPACT FRAMEWORK 9**

Web Services with ASP.NET – SOAP, WSDL, Web Services, .NET Compact Framework – Compact Edition Data Stores.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. E.Balagurusamy, "Programming in C#", Third Edition, Tata McGraw-Hill Education, 2010.
2. Jesse Liberty, Donald Xie, "Programming in C# 3.0", Fifth Edition, O'Reilly, 2007.

**REFERENCES**

1. Christian Nagel et al, "Professional C# 2005 with .NET 3.0", Wiley India, 2007.
2. Andy Wigley, Daniel Moth, Peter Foot, "Mobile Development Handbook", Microsoft Press, 2007.
3. S.Thamarai Selvi and R.Murugesan, "A Textbook on C#", Pearson Education, 2003.
4. Andrew Troelsen, "Pro C# 2010 and the .NET 4 Platform", Fifth Edition, A Press, 2010.

15IT43C

OPERATING SYSTEMS

L T P C

3 0 0 3

### COURSE OUTCOMES

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

- CO 1: explain the history of operating systems and inter process communication methods. (K1)
- CO 2: evaluate various scheduling algorithms and methods of deadlock handling. (K2)
- CO 3: compare various memory management techniques. (K1)
- CO 4: describe various file and I/O access methods. (K3)
- CO 5: discuss about various protection and security methods. (K1)

### UNIT I PROCESSES AND THREADS 9

Introduction to operating systems – Windows Installation - operating system structures – system calls – system programs. Process Management: Processes. Threads: Multi-threading models – Threading issues. Case Study: IPC in Linux.

### UNIT II PROCESS SCHEDULING AND SYNCHRONIZATION 9

CPU Scheduling: Scheduling algorithms. Process Synchronization: The critical-section problem – Semaphores – Classic problems of synchronization. Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Case study: Process scheduling in Linux.

### UNIT III MEMORY MANAGEMENT 9

Main Memory - Virtual Memory: Demand paging – Page replacement – Thrashing - ASLR- Hypervisor types. Case Study: Intel 32 and 64-bit Architectures.

### UNIT IV STORAGE MANAGEMENT 9

Mass Storage Structure: Disk Structure, Disk Scheduling, and Disk Management –swap space management – File System Interface: File concept, Access methods, Directory Structure.

### UNIT V PROTECTION AND SECURITY 9

Principles of protection – Access matrix – Implementation of Access matrix – Access Control – Revocation of access rights – Program threats – System and network threats – User authentication- Firewalling to Protect Systems and Networks. Case Study: Tripwire file system.

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOK

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Ninth Edition, Wiley India Pvt Ltd, 2013.

### REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, Pearson Education, 2014.
2. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2004.
3. Harvey M. Deital, “Operating Systems”, Third Edition, Pearson Education, 2004.

15IT44C

**DATABASE MANAGEMENT SYSTEMS****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO1: explain the role of data, files and databases in information systems. (K1)
- CO2: design databases and pose complex SQL queries of relational databases. (K3)
- CO3: describe normalization and its role in the database design process. (K1)
- CO4: illustrate the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure. (K2)
- CO5: discuss the internal storage structures using different file and indexing techniques. (K1)

**UNIT I INTRODUCTION****9**

Purpose of Database System - Views of data - Data Models - Database Languages - Database Architecture - Database users and Administrator – Entity Relationship model - E-R Diagrams - Introduction to relational databases.

**UNIT II RELATIONAL MODEL****9**

Structure of Relational Databases-The relational Model - Keys - Relational Query Languages -Relational Algebra - Domain Relational Calculus - Tuple Relational Calculus - SQL fundamentals - Integrity - Triggers - Security - Views – Introduction to Distributed Databases and Client/Server Databases.

**UNIT III RELATIONAL DATABASE DESIGN****9**

Features of Good Relational Designs - Functional Dependencies - First, Second, Third Normal Forms, Dependency Preservation - Boyce/Codd Normal Form- Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

**UNIT IV TRANSACTION MANAGEMENT****9**

Transaction Concepts - ACID Properties - A Simple Transaction Model – Serializability - Two Phase Commit - Concurrency - Need for Concurrency - Locking Protocols - Two Phase Locking – Transaction Recovery -Deadlock.

**UNIT V DATA STORAGE AND QUERYING****9**

Overview of Physical Storage Media - RAID - File Organization - Indexing and Hashing - B+ tree Index Files - B tree Index Files - Query Processing Overview - Catalog Information for Cost Estimation - Selection Operation - Sorting - Join Operation-Query Optimization –Transformation of Relational expressions.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2010.

## REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson / Addison Wesley, 2011.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata McGraw-Hill, 2006.
3. S.K.Singh, "Database Systems Concepts, Design and Applications", Second Edition, Pearson Education, 2011.
4. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

**15IT45C**

**SOFTWARE ENGINEERING**

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

## COURSE OUTCOMES

Upon completion of the course the students will be able to

CO1: explain the principles of software development process (K1)

CO2: outline the importance of requirements in software development process (K2)

CO3: construct design patterns using UML (K3)

CO4: apply structured coding techniques to produce quality code (K3)

CO5: evaluate the principal approaches to software testing and maintenance (K4)

### UNIT I INTRODUCTION

**9**

Software Engineering - Software Process - Generic process model - Prescriptive process model - specialized, unified process - Agile development - Agile Process - Extreme Programming - Other agile Process models - Software engineering Knowledge - core principles - Principles that guide each framework Activity.

### UNIT II REQUIREMENTS

**9**

Requirements Engineering - Establishing the Groundwork - Eliciting Requirements - Developing use cases -Building the requirements model - Negotiating, validating Requirements - Requirements Analysis - Requirements Modeling Strategies

### UNIT III DESIGN

**9**

MODELING WITH UML: UML Diagrams - Design concepts - Object Oriented Design Concepts, Design Classes - Design Model: Data, Architectural, Interface, Component, Deployment Level Design Elements.

### UNIT IV SOFTWARE IMPLEMENTATION

**9**

Structured coding Techniques - Coding Styles - Standards and Guidelines - Documentation Guidelines - Modern Programming Language Features: Type checking - User defined data types - Data Abstraction - Exception Handling - Concurrency Mechanism.

**UNIT V TESTING AND MAINTENANCE 9**

TESTING: Software Quality - Software Quality Dilemma- Achieving Software Quality - Strategic Approach to software Testing - Strategic Issues - Strategies for Conventional Software, Object oriented software, Web Apps - Validating Testing - System Testing - Art of Debugging. MAINTENANCE: Software Maintenance - Software Supportability - Reengineering - Business Process Reengineering - Software Reengineering - Reverse Engineering - Restructuring - Forward Engineering - Economics of Reengineering.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. Roger S Pressman, "Software Engineering – A Practitioner’s Approach", Seventh Edition, Tata Mc Graw Hill Education, 2014.
2. Ian Sommerville, "Software Engineering", Ninth Edition, Pearson Education, 2010.

**REFERENCES**

1. Richard Fairley, "Software Engineering Concepts", Tata Mc Graw Hill Education, 2008.
2. Hans Van Vliet, "Software Engineering: Principles and Practices", Third Edition, John Wiley and Sons, 2008.

**15IT46C****GREEN IT**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES**

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

- CO 1: explain various issues in Green Computing. (K2)
- CO 2: enumerate the importance of IT components that conform to low-power computation. (K2)
- CO 3: discuss the ways to make computing greener and more efficient. (K1)
- CO 4: explain the design and redesign of datacenter. (K2)
- CO 5: describe different real time application of Green Computing. (K1)

**UNIT I OVERVIEW AND INITIATIVES 9**

Reasons & Issues to go green: Toxins – Power consumption – Equipment Disposals – Cost Savings: Power saving – Hardware saving – Current initiatives – Global initiatives – Asia Standards.

**UNIT II CONSUMPTION ISSUES 9**

Minimizing power usage: Power problems – Monitoring power usage – Reducing power usage – Low power computers and components – Cooling costs: Reducing cooling costs – Optimizing airflow- Adding Cooling.

**UNIT III GREEN COMPUTING ARCHITECTURE 9**

Rethinking of behavior – paperless communication – Recycling – Hardware considerations.



**UNIT IV GREEN COMPUTING PLATFORMS 9**  
Greening process: Datacenter design and redesign – Virtualization – Savings.

**UNIT V GREEN COMPUTING APPLICATIONS AND CASE STUDIES 9**  
Technological Businesses – Other Organizations – Applying Green IT Strategies and Applications to a Hospital – Packaging Industry and Telecom Sector.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Toby J.Velte, Anthony T.Velte and Robert Elsenpeter, “ Green IT Reduce your Information System’s Environmental impact while Adding to the Bottom Line”, Tata McGraw-Hill, 2008.

**REFERENCES**

1. Wu Chun Feng, “Green Computing: Large-Scale Energy Efficiency”, CRC Press INC, 2013
2. BhuvanUnhelkar, “Green IT Strategies and Applications - Using Environmental Intelligence”, CRC Press, June 2011.
3. Jason Harris, “ Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting”, Lulu Publishers, 2008.

**15IT47C OPERATING SYSTEMS LABORATORY L T P C**  
**0 0 2 1**

**COURSE OUTCOMES**

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

- CO 1: use various system calls in UNIX operating system. (K3)
- CO 2: implement various process scheduling algorithms. (K5)
- CO 3: develop inter-process communication models (K2)
- CO 4: simulate the producer - consumer problem for process synchronization. (K3)
- CO 5: illustrate memory management and file allocation techniques. (K4)

**LIST OF EXPERIMENTS**

(Implement the following on LINUX or other UNIX like platform. Use C for high level language implementation)

1. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, etc.
4. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.

5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
6. Develop application using Inter Process communication (using shared memory, pipes or message queues)
7. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).
8. Implement various memory management schemes.
9. Implement any file allocation technique (Linked, Indexed or Contiguous)

**P: 30 TOTAL: 30 PERIODS**

**15IT48C                      DATABASE MANAGEMENT SYSTEMS LABORATORY                      L T P C**  
**0 0 2 1**

### **COURSE OUTCOMES**

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

- CO1: address a broad range of data management issues including data integrity and security. (K3)
- CO2: design databases and pose complex SQL queries of relational databases. (K3)
- CO3: develop a set of queries in PL/SQL to handle typical user inquiries for information extraction from the database. (K3)
- CO 4: gain a working knowledge of developing and maintaining a small-scale database project. (K3)

### **LIST OF EXPERIMENTS**

1. Creation and Modification of relations
2. Integrity constraint enforcement
3. Nested Queries & Join Queries
4. Creation and Updation of Views
5. Exercises using PL/SQL
6. Nosql
7. High level programming language extensions (Control structures, Procedures and Functions).
8. Creation of Triggers
9. Cursor management
10. Menu Design
11. Database Design and implementation (Mini Project).

### **REFERENCE**

1. Ivan Bayross, Commercial Application Development Using ORACLE Developer 2000, BPB Publications, 2000.

## LAB EQUIPMENTS

Hardware and Software required for a batch of 30 students:

### Hardware:

- 30 Personal Computers

### Software:

- Front end: VB/C#/JAVA
- Back end: Oracle 11g, my SQL, DB2
- Platform: Windows 7
- Oracle server could be loaded and can be connected from individual PCs.

**P: 30 TOTAL: 30 PERIODS**

**15IT49C**

**C# AND .NET FRAMEWORK LABORATORY**

**L T P C**

**0 0 2 1**

## COURSE OUTCOMES

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

- CO1: demonstrate the fundamental concepts of C# and .Net. (K2)
- CO2: experiment and examine runtime errors using exception handling. (K4)
- CO3: develop a simple application using ASP.Net controls. (K6)
- CO4: manipulate Database using ADO.Net. (K3)
- CO5: model web form based applications. (K6)
- CO6: design various real time applications using ASP.NET with ADO.NET. (K6)

## LIST OF EXPERIMENTS

1. Simple Console Application
2. Array, string and structures using C#
3. OO programming concepts
4. Exception Handling Mechanism
5. Simple web application using ASP.net Controls
6. Simple ASP.Net program using web controls
7. Session tracking using user authentication
8. Connected and Disconnected model of ADO.Net
9. Real time application using web services
10. Simple mobile application using .Net compact framework
11. Mini Project

**P: 30 TOTAL: 30 PERIODS**

15IT51C

**EMBEDDED SYSTEMS****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: explain the basic ARM processor functionalities and architecture. (K2)
- CO 2: discuss the Memory and interrupt handling in ARM processor. (K1)
- CO 3: outline the importance of Multi tasking in embedded systems. (K2)
- CO 4: develop basic programs using embedded c and embedded tools.(K3)
- CO 5: describe the working principle of various embedded systems. (K2)

**UNIT I INTRODUCTION****9**

Introduction to microprocessors – Features of 8085 – Architecture - Challenges of Embedded Systems – Embedded system design process - Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets.

**UNIT II MEMORY AND INTERRUPT HANDLING****9**

Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Design Examples: Cell Phones –Digital Still cameras.

**UNIT III MULTIPROCESS AND PERFORMANCE POLICIES****9**

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Design Examples: Compact Discs and DVDs.

**UNIT IV EMBEDDED PROGRAMMING AND TOOLS****9**

Programming embedded systems in assembly and C – Meeting real time constraints – Object-oriented programming with C- Multi-state systems and function sequences - Embedded software development tools – Emulators and debuggers.

**UNIT V CASE STUDY****9**

Design issues and techniques – Case studies – Complete design of example embedded systems.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. Marilyn Wolf, "Computers as Components: Principles of Embedded Computing System Design", Third Edition, Elsevier, 2012.
2. Michael J. Pont, "Embedded C", Pearson Education, 2008.

**REFERENCES**

1. Jean J.Labrosse, "Embedded system building blocks", CMP books, Second Edition, 1999.
2. Arnold berger, "Embedded system design", CMP books, First Edition, 2001.
3. Narayan and gong, "Specifications and design of embedded systems", Pearson education, Second Edition, 1999.

15IT52C

INTERNET AND WEB TECHNOLOGY

L T P C

3 0 0 3

### COURSE OUTCOMES

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

CO1: design and validate web pages using HTML and scripting languages. (K3)

CO2: design dynamic web pages using server side programming. (K3)

CO3: design Web Pages using Java framework (K3)

CO4: develop the Enterprise Applications and Web services. (K3)

### UNIT I INTRODUCTION 9

Client/Server concepts - World Wide Web – HTML 4 – HTML5- CSS-Case study- Website on Education

### UNIT II SCRIPTING LANGUAGES 9

JavaScript –Angular.JS – JQuery - JSON.

### UNIT III SERVER SIDE TECHNOLOGIES 9

Servlet - JSP –Database connectivity- Case study: Book Exchange-MVC paradigm

### UNIT IV JAVA FRAMEWORK 9

Strut- Spring- Hibernate

### UNIT V WEB SERVICES 9

Web service – SOAP – WSDL – Case study: Airline reservation

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOK

1. Jeffrey C.Jackson, "Web Technologies - A Computer Science Perspective", Pearson Education, 2011.

### REFERENCES

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2011.
2. Ravi Kant Soni , Learning Spring Application Development, Packt Publishing, 2015
3. Dane Cameron, A Software Engineer Learns HTML5, JavaScript and jQuery: A guide to standards-based web applications Kindle Edition, 2013
4. James Holmes, Struts: The Complete Reference, 2nd Edition, Mcgraw Hill Education , 2006
5. Andrew Grant, Beginning AngularJS, Apress, 2015
6. Robert. W. Sebesta, "Programming the World Wide Web", 7/E, Pearson Education, 2013.

15IT53C

**COMPUTER NETWORKS****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: describe the fundamentals of data communication and networking. (K1)
- CO 2: analyze the principles of data link layer concepts and issues(K4)
- CO 3: identify the design issues of network layer and apply suitable techniques to solve them. (K3)
- CO 4: implement client-server applications using TCP and UDP (K5)
- CO 5: elaborate the functions of various traditional and modern wireless technologies. (K2)

**UNIT I DATA COMMUNICATION AND NETWORKING 9**

Introduction – Data Communication & Networking Model – Topology – Transmission Media – OSI Model – TCP/IP Protocol suite – Internet Architecture

**UNIT II DATA LINK CONTROL PROTOCOLS 9**

Flow Control: Stop and Wait – Sliding Window – Error Detection & Control Mechanism – HDLC – Medium access: CSMA – Ethernet – Token ring – FDDI

**UNIT III NETWORK LAYER 9**

Circuit Switching – Packet Switching – Principles of Internetworking – Internet Protocols – Routing Metrics – Routing Algorithms – Multicast Routing – IP Addressing – Subnetting.

**UNIT IV TRANSPORT AND APPLICATION LAYER 9**

Duties of Transport layer – TCP – UDP – Congestion Control – Congestion Avoidance – Quality of Service – Socket Basics – WWW – Email– HTTP – FTP – DNS.

**UNIT V ADVANCED TECHNOLOGY 9**

Traditional wireless technology: GSM, GPRS, UMTS, CDMA – Modern wireless technology: Bluetooth, Wi-Fi, WiMax, IMS, LTE and Li-Fi.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. William Stallings, "Data and Computer Communications", Pearson Education, Tenth Edition, 2013.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A systems approach", Morgan Kaufmann Publishers, Fifth Edition, 2011.

**REFERENCES**

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw – Hill, Fifth Edition, 2012.
2. Andrew S.Tanenbaum, David J.Wetherall, "Computer Networks", Pearson Education, Fifth Edition, 2014.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach, Pearson Education, Fifth Edition, 2012.



**TEXT BOOKS**

1. Donald Hearn, M.Pauline Baker, "Computer Graphics – C Version", Pearson Education, Second Edition, 2004
2. F.S. Hill Jr, Stephen Kelley, "Computer Graphics using OPENGL", Prentice Hall Education, Third Edition, 2007.
3. Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications & Applications", Pearson education, 2009.

**REFERENCES**

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics- Principles and practice", Pearson Education, Second Edition, 2007.
2. Tay Vaughan, "Multimedia Making It Work", McGraw Hill, Seventh Edition, 2008

|                |                                       |          |          |          |          |
|----------------|---------------------------------------|----------|----------|----------|----------|
| <b>15IT55C</b> | <b>PROJECT MANAGEMENT AND FINANCE</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                | (Common to all Programmes)            | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**COURSE OUTCOMES**

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

- CO1: Explain the concept of operational and project management. (K2)  
 CO2: Define the scope of a project and develop the project plan. (K2)  
 CO3: Evaluate the technical, business and social environment related to the project. (K3)  
 CO4: Formulate and manage project team successfully. (K5)  
 CO5: Monitor and control projects using tools and techniques. (K3)

**UNIT I BASIC CONCEPT 9**

Concept and categories of project - Project development cycle - Concept, tools and techniques of project management - Logistics and supply chain management - Forms of project organizations.

**UNIT II PROJECT FORMULATION 9**

Project identification, formulation and preparation. Market and demand estimation - Market survey techniques - Demand forecasting. Materials management - Analysis of materials input, technology, production, plant capacity, location and site, civil works, charts, layouts and work schedule. Cost of project - Means of financing, estimates of cost - Financial projections.

**UNIT III PROCESS OF PROJECT APPRAISAL 9**

Technical, Economic, Financial, Legal and Social appraisal of the Industrial Projects. Problems due to rate of discount, wage-rate, exchange rates, treatment of taxes, social cost-benefits - treatment of risk and uncertainty - sensitivity analysis and probability approach - Single as well as multiple projects - Big data analytics - PLM and SLM.



**UNIT IV PROJECT TEAM FORMULATION AND MAXIMIZING PARTICIPATION 9**

Project Team frame works - Project Team cultures - Barriers and challenges - Selecting Team Members - Key skills of effective project leaders - Giving / receiving feedback from different members of the project.

**UNIT V IMPLEMENTATION, MONITORING AND CONTROL OF PROJECTS 9**

Project scheduling, network techniques for resource, cost budgeting and scheduling - project management teams and coordination - Monitoring and post implementation, evaluation of the project - ERP - Project financing.

**L:45; TOTAL:45 PERIODS**

**TEXT BOOKS**

1. Gobalakrishnan P and Ramamoorthy VE "Textbook of Project Management", Macmillan Publications, 2014.
2. Maylor "Project Management", 3<sup>rd</sup> Edition, Pearson, 2010.

**REFERENCES**

1. Gido, "Effective project management", 3<sup>rd</sup> Edition, Cengage Learning, 2008.
2. Gray and Larson, "Project Management: The Managerial Process", 3<sup>rd</sup> Edition, TMH, 2010.
3. Choudhury S, "Project Management", 1<sup>st</sup> Edition, Tata Mc Graw Hill Publishing Co., 2007.

**15IT56C INTERNET AND WEB TECHNOLOGY LABORATORY L T P C  
0 0 2 1**

**COURSE OUTCOMES**

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

- CO1: design and validate the web applications using scripting languages. (K3)
- CO2: design the dynamic web applications using server side programming and web services (K3)
- CO3: design the web applications using Java framework. (K3)

**List of Experiments**

1. Create the web pages using HTML
2. Create the web pages with all types of Cascading style sheets.
3. Form validation using JavaScript, JQuery and AngularJS
4. Write a servlet program to invoke servlets from HTML forms
5. Develop the database web applications using servlet.
6. Develop the database web applications using JSP
7. Create an application using strut
8. Create an application in spring
9. Develop an application for Integrating Hibernate with the Spring Framework
10. Develop web service applications

Mini project

**P: 30 TOTAL: 30 PERIODS**

**15IT57C****NETWORKING LABORATORY****L T P C****0 0 2 1****COURSE OUTCOMES**

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

CO 1: identify and describe the functions of common networking devices. (K2)

CO 2: analyze the structure and organization of networks topology. (K3)

CO 3: develop and implement solutions for application of computer networks. (K3)

**LIST OF EXPERIMENTS**

1. Study of networking devices and troubleshooting commands.
2. Study of switching (L2) and Routing (L3) concepts
3. Create LAN with computers and internetworking devices.
4. Configure a network topology using CISCO Packet Tracer.
5. Sending & Receiving packets with unicast, broadcast and multicast mechanism.
6. Implement ARP/RARP protocol in routing.
7. Configure a network topology using distance vector routing protocols (eg. RIP).
8. Implement link state routing protocols (eg.OSPF) in a network.
9. Sniff and analyse packet capture & network traffic with Wireshark and tcpdump
10. Configure DHCP in an Enterprise Branch Network using CISCO Packet Tracer.
11. Configure Standard Access Control Lists in a Medium-Size Enterprise Branch Office Network using CISCO Packet Tracer.
12. Configure Virtual LANs on the switches in a converged network topology.
13. Configuring Point-to-point protocol authentication using PAP and CHAP.
14. Create & send different type of data control traffic using PackETH (Linux Opensource packet generator)
15. Configure spanning tree protocol using CISCO Packet Tracer

**P: 30 TOTAL: 30 PERIODS****15IT58C****MULTIMEDIA LABORATORY****L T P C****0 0 2 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

CO1: enhance their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information. (K3)

CO2: create and evaluate graphic design projects using computer graphics software. (K4)

**LIST OF EXPERIMENTS**

1. To implement Bresenham's algorithms for line, circle and ellipse drawing.
2. To perform 2D Transformations such as translation, rotation, scaling, reflection and shearing of objects.
3. To implement Cohen-Sutherland 2D clipping and window view port mapping

4. To perform 3D Transformations such as translation, rotation and scaling.
5. To implement Composite 3D transformations.
6. To draw 3D objects and scenes using OPENGL.
7. To convert between color models (RGB, YIQ, CMY & HSV)
8. Implementation of text compression algorithm using RLE and Static Huffman.
9. To implement image compression using Huffman algorithm.
10. To perform animation using any Animation software (Macromedia Flash,Blender,CreaToon etc)
11. To perform basic operations on image using Photoshop /GIMP /any equivalent Image manipulation software

**Software:**

1. C/C++/Java
2. OpenGL 3.7 (precompiled GLUT libraries 3.7 – Open source)
3. Any open source software like GIMP 2.6 / Flash 8.0 / Adobe Photoshop / Blender 2.5

**P: 30 TOTAL: 30 PERIODS**

|                |                                    |                |
|----------------|------------------------------------|----------------|
| <b>15IT61C</b> | <b>SOFTWARE PROJECT MANAGEMENT</b> | <b>L T P C</b> |
|                |                                    | <b>3 0 0 3</b> |

**COURSE OUTCOMES**

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

- CO 1: explain various activities of project management. (K2)
- CO 2: discuss various evaluation techniques. (K3)
- CO 3: plan various activities in the project development. (K1)
- CO 4: describe the software effort estimation techniques. (K1)
- CO 5: analyze the problem and identify suitable team members. (K1)

**UNIT I INTRODUCTION 9**

Project Definition – Software projects versus other types of project – Activities Covered by Software Project Management – Plans, methods and methodologies – Stakeholders – Project success and failure

**UNIT II PROJECT MANAGEMENT 9**

Project portfolio management - Evaluation of individual projects – Cost Benefit Evaluation Techniques – Risk Evaluation- Program management - Strategic program management - Benefits management

**UNIT III ACTIVITY PLANNING 9**

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management.

**UNIT IV SOFTWARE EFFORT ESTIMATION 10**

Problems with over and under estimate - The basis for software estimation - software estimation Techniques. Bottom-up estimating - The top-down approach and parametric models - Expert judgments, Estimation by analogy, Function point –COCOMO: a parametric model.

**UNIT V PEOPLE MANAGEMENT AND TEAM ORGANIZATION 8**

Organizational behavior – Selecting the right person for the job- Instruction in the best methods – Motivation – The Oldham–Hackman job characteristics model – Stress – Health and safety - Becoming a team – Decision making – Organizational Structure – Leadership.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. Bob Hughes, Mikecoterell, “Software Project Management”, Fifth Edition, Tata McGraw Hill, New Delhi, 2011.

**REFERENCES**

1. Kelkar Sa, “Software Project Management”, Third Edition, PHI Learning, New Delhi, 2012.
2. Gopaldaswamy Ramesh, “Managing Global Software Projects”, Tata McGraw Hill, New Delhi, 2006.
3. Roger S Pressman, “Software Engineering, A Practitioner’s Approach”, Sixth Edition, Tata McGraw Hill, New Delhi, 2009.
4. Kamna Malik, Praveen Choudary, “Software Quality, a practitioner’s Approach”, Tata McGraw Hill, New Delhi, 2009.

**15IT62C****ENTERPRISE MOBILITY****L T P C****3 0 0 3****COURSE OUTCOMES**

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

CO1: use various scripting technologies. (K1)

CO2: explain the devices, platform, and layers in Mobile Architecture. (K1)

CO3: develop simple mobile applications using mobile platforms. (K3)

CO4: describe advanced technologies in mobility. (K1)

**UNIT I INTRODUCTION 9**

Development in Web Standards - HTML5 – Java script - Event programming in Java

**UNIT II ENTERPRISE MOBILITY ARCHITECTURE 9**

Innovations in Mobile Device platforms-Enterprise mobility landscape- Enterprise mobility layer-Mobility solution architecture

**UNIT III MOBILE PLATFORMS AND DESIGN 9**

Mobile platforms- Mobile application designing

**UNIT IV MOBILE PROGRAMMING 9**

Mobile programming: Android – iPhone - Windows Phone - Windows mobile - Case study:  
Mobility solutions for healthcare

**UNIT V TECHNOLOGIES IN MOBILITY 9**

Mobile security- Mobile NFC - Device capabilities in App location – Mobile cloud computing.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Jithesh Sathyan, Anoop N, Navin Narayan , Shibu Kizhakke Vallathai, “A Comprehensive Guide to Enterprise Mobility”, CRC Press, 2013.

**REFERENCES**

1. Zak Ruvalcaba and Anne Boehm, “Murachs HTML5 & CSS3 ”, Mike Murach & Associates Inc, Third edition , 2015.
2. Nicholas C. Zakas, “Professional Javascript For Web Developers”, Third Edition, Wiley India Pvt Ltd, 2012.
3. Greg Shackles, “Mobile Development with C#: Building Native IOS, Android, and Windows Phone Applications (Paperback)”, O'Reilly Media Publishers, 2012.
4. Sumi Helal, Raja Bose, Wengdong Li, “Mobile Platforms and Development Environments (Paperback)”, Morgan & Claypool Publishers, 2012.

**15IT63C DATA ANALYTICS AND BUSINESS INTELLIGENCE L T P C  
3 0 0 3**

**COURSE OUTCOMES**

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

- CO1: apply linear and logistic regression models for analyzing the data. (K3)
- CO2: illustrate the casual inference using regression models. (K2)
- CO3: describe multilevel regression models. (K1)
- CO4: explain data collection and variance analysis. (K2)

**UNIT I LINEAR REGRESSION 9**

Introduction to data analysis – Statistical processes – statistical models – statistical inference – review of random variables and probability distributions – linear regression – one predictor – multiple predictors - prediction and validation – linear transformations – centering and standardizing – correlation – logarithmic transformations – other transformations – building regression models – fitting a series of regressions

**UNIT II LOGISTIC AND GENERALIZED LINEAR MODELS 9**

Logistic regression – logistic regression coefficients – latent - data formulation – building a logistic regression model – logistic regression with interactions – evaluating, checking, and

comparing fitted logistic regressions – identifiability and separation – Poisson regression – logistic – binomial model - Probit regression – multinomial regression – robust regression using t model – building complex generalized linear models – constructive choice models

**UNIT III SIMULATION AND CAUSAL INFERENCE 9**

Simulation of probability models – summarizing linear regressions – simulation of non – linear predictions – predictive simulation for generalized linear models – fake - data simulation – simulating and comparing to actual data – predictive simulation to check the fit of a time series model – causal inference randomized experiments – observational studies – causal inference using advanced models – matching - instrumental variables

**UNIT IV MULTILEVEL REGRESSION 9**

Multilevel structures – clustered data – multilevel linear models – partial pooling – group – level predictors – model building and statistical significance – varying intercepts and slopes – scaled inverse - Wishart distribution – non-nested models – multi-level logistic regression – multi-level generalized linear models

**UNIT V DATA COLLECTION AND MODEL UNDERSTANDING 9**

Design of data collection – classical power calculations – multilevel power calculations – power calculation using fake - data simulation – understanding and summarizing fitted models – uncertainty and variability – variances – R<sup>2</sup> and explained variance – multiple comparisons and statistical significance – analysis of variance – ANOVA and multilevel linear and general linear models – missing data imputation.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Andrew Gelman and Jennifer Hill, "Data Analysis using Regression and multilevel / Hierarchical Models", Cambridge University Press, 2007.

**REFERENCES**

1. Philipp K. Janert, "Data Analysis with Open Source Tools", O'Reilley, 2010.
2. Wes McKinney, "Python for Data Analysis", O'Reilley, 2012.
3. Robert Nisbelt, John Elder, and Gary Miner, "Handbook of statistical analysis and data mining applications", Academic Press, 2009.
4. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
5. David Ruppert, "Statistics and Data Analysis for Financial Engineering", Springer, 2011.

**15IT64C CRYPTOGRAPHY AND NETWORK SECURITY**

**L T P C**  
**3 2 0 4**

**COURSE OUTCOMES**

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

- CO 1: apply conventional encryption techniques for solving problems. (K3)
- CO 2: explain the concepts and algorithms of symmetric and asymmetric key encryption. (K2)
- CO 3: construct a message digest and digital signature for securing a system. (K6)
- CO 4: describe the various authentication and internet security protocols. (K1)
- CO 5: outline the importance of security in wireless networks. (K1)

**UNIT I ELEMENTARY CRYPTOGRAPHY 15**

Security Goals – Attacks, Services and mechanisms - Substitution Ciphers, Transposition Ciphers - Stream and Block Ciphers - Mathematics for Cryptography – Applied Cryptography

**UNIT II SYMMETRIC AND ASYMMETRIC ALGORITHMS 15**

Data Encryption Standards - Advanced Encryption Standard – RC5 - Asymmetric key algorithms - Diffie Hellman Key Exchange - RSA Cryptosystem – Case Study: Key Exchange in Sensor Networks

**UNIT III DATA INTEGRITY TECHNIQUES 15**

Message Authentication Code – MD5 – Hash Functions – SHA 512 – Whirlpool - HMAC – Digital Signatures: DSS – Fast one time signature (Lamport).

**UNIT IV AUTHENTICATION PROTOCOLS 15**

Protocols for Internet Security – SSH (Remote Login Protocol) – Kerberos – SSL – TLS - PKI

**UNIT V WIRELESS NETWORK SECURITY 15**

Wired Equivalent privacy - Wireless Network Threats – Measures – Mobile Device Security – Security in Wireless networks – WAP Security

**L: 45 T: 30 TOTAL: 75 PERIODS**

**TEXT BOOK**

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Pearson Education, Sixth Edition, 2014.

**REFERENCES**

1. Behrouz A. Foruzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw-Hill, Second Edition, 2010.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, Eighth Edition, 2006.
3. Abhijit Das, C.E.Veni Madhavan, "Public Key Cryptography, Theory and Practice", Pearson Education, 2009.
4. Wenbo Mao, "Modern Cryptography: Theory and Practice", Pearson Education, 2007.

15IT65C

**CLOUD COMPUTING****L T P C****3 2 0 4****COURSE OUTCOMES**

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

- CO 1: describe the fundamentals of cloud computing. (K2)
- CO 2: distinguish the various cloud services. (K2)
- CO 3: explain collaborations on cloud computing. (K2)
- CO 4: analyze the different cloud services. (K4)
- CO 5: illustrate the different social networks and groupware. (K3)

**UNIT I INTRODUCTION 15**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Types - Advantages – Disadvantages – Case Study: Companies in the Cloud Today

**UNIT II DEVELOPING CLOUD SERVICES 15**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds – Case study: Amazon Web Service.

**UNIT III CLOUD COMPUTING FOR EVERYONE 15**

Centralizing Email Communications – Collaborating on Schedules, To-Do Lists, Contact Lists, Group Projects and Events – Cloud Computing for the Community, Corporation – Case study: RTM, Google contact lists

**UNIT IV USING CLOUD SERVICES 15**

Collaborating on Calendars, Schedules, and Task Management – Exploring Online Scheduling Applications – Collaborating on Event, Contact and Project Management – Collaborating on Word Processing and Databases – Storing and Sharing Files- Case study: Yahoo calendar, Google calendar

**UNIT V OTHER WAYS TO COLLABORATE ONLINE 15**

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services and Web Conference Tools – Collaborating via Social Networks and Groupware – Blogs and Wikis – Case study: Facebook, Whatsapp

**L: 45 T: 30 TOTAL: 75 PERIODS****TEXT BOOK**

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", First Edition, Que Publishing, 2009.

**REFERENCES**

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Second Edition, Emereo Pvt Limited, 2009.
2. <http://thecloudtutorial.com/>



**15IT66C**

**DATA ANALYTICS LABORATORY**

**L T P C**

**0 0 2 1**

**COURSE OUTCOMES**

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

- CO1: analyze various business modeling methods with the knowledge of spreadsheets and data analysis software (K3)

**List of Experiments**

1. Descriptive Statistics
2. Hypothesis – Parametric
3. Hypothesis – Non-parametric
4. Correlation & Regression
5. Forecasting
6. Portfolio Selection
7. Risk Analysis & Sensitivity Analysis
8. Revenue Management
9. Transportation & Assignment
10. Networking Models
11. Queuing Theory
12. Inventory Models

**P: 30 TOTAL: 30 PERIODS**

**15IT67C**

**MOBILE TECHNOLOGIES LABORATORY**

**L T P C**

**0 0 2 1**

**COURSE OUTCOMES**

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

- CO1: develop mobile applications. (K3)  
CO2: create mobile database applications. (K3)

**LIST OF EXPERIMENTS**

1. Develop mobile applications that use User Interface Components
2. Develop an application using Layout Managers and event listeners.
3. Develop a mobile application for loading images to the SD card
4. Develop mobile applications using SQLITE
5. Develop mobile applications using external database.
6. Implement an application that creates an alert upon receiving a message.
7. Write a mobile application that creates alarm clock
8. Mini project

**Software**

- ADT bundle
- XCODE

**P: 30 TOTAL: 30 PERIODS**

|                |                                       |          |          |          |          |
|----------------|---------------------------------------|----------|----------|----------|----------|
| <b>15IT68C</b> | <b>PRODUCT DEVELOPMENT LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                                       | <b>0</b> | <b>0</b> | <b>4</b> | <b>2</b> |

**COURSE OUTCOMES**

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

- CO 1: understand the integration of customer requirements in product design.
- CO 2: Apply structural approach to concept generation, selection and testing.
- CO 3: Understand various aspects of design such as industrial design, design for manufacture.

The objective of this course is to make the students learn methodologies for identifying customer needs, developing new product concepts, prototype development, estimation of manufacturing costs, and developing business plans to support the development and marketing of these products. A student or a team of students shall develop their own products based on the users need, build simple prototypes of their design, and write development plans for the products.

**P: 60 TOTAL: 60 PERIODS**

|                |   |          |          |          |          |
|----------------|---|----------|----------|----------|----------|
| <b>15IT72C</b> | <b>RESEARCH PAPER AND PATENT REVIEW –<br/>SEMINAR</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> |

The Students will make a technical presentation on current topics related to the specialization. The same will be assessed by a committee appointed by the department. The students are expected to submit a report at the end of semester covering the various aspects of his/her presentation.

**P: 30 TOTAL: 30 PERIODS**

|                |                      |          |          |          |          |
|----------------|----------------------|----------|----------|----------|----------|
| <b>15IT73C</b> | <b>COMPREHENSION</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> |

**COURSE OUTCOMES**

Upon Successful completion of this course, the students will be able to

- CO 1: Recall and Debug programs in various languages. (K2)
- CO 2: Improve the technical skills to face competitive exams. (K3)

**Guidelines**

- A group of three students may be assigned to discuss a particular subject in each hour. The cycle should be repeated throughout the semester.
- Periodic review, Assignments, case study should be filed properly and it will be reviewed by the subject experts. During the end of semester it should be evaluated by Examiners.

| S. No | Subject Area                     | Responsible   | Internal (50 Marks) |  | External (50 Marks)  |  |  |
|-------|----------------------------------|---------------|---------------------|--|--|--|--|
|       |                                  |               | Weight age          | Assessment Methods   |  |  |  |
| 1.    | OOP using Java                   | DEG-1<br>CC-2 | 20                  | Objective test,<br>Assignments,<br>Minute paper,<br>Seminars &<br>case study | A panel of two members will be evaluating the students.<br><br>Written – 30<br>Oral(VV) – 20 |  |  |
| 2.    | C# and .NET Framework            |               |                     |  |  |  |  |
| 3.    | Data Structures                  |               |                     |  |  |  |  |
| 4.    | Database Management Systems      |               |                     |  |  |  |  |
| 5.    | Computer Architecture            | DEG-1<br>CC-2 | 15                  |  |  | Objective test,<br>Assignments,<br>Minute paper,<br>Seminars &<br>case study | A panel of two members will be evaluating the students.<br><br>Written – 30<br>Oral(VV) – 20 |
| 6.    | Digital Systems                  |               |                     |  |  |  |  |
| 7.    | Embedded Systems                 |               |                     |  |  |  |  |
| 8.    | Operating Systems                |               |                     |  |  |  |  |
| 9.    | Computer Networks                |               |                     |  |  |  |  |
| 10.   | Principles of Data Communication |               |                     |  |  |  |  |
| 11.   | Software Engineering             |               |                     |  |  |  |  |
| 12.   | Internet and Web Technology      | DEG-1<br>CC-2 | 15                  |  |  |  |  |

(DEG – Domain Expert Group, CC – Course Coordinator)

**P: 30 TOTAL: 30 PERIODS**

**15IT81C**

**PROJECT WORK**

**L T P C**

**0 0 20 10**

**GUIDELINES**

- Maximum of three students can be formed as a team
- The project must be a discovery of new facts or techniques or correlation of facts already known which may be of analytical, experimental, hardware oriented projects.
- Periodical review will be conducted

| Internal Evaluation |   |  |            |                    |
|---------------------|---|--|------------|--------------------|
| Evaluation          | Contents  | Evaluation committee   | Weight age | Duration           |
| Review1             | <ul style="list-style-type: none"> <li>• Problem identification in emerging technologies (Social/E-Governance/ etc)</li> <li>• Literature review</li> </ul> | <ul style="list-style-type: none"> <li>• A panel of 3 internal expert members (depends upon the Domain Expert Group) review the oral presentation</li> </ul> | 20         | 4 months (VII Sem) |

|  |  |   |    |                     |
|--|--|---|----|---------------------|
| Review2  | <ul style="list-style-type: none"> <li>• Technology feasibility</li> <li>• Proposed methodology</li> <li>• 50% of implementation</li> </ul>        | <ul style="list-style-type: none"> <li>• A panel of 3 internal expert members (depends upon the Domain Expert Group) review the oral presentation</li> <li>• Implementation will be reviewed by respective guides</li> </ul>  | 30 | 2 Months (VIII Sem) |
| Review3  | <ul style="list-style-type: none"> <li>• 100 % of implementation</li> <li>• Report preparation</li> <li>• Conference/Journal submission</li> </ul> | <ul style="list-style-type: none"> <li>• A panel of 3 internal expert members (depends upon the Domain Expert Group) review the oral presentation</li> <li>• Implementation and report preparation will be reviewed by the respective guides and internal expert members</li> </ul> | 50 | 2 Months (VIII Sem) |
| <b>External Evaluation</b>                                       |  |   |    |                     |
| External Examiner reviews the oral presentation of the students. |  |   |    |                     |

15IT01E

DISTRIBUTED DATABASES

L T P C  
3 0 0 3**COURSE OUTCOMES**

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

- CO1: explain the features of distributed database. (K2)
- CO2: apply query optimization principles for optimizing query performance (K3)
- CO3: interpret distributed transaction and concurrency control principles in distributed database applications. (K3)
- CO4: apply reliability and distributed database administration principles for managing distributed database. (K3)
- CO5: describe the query processing and transaction management in Object DBMS. (K2)

**UNIT I INTRODUCTION TO DISTRIBUTED DATABASES 9**

Features of Distributed versus Centralized Databases - Principles of Distributed Databases - Levels of Distribution Transparency - Reference Architecture for Distributed Databases - Types of Data Fragmentation - Integrity Constraints in Distributed Databases.

**UNIT II DISTRIBUTED QUERY PROCESSING AND OPTIMIZATION 9**

Translation of Global Queries to Fragment Queries - Equivalence Transformations for Queries - Transforming Global Queries into Fragment Queries - Distributed Grouping and Aggregate Function Evaluation - Parametric Queries - Optimization of Access Strategies - A Framework for Query Optimization - Join Queries - General Queries.

**UNIT III TRANSACTIONS AND CONCURRENCY CONTROL 9**

The Management of Distributed Transactions - A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions - Concurrency Control for Distributed Transactions – Foundations of Distributed Concurrency Control - Distributed Deadlocks - Concurrency Control based on Timestamps - Optimistic Methods for Distributed Concurrency Control.

**UNIT IV RELIABILITY 9**

Reliability - Nonblocking Commitment Protocols - Reliability and concurrency Control - Determining a Consistent View of the Network - Detection and Resolution of Inconsistency - Checkpoints and Cold Restart - Distributed Database Administration.

**UNIT V DISTRIBUTED OBJECT DBMS 9**

Architectural Issues - Object Management - Distributed Object Storage - Object Query Processing - Transaction Management: Transaction Management in Object DBMSs - Transactions as Objects.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Stefano Ceri, Giuseppe Pelagatti, "Distributed Database Principles & Systems", Second Edition, McGraw-Hill, 2008.
2. M.Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Third Edition, Springer, 2011.

**REFERENCES**

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2009.
2. Saeed K. Rahimi, Frank S. Haug, "Distributed Database Management Systems: A Practical Approach", Wiley, 2010.
3. Ray, Chhanda, "Distributed Database Systems", Pearson Education, India, 2009.

15IT02E

**ADVANCED DATABASE SYSTEMS****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO1: explain distributed database architectures and models in different application contexts. (K1)
- CO2: design object model to manipulate an object database. (K3)
- CO3: design PHP-based web application. (K3)
- CO4: explain mobile and active databases. (K1)

**UNIT I DISTRIBUTED DATABASES 9**

Database System Architectures: Centralized and Client-Server Architectures –Distributed Database Concepts – Distributed Database Design – Types – Distributed Query Processing – Concurrency control - Recovery control - Three Tier Client Server Architecture- Distributed Database in Oracle.

**UNIT II OBJECT RELATIONAL DATABASES 9**

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL / Oracle.

**UNIT III WEB DATABASES 9**

Web Database Programming Using PHP: Structured, Semi structured and Unstructured Data –PHP – PHP Database Programming – Data Mining - Data Warehousing and OLAP.

**UNIT IV EMERGING TECHNOLOGIES 9**

Mobile Databases: Mobile Computing Architecture – Multimedia Databases- Geographic Information Systems (GIS).

**UNIT V INTELLIGENT DATABASES 9**

Active Database concepts – Temporal Database concepts - Spatial Database concepts- Deductive Databases.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education/Addison Wesley, 2010.

**REFERENCES**

1. Henry F Korth, Abraham Silberschatz and S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2011.
2. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.







Virtualized, and Cloud Environments”, Second Edition, EMC Education Services, Wiley India Pvt. Ltd., March 2012.

## REFERENCES

1. Robert spadling, “Storage networks: The complete reference”, Second Edition, Tata McGrawhill / Osborne, 2003.
2. Marc Farley, “Building storage networks”, Tata McGraw Hill, Second Edition, Tata McGrawhill / Osborne, 2001.

**15IT05E**

**BIOMETRICS**

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

## COURSE OUTCOMES

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

- CO1: explain the fundamentals of biometrics. (K2)
- CO2: discuss the flow of processing in various biometric techniques (K2)
- CO3: describe automated biometric authentication techniques. (K2)
- CO4: describe the biometric standards and privacy risks. (K1)
- CO5: discuss various applications of biometrics. (K2)

### **UNIT I INTRODUCTION 9**

Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes – Performance measures in biometric systems – Basic Biometric System Operations.

### **UNIT II PHYSIOLOGICAL BIOMETRICS 9**

Finger scan – Facial scan – Iris scan – Voice scan – Hand Scan, Retina Scan - components, working principles, competing technologies, strengths and weaknesses.

### **UNIT III AUTOMATED BIOMETRIC SYSTEM AND BEHAVIOURAL BIOMETRICS 9**

Automated fingerprint identification systems – Signature scan – Keystroke scan – components, working principles, strengths and weaknesses.

### **UNIT IV PRIVACY AND STANDARDS IN BIOMETRICS 9**

Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

### **UNIT V BIOMETRIC APPLICATIONS 9**

Categorizing biometric applications – application areas: criminal and citizen identification, surveillance, PC/network access, e-commerce and retail/ATM – costs to deploy – other issues in deployment

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Samir Nanavati, Michael Thieme, Raj Nanavati, "Biometrics – Identity Verification in a Networked World", Wiley – dream tech India Pvt Ltd, New Delhi, 2002.
2. Paul Reid, "Biometrics for Network Security", Pearson Education, New Delhi, 2004.

**REFERENCES**

1. John R Vacca, "Biometric Technologies and Verification Systems", Elsevier Inc, 2007.
2. Anil K Jain, Patrick Flynn, Arun A Ross, "Handbook of Biometrics", Springer, 2008.
3. Jain, Anil K.; Ross, Arun A. & Nandakumar, Karthik, "Introduction to Biometrics", Springer, 2011.
4. Eliza Yingzi Du, "Biometrics, From Fiction to Practice", Pan Stanford Publishing, 2013.

**15IT06E****BIO INFORMATICS****L T P C  
3 0 0 3****COURSE OUTCOMES**

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

- CO1: explain the fundamentals of bioinformatics. (K2)
- CO2: describe the organization of databases. (K2)
- CO3: identify the data mining tools for Bioinformatics. (K4)
- CO4: explain various machine learning and prediction algorithms (K2)

**UNIT I INTRODUCTION 9**

Overview of structural Bioinformatics: Characteristics – Categories - Navigation and information retrieval of Bioinformatics databases.

**UNIT II DATABASES 9**

Description and Organization of Sequence - Structure and Other databases-Data Warehousing and data mining in Bioinformatics.

**UNIT III TOOLS 9**

Need for tools - Knowledge discovery - Industry trends and data mining tools - Data submission tools - Data analysis tools - Prediction tools and modeling tools.

**UNIT IV MACHINE LEARNING 9**

Neural network - Genetic and fuzzy logic applications in Bioinformatics - Modeling for Bioinformatics – Hidden Markov – Comparative - probabilistic and molecular modeling.

**UNIT V ALGORITHMS 9**

Classification algorithms - Implementing algorithms - biological algorithms - bioinformatics tasks - corresponding algorithms - bioinformatics software - Data analysis algorithms - Sequence comparison - Substitution matrices and sequence alignment optimal algorithm -

Prediction algorithms - Gene prediction - Phylogenetic prediction - protein structure prediction algorithms.

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOKS

1. Orpita Bosu and Simminder Kaur Thukral, "Bioinformatics Databases, Tools and Algorithms", First Edition, Oxford University press, New Delhi, 2007.
2. Yi – Ping Phoebe Chen, "Bioinformatics Technologies", Springer International Edition, New Delhi, 2014.

### REFERENCES

1. Harshawardhan P.Bal, "Bioinformatics principles and applications", TataMcGraw Hill Publishing Company Ltd, New Delhi, 2007.
2. Kenneth Baclawski, Tianhua Niu," Bioinformatics", Jaico Publishing House, Delhi, 2007.
3. Lukas K. Beehler and Hooman H. Rashidi, "Bioinformatics basics Applications in biological science and medicine", Taylor and Francis Group, 2005.

**15IT07E**

**ANALYTIC COMPUTING**

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

### COURSE OUTCOMES

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

- CO1: explain about descriptive statistics and probability distributions.(K2)
- CO2: describe about machine learning approaches. (K1)
- CO3: illustrate about association rule mining and big data. (K2)
- CO4: explain about clustering analysis for data. (K2)

|  |   |           |
|--|---|-----------|
| <b>UNIT I</b>  | <b>DESCRIPTIVE STATISTICS</b>                         | <b>9</b>  |
| The Role of Statistics in Engineering - Descriptive Statistics: Sampling Distributions and Point Estimation of Parameters - Statistical Intervals - Tests of Hypotheses. |   |           |
| <b>UNIT II</b>   | <b>PROBABILITY DISTRIBUTIONS</b>                      | <b>9</b>  |
| Probability Distributions: Discrete Random Variables- Continuous Random Variables - Joint Probability Distributions – Regression   |   |           |
| <b>UNIT III</b>  | <b>MACHINE LEARNING</b>                               | <b>11</b> |
| Introduction to Machine Learning - Supervised Learning - Support Vector Machines -- Neural Networks -Deep Learning   |   |           |
| <b>UNIT IV</b>   | <b>ASSOCIATION RULE MINING AND BIG DATA</b>           | <b>7</b>  |
| Supervised Learning: Associative Rule Mining - Big Data - Hadoop - HIVE  |   |           |
| <b>UNIT V</b>  | <b>CLUSTERING ANALYSIS AND PRESCRIPTIVE ANALYTICS</b> | <b>9</b>  |
| Clustering Analysis - Introduction to Experimentation and Active Learning - An Introduction to Online Learning - Reinforcement Learning.                                 |   |           |

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. Hastie, Trevor, et al, "The elements of statistical learning", Second Edition, Vol. 2. No. 1. New York: springer, 2009

**REFERENCES**

1. Montgomery, Douglas C., and George C. Runger, "Applied statistics and probability for engineers", Fifth Edition, John Wiley & Sons, 2010.
2. Edward Capriolo, Dean Wampler, Jason Rutherglen, Programming Hive, O'Reilly - Kindle Edition , 2012
3. Vignesh Prajapati, Big Data Analytics with R and Hadoop, Packt Publishing-Kindle Edition,2013

**WEB REFERENCES**

1. [https://en.wikipedia.org/wiki/Prescriptive\\_analytics](https://en.wikipedia.org/wiki/Prescriptive_analytics)
2. Active and Reinforcement learning:[nptel.ac.in/courses/110106064/43](http://nptel.ac.in/courses/110106064/43)

**15IT08E****INFORMATION SECURITY****L T P C****3 0 0 3****COURSE OUTCOMES**

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

CO1: define key terms and critical concepts of information security (K1)

CO2: enumerate the phases of the security systems development life cycle (k3)

CO3: describe the information security roles of professionals within an organization. (K2)

**UNIT I INFORMATION SECURITY & NEEDS FOR SECURITY****9**

Information Security: Introduction- History of Information security - What is Security - CNSS Security Model - Components of Information System - Balancing Information Security and Access -Approaches to Information Security Implementation - The Security Systems Development Life Cycle, Threats, Attacks, Secure Software development.

**UNIT II RISK MANAGEMENT & PROFESSIONAL ISSUES IN INFORMATION SECURITY****9**

Law & Ethics in Information Security-Risk Management-Risk Identification-Risk Assessment-Risk Control Strategies- Information Security Planning & Governance-Information Security Policy, Standards, and Practices – Continuity Strategies

**UNIT III CRYPTOGRAPHY****9**

Foundation of Cryptology - Cipher methods – Cryptographic Algorithms – Cryptographic tools – Protocol for secure communications - Attacks on cryptosystems - Physical Security.

**UNIT IV SECURITY TECHNOLOGY 9**

Introduction – Access Control – Firewall – Protecting Remote Connections- Intrusion Detection and Prevention systems – Honeypots, Honeynets and padded cell systems – Scanning and Analysis Tools – Biometric access Controls.

**UNIT V IMPLEMENTATION AND MAINTENANCE 9**

Information Security Project Management – Bull’s Eye Model –Security Certification and Accreditation - Credentials of Information Security Professionals – Employment Policy and Practices – Security Management Maintenance Models – Digital Forensics.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, Fourth Edition, CENGAGE Learning, 2012.
2. William Stallings, “Cryptography and Network Security”, Fourth Edition, Pearson Education, 2011.
3. Forouzan Mukhopadhyay, “Cryptography and Network Security”, Second Edition, Mc Graw Hill, 2010

**REFERENCES**

1. C K Shyamala, N Harini, Dr T R Padmanabhan, “Cryptography and Network Security”, First Edition, Wiley, India
2. Bernard Menezes, “Network Security and Cryptography”, First Edition, CENGAGE Learning, 2010.
3. Atul Kahate, “Cryptography and Network Security“, Second Edition, Mc Graw Hill, 2007.
4. WM.Arthur Conklin, “Principles of Computer Security”, Second Edition, Greg White, TMH, 2008.
5. Neal Krawetz, “Introduction to Network Security”, First Edition, CENGAGE Learning, 2007.

**15IT09E**

**BIG DATA ANALYTICS**

**L T P C**

**3 0 0 3**

**COURSE OUTCOMES**

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

- CO 1: explain statistical analysis methods in Big Data platform (K2)
- CO 2: discuss the problems appropriate to mining data streams (K2)
- CO 3: apply the knowledge of clustering techniques in data mining (K3)
- CO 4: explain the social networking data analytics (K2)
- CO 5: discuss visualization techniques for Distributed file systems (K2)

**UNIT I INTRODUCTION TO BIG DATA 9**

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability - analytic processes and tools, - Analysis vs reporting -

Modern data analytic tools - Statistical concepts: Sampling distributions – resampling - statistical inference - prediction error.

**UNIT II MINING DATA STREAMS 9**

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing - Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Real time Analytics Platform(RTAP) applications - real time sentiment analysis - stock market predictions.

**UNIT III FREQUENT ITEMSETS AND CLUSTERING 9**

Mining Frequent item sets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent item sets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in Non-Euclidean space – Clustering for streams and Parallelism.

**UNIT IV SOCIAL NETWORKING DATA ANALYTICS 9**

An introduction to social network data Analytics – Introduction - Online Social Networks: Research Issues - Research Topics in Social Networks. Data mining in social media - Data mining in a Nutshell - Social Media - Motivations for Data Mining in Social Media - Data Mining Methods for Social Media - visualizing social networks - A Taxonomy of Visualizations - The Convergence of Visualization - Interaction and Analytics.

**UNIT V FRAMEWORKS AND VISUALIZATION 9**

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques - interaction techniques; Systems and applications.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Toby J.Velte, Anthony T.Velte and Robert Elsenpeter, “ Green IT Reduce your Information System’s Environmental impact while Adding to the Bottom Line”, Tata McGraw-Hill, 2008.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

**REFERENCES**

1. Charu C. Aggarwal, “Social Network Data Analytics”, Springer, 2011.
2. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics”, John Wiley & sons, 2012.
3. Glenn J. Myatt, “Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O’Reilly, 2011.
4. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

15IT10E

CYBER FORENSICS

L T P C  
3 0 0 3

### COURSE OUTCOMES

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

- CO 1: describe the fundamentals of hacking and computer forensics. (K1)
- CO 2: explain the various computer forensics Technologies. (K2)
- CO 3: elaborate the functions of various forensics systems. (K2)
- CO 4: analyze and validate the forensics data. (K4)
- CO 5: identify and authenticate evidence of various forensics data. (K3)

#### UNIT I INTRODUCTION TO HACKING AND COMPUTER FORENSICS 9

Hacking: Introduction – Technologies – Phases – Hacktivism – Types of Hacker Classes – Skills – Ways to conduct Ethical hacking - Computer Forensics Fundamentals.

#### UNIT II COMPUTER FORENSICS TECHNOLOGY 9

Military Forensics Technology – Law Enforcement – Business – Specialized Forensics technology – Hidden data and how to find it – Spyware and Adware – Encryption methods and vulnerabilities – Protecting data – Security and Wireless technologies – Avoiding pitfalls with firewalls – Biometric security systems

#### UNIT III COMPUTER FORENSICS SYSTEMS 9

Internet Security - Intrusion Detection - Firewall Security - Storage Area Network security - Network Disaster Recovery - Public Key Infrastructure - Wireless Network Security - Satellite Encryption Security - Instant Messaging System – Net privacy – Identity Management - Identity Theft Biometric Security Systems

#### UNIT IV COMPUTER FORENSICS EVIDENCE AND CAPTURE 9

Data Recovery – Evidence Collection and Data Seizure – Duplication and Prevention of Digital Evidence – Computer Image Verification and Authentication

#### UNIT V ANALYSIS AND RECOVERY 9

Electronic document discovery - Identification of Data- Reconstructing Past Events – Recovering Graphics Files - Network Forensics

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOKS

1. John R.Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Second Edition, Charles River Media, 2005.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.

### REFERENCES

1. <http://catalogimages.wiley.com/images/db/pdf/9780782144376.excerpt.pdf>
2. Marjie T.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, Third Edition, Prentice Hall, 2013.

15IT11E

**DIGITAL SIGNAL PROCESSING****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: explain the basics of Signals, Systems and Signal Processing. (K1)
- CO 2: summarize the concepts of Frequency Analysis of Signals and Systems. (K2)
- CO 3: illustrate the Design of Digital Filters such as FIR and IIR. (K3)
- CO 4: discuss the Multirate Signal Processing and its applications. (K2)

**UNIT I SIGNALS AND SYSTEMS 9**

Basic Elements of Digital Signal Processing – Concept of Frequency in Continuous Time and Discrete Time Signals – Sampling Theorem – Discrete Time Signals – Discrete Time Systems – Analysis of Linear Time Invariant Systems – Z-Transform – Convolution and Correlation.

**UNIT II FREQUENCY TRANSFORMATIONS 9**

Introduction to DFT – Properties of DFT -Efficient Computation of DFT –Linear Filtering Methods Based on DFT– FFT Algorithms – Radix-2 FFT Algorithms. Use of FFT Algorithms in Linear Filtering and Correlation.

**UNIT III IIR FILTER DESIGN 9**

Structures of IIR systems – Analog filter design – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives - Discrete time IIR filter from analog filter - filter design using frequency translation.

**UNIT IV FIR FILTER DESIGN 9**

Symmetric and Antisymmetric FIR Filters – Design of Linear Phase Filter – Windowing Technique – Rectangular– Kaiser Windows. Design of Linear Phase Filter – Frequency Sampling Techniques – Structure for FIR Systems.

**UNIT V MULTIRATE SIGNAL PROCESSING 9**

Introduction, Sampling rate conversions–Multistage Implementation of Sampling Rate Conversion– Sampling Rate Conversion by an Arbitrary Factor– Applications of Multirate Signal Processing.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. John G. Proakis & Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Pearson education / Prentice Hall, Fourth Edition, 2007.
2. Sanjit K Mitra, “Digital Signal Processing - A Computer Based Approach”, Tata McGraw-Hill Publishing Co. Pvt., Ltd., New Delhi, Fourth Edition, 2013.

**REFERENCES**

1. Andreas Antoniou, “Digital Signal Processing: Signals, Systems, and Filters”, McGraw Hill Education, First Edition, 2005.



2. Monson H.Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc., Singapore, 2008.
3. Simon Haykin , "Adaptive Filter Theory", Pearson Education, South Asia, Fourth Edition, 2009.
4. Emmanuel C.Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002.

**15IT12E**

**SOFTWARE TESTING**

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

**COURSE OUTCOMES**

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

- CO 1: recognize the roles and responsibilities of the tester. (K1)
- CO 2: design the test cases using various testing strategies (K2)
- CO 3: analyze various levels of testing methodologies. (K2)
- CO 4: explain various test procedures and test planning. (K2)
- CO 5: describe control and monitoring of testing process. (K1)

**UNIT I TESTING FUNDAMENTALS 9**

Testing as a Process- Software Testing Principles - The Tester's Role in a Software Development Organization- Origins of Defects - Defect Classes, Defect Repository, Test Design – Defect Examples – Developer/Tester Support for Developing a Defect Repository

**UNIT II TEST CASE DESIGN 9**

Test Case Design Strategies – Using Black Box Approach to Test Case Design - Random Testing – Equivalence Class Partitioning - Boundary Value Analysis - cause-effect graphing – state transition testing- error guessing- Using White–Box Approach to Test design- Test Adequacy Criteria- Coverage and Control Flow Graphs – Covering Code Logic – Paths and their Role in White–box Based Test Design- Additional White box test design approaches - Evaluating Test Adequacy Criteria

**UNIT III LEVELS OF TESTING 9**

The Need for Levels of Testing – Unit Test: Functions, Procedures, Classes and Methods - Unit Test Planning –Designing the Unit Tests - The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – System Testing – Functional Testing - Performance testing –Stress Testing- Configuration testing-Security Testing- Recovery Testing-Regression Testing — Ad-hoc testing - Alpha , Beta Tests – Acceptance Testing.

**UNIT IV TESTING PROCEDURES AND ORGANIZATION 9**

Test Planning – Test Plan Components – Test Plan Attachments –Locating Test Items - Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

**UNIT V TEST CONTROLLING AND MONITORING 9**

Measurements and Milestones for Controlling and Monitoring: Testing Status-Tester Productivity- Testing Costs- Error, Faults and Failures- Test Effectiveness- Status Meetings, Reports and Control issues-Criteria for Test Completion- Software Configuration Management-Controlling and Monitoring: Three Critical Views.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOK**

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2012.

**REFERENCES**

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson education, 2006.
2. Aditya P. Mathur, "Foundations of Software Testing – Fundamental algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

**15IT13E****ADVANCED JAVA****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO 1: describe the Swing Components. (K1)
- CO 2: write socket programming using java. (K2)
- CO 3: familiar with the application development using Servlets. (K2)
- CO 4: gain knowledge about server side programming languages using JSP. (K2)
- CO 5: explain about concepts of Enterprise Java Beans. (K1)

**UNIT I INTRODUCING SWING 9**

Swing – components and containers – the swing packages – Painting in a Swing – Exploring Swing: JLabel and ImageIcon – JTextField – The Swing Buttons – JTabbedPane – JScrollPane – JList – JComboBox – Trees – JTable.

**UNIT II NETWORK PROGRAMMING IN JAVA 9**

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services.

**UNIT III SERVLETS 9**

Servlet Overview and Architecture – Interface Servlet and the Servlet Life Cycle – Handling HTTP get Requests – Handling HTTP post Requests – Redirecting Requests to Other Resources – Session Tracking – Cookies – Session Tracking with HttpSession.

**UNIT IV JAVA SERVER PAGES (JSP) 9**

Introduction – Java Server Pages Overview – A First JavaServer Page Example – Implicit Objects – Scripting – Standard Actions – Directives – Custom Tag Libraries – Struts.



**UNIT IV SOFTWARE TESTING 9**

Software Testing fundamentals- Test case design – White box testing – Basic path testing – Control structure testing – Black box testing - Unit testing – Integration testing – Validation testing - System testing – Debugging.

**UNIT V APPLYING QUALITY TOOLS 9**

Ishikawas Seven basic tools – Check list – Pareto diagram – Histogram – Run charts – Scatter diagram – Control chart – Cause and effect diagram.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Stephen H. Kan, "Metrics and models in Software quality engineering", Second Edition, Pearson Education, 2012.
2. Roger S. Pressman, Software engineering- A practitioner's Approach, Seventh Edition, McGraw-Hill International Edition, 2010.

**REFERENCES**

1. Ian Sommerville, "Software engineering", Seventh Edition, Pearson education Asia, 2007.
2. Watts S. Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
3. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

**15IT15E**

**INTERNET OF THINGS**

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

**COURSE OUTCOMES**

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

- CO1: explain new models for market strategic interaction (K1)
- CO2: illustrate various protocols for Internet of Things (K1)
- CO3: describe business intelligence and information security for Web of things (K1)
- CO4: explain the integrated solution of network dynamics (K1)
- CO5: explain the application of Internet of Things (K1)

**UNIT I INTRODUCTION 9**

Introduction – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things, Middleware for IoT- IoT Information Security

**UNIT II IOT PROTOCOLS 9**

Protocol Standardization for IoT – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer

**UNIT III WEB OF THINGS 9**

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture

**UNIT IV INTEGRATED IOT 9**

Integrated Billing Solutions in the Internet of Things - Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon

**UNIT V APPLICATIONS 9**

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.

**REFERENCES**

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", Springer, 2011.
2. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010 .
3. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2012.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

**15IT16E NATURAL LANGUAGE PROCESSING L T P C  
3 0 0 3**

**COURSE OUTCOMES**

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

- CO1: explain natural language processing and apply basic algorithms.(K1)
- CO2: describe the concepts of information retrieval. (K2)
- CO3: apply NLP in text processing. (K4)
- CO4: design an application that uses different aspects of language processing. (K3)

|  |                              |          |
|--|------------------------------|----------|
| <b>UNIT I</b>  | <b>INTRODUCTION</b>          | <b>9</b> |
| Natural Language Processing – Linguistic Background - Spoken language input and output Technologies – Written language Input - Mathematical Methods – Statistical Modeling and Classification Finite State methods Grammar for Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation. |                              |          |
| <b>UNIT II</b>   | <b>INFORMATION RETRIEVAL</b> | <b>9</b> |
| Information Retrieval architecture - Indexing- Storage – Compression Techniques – Retrieval Approaches – Evaluation - Search engines- commercial search engine features-comparison - performance measures – Document Processing - NLP based Information Retrieval – Information Extraction.  |                              |          |
| <b>UNIT III</b>  | <b>TEXT MINING</b>           | <b>9</b> |
| Categorization – Extraction based Categorization- Clustering- Hierarchical Clustering - Document Classification and routing- finding and organizing answers from Text search – use of categories and clusters for organizing retrieval results – Text Categorization and efficient Summarization using Lexical Chains – Pattern Extraction.      |                              |          |
| <b>UNIT IV</b>   | <b>GENERIC ISSUES</b>        | <b>9</b> |
| Multilinguality – Multilingual Information Retrieval and Speech processing – Multimodality – Text and Images – Modality Integration - Transmission and Storage – Speech coding - Evaluation of systems – Human Factors and user Acceptability.   |                              |          |
| <b>UNIT V</b>  | <b>APPLICATIONS</b>          | <b>9</b> |
| Machine Translation – Transfer Metaphor - Interlingua and Statistical Approaches - Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.   |                              |          |

**L: 45 TOTAL: 45 PERIODS**

#### **TEXT BOOKS**

1. Daniel Jurafsky and James H. martin, “Speech and Language Processing”, 2000.
2. Ron Cole, J.Mariani, et.al “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.
3. Michael W. Berry “Survey of Text Mining: Clustering, Classification and Retrieval”, Springer Verlag, 2003.
4. Christopher D.Manning and HinrichSchutze, “Foundations of Statistical Natural Language Processing “, MIT Press, 1999.

#### **REFERENCES**

1. James Allen “Natural Language Understanding”, Benjamin, Cummings Publishing Co. 1995.
2. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
3. Tomek Strzalkowski “Natural Language Information Retrieval“, Kluwer academic Publishers, 1999.



15IT18E

**NETWORK MANAGEMENT****L T P C****3 0 0 3****COURSE OUTCOMES**

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

- CO1: explain the network management architectures and protocols.(K2)
- CO2: explain the importance of network management and how it impacts cost, revenue and network availability. (K2)
- CO3: Describe the different phases in the network management functional models. (K2)
- CO4: Explain the network management primitives and protocol message structures. (K2)
- CO5: Use metrics to quantify network management value propositions and measure the effectiveness of network management technology. (K3)

**UNIT I INTRODUCTION****9**

Data Communication and Network Management – SNMP and Network Management – Network Management Applications.

**UNIT II NETWORK MANAGEMENT – AN OVERVIEW****9**

Setting the Stage – On the Job with a Network Manager- The Basic Ingredients of Network Management

**UNIT III MANAGEMENT PERSPECTIVES****9**

The Dimensions of Management - Management Functions and Reference Models - Network Management Tools, Systems and Engineering.

**UNIT IV MANAGEMENT BUILDING BLOCKS****9**

Management Information - Management Communication Patterns - Common Management Protocols - Management Organization

**UNIT V APPLIED NETWORK MANAGEMENT****9**

Management Integration - Service Level Management - Management Metrics: Assessing Management Impact and Effectiveness.

**L: 45 TOTAL: 45PERIODS****TEXT BOOKS**

1. Mani Subrahmanian, "Network Management Principles and Practice", Second Edition, Pearson Education, 2012.
2. A. Clemm, "Network Management Fundamentals", Cisco Press, ISBN-13 978-1-58720-137-0.

**REFERENCES**

1. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Third Edition, Pearson Edition, 2009.
2. Morris, "Network management", 1<sup>st</sup> Edition, Pearson Education, 2008.
3. Mark Burges, "Principles of Network System Administration", First Edition, Wiley DreamTech, 2008



15IT19E

GAME PROGRAMMING

L T P C

3 0 0 3

### COURSE OUTCOMES

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

- CO 1: Explain the fundamentals of game theory. (K2)
- CO 2: Outline the importance of Non cooperative games in strategic and dynamic forms. (K2)
- CO 3: Discuss the Cooperative games using Bargaining theory and Coalition approach. (K2)
- CO 4: Describe the evolutionary and auction based approaches in game theory. (K2)
- CO 5: Explain the application of game theory in communication networks. (K2)

### UNIT I FUNDAMENTALS OF GAME THEORY 9

Introduction - Game theory: Component of game theory - Nash Equilibrium (games equivalent to the Prisoner's Dilemma, Nash equilibrium and weakly dominated actions, Cournot's duopoly game).

### UNIT II NON COOPERATIVE GAMES 9

Non-cooperative games: preliminaries- strategic form- Dynamic non-cooperative games- Special classes of non-cooperative games.

### UNIT III COOPERATIVE GAMES 9

Bargaining theory- Coalitional game theory- canonical coalitional games- coalition-formation games- coalitional graph games.

### UNIT IV EVOLUTIONARY, AUCTION AND BAYESIAN GAMES 9

Bayesian games- Differential games- Evolutionary games- Auction theory and mechanism design.

### UNIT V GAME THEORY APPLICATION IN NETWORKS 9

Internet networks: Combined flow control and routing in communication network- Congestion control in networks with a single service provider- Pricing and revenue sharing for Internet service providers- Cooperative file sharing in peer-to-peer networks.

**L: 45 TOTAL: 45 PERIODS**

### TEXT BOOK

1. Zhu Han, Dusit Niyato, Walid Saad, Tamer Başar, Are Hjorungnes, "Game Theory in Wireless and Communication Networks Theory, Models, and Applications", Cambridge University Press, First Edition, 2012.

### REFERENCE

1. Martin J. Osborne, "An Introduction to Game Theory", University of Toronto, 2004.



15IT21E

**SOCIAL NETWORKING**

**L T P C**

**3 0 0 3**

**COURSE OUTCOMES**

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

- CO1: explain the basics of social networks. (K2)
- CO2: describe the structural and locational properties. (K2)
- CO3: discuss the concepts of web analysis. (K2)
- CO4: outline the Market and strategic interaction in networks. (K2)
- CO5: Illustrate the performance of Network effects. (K2)

**UNIT I INTRODUCTION TO SOCIAL NETWORK 9**

Introduction: Motivation - Different Sources of Network Data - Types of Networks - Tools for Visualizing Network Data - Review of Graph Theory Basics.

**UNIT II STRUCTURAL AND LOCATIONAL PROPERTIES 9**

Structural Properties of Networks - Notions of Centrality - Cohesiveness of Subgroups - Roles and Positions - Structural Equivalence - Representation of Network Positions - Block Models.

**UNIT III SOCIAL NETWORK ANALYSIS 9**

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web - Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks - Applications of Social Network Analysis.

**UNIT IV MARKET AND STRATEGIC INTERACTION IN NETWORK 9**

Matching Market: Bipartite Graphs and Perfect Matching - Prices and Market - Clearing Property - Network Models of Markets with Intermediaries - Price Setting in Market - Social Welfare - Trader Profit. Bargaining and Power in Network - Power in Social Network - Results of Network Exchange Experts - Modeling with Network Exchange - Stable outcomes - Modeling with Network Exchange - Balanced outcomes.

**UNIT V NETWORK DYNAMICS 9**

Information Cascade - Networks Effects - The Economy with Network Effects Industries with Network goods - Advanced Materials for Positive Externalities - Power Laws - The Effect of Search Tools and Recommendations.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected World", First Edition, Cambridge University Press, 2010.

**REFERENCE**

1. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods and Applications", Second Edition, Cambridge University Press, 1999.

**15IT22E SERVICE ORIENTED ARCHITECTURE L T P C**  
**3 0 0 3**

**COURSE OUTCOMES**

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

- CO1: Explain about principles of Service Orientation. (K1)
- CO2: Describe about service oriented analysis techniques. (K2)
- CO3: Describe the Service Oriented Design concepts. (K2)
- CO4: Explain the parts of the development and runtime ends of a distributed technology platform for SOA. (K2)
- CO5: Describe about various Web service specification standards. (K1)

**UNIT I PRINCIPLES OF SERVICE ORIENTATION 9**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA - How components in an SOA interrelate - Principles of service orientation.

**UNIT II SERVICE ORIENTED ANALYSIS TECHNIQUES 9**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration – Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

**UNIT III SERVICE ORIENTED DESIGN 9**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Task-centric business service design

**UNIT IV SOA PLATFORM BASICS 9**

SOA platform basics – SOA support in J2EE – Java API for XML based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) - Web Services Interoperability Technologies (WSIT) – SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE)

**UNIT V WEB SERVICE SPECIFICATION STANDARDS 9**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WS-Security

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology and Design”, Pearson Education, 2006.

**REFERENCES**

1. Thomas Erl, “SOA Principles of Service Design”, The Prentice Hall, 2007

2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Prentice Hall Professional, 2005.
4. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation", First Edition, O'REILLY, 2006.

**15IT23E**

**M-COMMERCE**

**L T P C**

**3 0 0 3**

### **COURSE OUTCOMES**

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

- CO 1: explain the underlying economic mechanisms and driving forces of E-Commerce. (K1)
- CO 2: examine the infrastructure and services required for wireless m-commerce. (K1)
- CO 3: identify the critical building blocks of M-Commerce and different types of prevailing business models. (K2)
- CO 4: discuss the theory and applications of M-commerce in business domain. (K3)

### **UNIT I INTRODUCTION TO E-COMMERCE**

**9**

Electronic Commerce Framework – Electronic Commerce and Media Convergence – Anatomy of E-Commerce Applications – Consumer Application – Electronic Commerce organization application.

### **UNIT II MOBILE COMMERCE**

**9**

Introduction – Infrastructure of M-Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non- Internet Applications In M-Commerce – Wireless/Wired Commerce Comparisons.

### **UNIT III MOBILE COMMERCE TECHNOLOGY**

**9**

A Framework For The Study Of Mobile Commerce – NTT Docomo's I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks –The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

### **UNIT IV MOBILE COMMERCE: THEORY AND APPLICATION**

**9**

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E-commerce in The Automotive Industry – Location Based Services: Criteria For Adoption And Solution Deployment – The Role of Mobile Advertising In Building A Brand – M-commerce Business Models

**UNIT V BUSINESS-TO-BUSINESS MOBILE E-COMMERCE 9**

Enterprise Enablement – Email and Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support – Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

**L: 45 TOTAL: 45 PERIODS****TEXT BOOKS**

1. Ravi Kalakota, Andrew B. Whinston, "Frontiers of Electronic Commerce", Pearson Education, Ninth Impression, 2009.
2. Dave Chaffey, "E-Business and E-Commerce Management", Pearson Education, Third Edition, 2009.
3. Brian E. Mennecke, Troy J. Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003.

**REFERENCES**

1. P. J. Louis, "M-commerce Crash Course: The Technology and Business of Next Generation Internet", McGraw Hill Education, 2001.
2. Paul May, "Mobil Commerce: Opportunities, Applications, and Technologies of Wireless Business", Cambridge University Press, 2001.
3. P.Candace Deans, "E-Commerce and M-Commerce Technologies", Idea Group Inc (IGI), 2004.

**15IT24E****DIGITAL COMMUNICATION****L T P C  
3 0 0 3****COURSE OUTCOMES**

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

- CO 1: describe the concepts of digital communication systems. (K1)
- CO 2: calculate signal to quantization noise ratio for various modulation techniques. (K3)
- CO 3: design an encoder and decoder for error control. (K4)
- CO 4: analyze base band reception techniques. (K4)
- CO 5: estimate the performance of coherent detection systems. (K3)

**UNIT I INFORMATION THEORY AND INTRODUCTION TO DIGITAL COMMUNICATION SYSTEM 9**

Measure of information – Entropy – Source coding theorem – Discrete memory less channels, Mutual information, Channel capacity, Shannon-Fanocoding, Digital communication Systems – Functional description, Channel classification, Bandwidth.

**UNIT II BASEBAND FORMATTING TECHNIQUES 9**

Quantization – Uniform and Non-uniform; Encoding Techniques – Temporal waveform encoding -PCM, Bandwidth of PCM system, Noise in a PCM system, SNR of PCM system with quantization noise, Adaptive PCM, DPCM.

**UNIT III CHANNEL CODING TECHNIQUES AND LINE CODES 9**

Error Control Codes - Block Codes, Convolutional Codes, Concept of Error Free communication; Classification of line codes, desirable characteristics and power spectra of line codes.

**UNIT IV BASEBAND RECEPTION TECHNIQUES 9**

Geometric representation of Signals, Gram Schmidt Orthogonalization Procedure, Noise in Communication Systems; Receiving Filter – Correlator type, Matched Filter type; Equalizing Filter -Signal and system design for ISI elimination, Implementation, Eye Pattern analysis.

**UNIT V BANDPASS SIGNAL TRANSMISSION AND RECEPTION 9**

Memory-less modulation methods - Representation and Spectral characteristics, Binary ASK, Binary PSK, Binary FSK, QAM, QPSK; Band pass receiving filter, Error performance – Coherent detection systems: ASK,FSK,PSK. Introduction to spread spectrum techniques.

**L: 45 TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Amitabha Bhattacharya, "Digital Communications", Tata McGraw Hill, First Edition, 2006.
2. Simon Haykins, "Communication Systems", John Wiley, Fifth Edition, 2009.

**REFERENCES**

1. Simon Haykin, "Digital Communications", John Wiley, Fifth Edition, 2006.
2. John. Proakis, "Fundamentals of Communication Systems", Pearson Education, Fifth Edition, 2006.
3. Michael. B. Pursley, "Introduction to Digital Communication", Pearson Education, 2006.

**15IT25E**

**BIG DATA ANALYTICS LABORATORY**

**L T P C**

**0 0 2 1**

**COURSE OUTCOMES**

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

- CO1: develop MapReduce programs for parallel tasks. (K3)
- CO2: apply the data processing tools for big data. (K3)

**List of Experiments**

1. Installation of Apache Hadoop and MapReduce.
2. Installation of clustered Hadoop and MapReduce.
3. Develop MapReduce programs.
4. Classification using SVM.
5. Implement data mining clustering algorithms.
6. Big Data processing with Hive.

7. Query Processing using Hive and Beeswax.
8. Data Visualization.
9. Mini Project.

**P: 30 TOTAL: 30 PERIODS**

**15IT26E**

**SOFTWARE TESTING LABORATORY**

**L T P C**

**0 0 2 1**

### **COURSE OUTCOMES**

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

- CO 1: test a program for finding errors. (K3)
- CO 2: use various testing tools and write a test conditions. (K3)

### **LIST OF EXPERIMENTS**

1. Write programs in C Language to demonstrate the working of the following constructs:  
i) do...while ii) while....do iii) if...else iv) switch v) for
2. A program written in C language for Matrix Multiplication fails and introspect the causes for its failure and write down the possible reasons for its failure.
3. Take any real time system and study its system specifications and report the various bugs.
4. Write the test cases for any known application.
5. Create a test plan document for any known application.
6. Write and test a program to update 10 student records into table in Excel file.
7. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
8. Study of any testing tool (e.g. Win runner)
9. Study of any web testing tool (e.g. Selenium)
10. Using Selenium IDE, Write a test suite containing minimum 4 test cases.

**P: 30 TOTAL: 30 PERIODS**



15IT27E

ADVANCED JAVA LABORATORY

L T P C

0 0 2 1

### COURSE OUTCOMES

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

CO1: create application using swing and network programming (K3)

CO2: develop interactive application using servlet, JSP, struct and enterprise java beans. (K3)

### LIST OF EXPERIMENTS

#### 1. Programs on Swing

1. Write a Java program to demonstrate the use of Java Swing components, namely, buttons, text boxes, lists/combos, menus etc.
2. Write a Java program to implement the JTrees.
3. Write a Java program to implement the JTable.

#### 2. Programs on Network Programming

1. Write programs for TCP server and Client interaction
2. Write programs for Datagram server and Client interaction

#### 3. Programs on Servlets

1. Write a program to display a greeting message in the browser by using HttpServlet.
2. Write a Java Servlet program to demonstrate the use of cookies.
3. Write a Java Servlet program to demonstrate the use of sessions.

#### 4. Programs on JSP

1. Write JSP program to implement form data validation to accept correct data.
2. Write JSP program to implement employee salary calculation.

#### 5. Programs on Struct

1. Write Java program to implement datetimepicker using struct.
2. Write Java program to implement File upload and save application using struct.

#### 6. Programs on Java Beans

1. Write a program to develop a Enterprise Java Bean of "Session Bean" type.
2. Write a program to develop a Enterprise Java Bean of "Entity Bean" type.

**P: 30 TOTAL: 30 PERIODS**

15IT28E

CASE TOOLS LABORATORY

L T P C

0 0 2 1

**COURSE OUTCOMES**

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

- CO1: design the suitable UML diagram for a given problem and develop the User Interface Design (K3)

**LIST OF EXPERIMENTS**

Develop a mini-project for any one problem of your choice using the following guidelines.

1. Develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan.
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identify the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested Applications for Mini-project

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Credit card processing
8. E-book management system
9. Recruitment system
10. Library management system
11. Conference management system
12. BPO management system

**P: 30 TOTAL: 30 PERIODS**

**B.Tech. – INFORMATION TECHNOLOGY**  
**ONE CREDIT ELECTIVE COURSES**

15IT01L

**AGILE DEVELOPMENT PROCESS****L T P C****1 0 0 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** Describe the fundamental principles and practices associated with agile development methods. (K1)

**LIST OF CONTENTS**

1. Agile Methodology
2. Agile Models in Software Development & Testing
3. SCRUM Process Framework
4. KANBAN Process Framework
5. Software Development using SCRUM
6. Software Testing using KANBAN

**L: 15 TOTAL: 15 PERIODS****REFERENCES**

1. Robert C.Martin, "Agile Software Development, Principles, Patterns, and Practices", Pearson New International publication, First Edition, 2013.
2. Ken Schwaber, Mike Beedle,"Agile Software Development with Scrum", First Edition, Van Haren Publishing, 2001.

15IT02L

**DATA ANALYTICS****L T P C****0 0 2 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** Design, implement, populate and query relational databases for operational and informational data. (K3)

**LIST OF CONTENTS**

1. Fundamentals of Analytics
2. Typical Analytics Application Structure
3. Microsoft Analytics Solution (OLAP) Model
4. Creating Database using Microsoft SQL Server
5. Creating DataMart using Microsoft SQL Server
6. Creating Employee Analytics (OLAP) using Microsoft Analytics Server
7. Understanding Dimensions and Measures in Microsoft Analytics
8. Understanding MDX Queries
9. Samples of Analytical Reporting

**L: 30 TOTAL: 30 PERIODS**

## REFERENCES

1. Buck Woody, Danielle Dean, Debraj GuhaThakurta, Gagan Bansal, Matt Conners, Wee-Hyong Tok, "Data Science with Microsoft SQL Server 2016", Microsoft publisher, 2016.
2. Stacia Varga, Denny Cherry, and Joseph D'Antoni, "Introducing Microsoft SQL Server 2016: Mission-Critical Applications, Deeper Insights, Hyperscale Cloud, Microsoft publisher, 2016.

**15IT03L**

**HTML5 and CSS3 MOBILE PROGRAMMING**

**L T P C**

**0 0 2 1**

## COURSE OUTCOMES

Upon Completion of this course, the students will be able to

- CO1:** Develop client side intensive mobile applications using HTML5 family technologies. (K3)

## LIST OF CONTENTS

1. Fundamentals of Mobile Programming.
2. Introduction to HTML5.
3. Introduction to CSS3.
4. Typical Mobile App Model using HTML5 and CSS3.
5. Creating a Mobile App using HTML5 and CSS3.
6. Deployment of Mobile App on Android and IOS platforms.

**P: 30 TOTAL: 30 PERIODS**

## REFERENCES

1. Oswald Campesato, "jQuery, CSS3, and HTML5 for Mobile and Desktop Devices: A Primer", Mercury Learning and Information, 2014.
2. Jake Carter, "HTML5 Mobile Web Development", O'Reilly Media publisher, 2010.

**15IT04L**

**WEB SERVICES FOR MOBILE PROGRAMMING**

**L T P C**

**0 0 2 1**

## COURSE OUTCOMES

Upon Completion of this course, the students will be able to

- CO1:** recognize and use the core standards related to programming of Web services for Mobile environments. (K2)

## LIST OF CONTENTS

1. Introduction to Web services Concept
2. Create a Web service using ASP.NET C#
3. Testing Web service
4. Deploying Web service

5. Role of Web service in Mobile App
6. Calling Web service from Mobile App
7. Penetration Testing

**P:30 TOTAL: 30 PERIODS**

**REFERENCES**

1. DT Editorial Services,"Mobile Application Development Black Book", Dreamtech Press, 2015.
2. <https://www.cs.cmu.edu/~bam/uicourse/830spring09/BFeiginMobileApplicationDevelopment>

**15IT05L**

**E-LEARNING PLATFORM**

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

**COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** Develop E-learning applications comprising of all latest innovative education Methodologies and assessment techniques.(K3)

**LIST OF CONTENTS**

1. Introduction to E-Learning
2. Typical E-Learning Application Model
3. E-Learning Content Creation & Management
4. E-Learning Content Delivery
5. E-Learning Courses Management
6. E-Learning Participants Management
7. E-Learning Assessments

**P: 30 TOTAL: 30 PERIODS**

**REFERENCES**

1. <https://www.talentlms.com/elearning/elearning-101-jan2014-v1.1.pdf>.
2. [www.efrontlearning.net](http://www.efrontlearning.net) .
3. [www.talentlms.com](http://www.talentlms.com).

**15IT06L**

**COMPUTER HARDWARE AND TROUBLE SHOOTING**

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

**COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** classify and explain the working of different computer hardware components. (K2)  
**CO2:** perform diagnostic procedures and troubleshooting techniques. (K3)

## LIST OF CONTENTS

### 1. PC Hardware Overview

Basic Parts of PC, System board, Microprocessor, Interrupts, DMA, SMPS, BIOS, POST sequence, System configuration, Memory, Mass storage, I/O interface standards.

### 2. Bus Standards and Networking

ISA, PCI, SCSI, IDE, USB, Network Interface Cards, Cables and connectors, MODEM

### 3. Installation and Preventive Maintenance

System Configuration, Installation Practice, PC Assembling and Integration, Virus, data Recovery

### 4. Troubleshooting & Tools

Troubleshooting problems of system boards, add on cards and peripherals.

**P:30 TOTAL: 30 PERIODS**

## REFERENCES

1. Michael Meyers, "Introduction to PC Hardware and Troubleshooting", McGraw Hill Publisher, First Edition, 2003.
2. Kyle McRae, Gary Marshall, "Computer Troubleshooting: The Complete Step-by-step Guide to Diagnosing and Fixing Common PC Problems", Second Edition, 2008.
3. Govindarajalu.B, "IBM PC AND CLONES: Hardware, Troubleshooting and Maintenance", Tata McGraw-Hill, 2011.

15IT07L

PHP PROGRAMMING

L T P C

0 0 2 1

## COURSE OUTCOMES

Upon Completion of this course, the students will be able to

- CO1:** Develop PHP programs to build interactive, data-driven sites with Database connectivity. (K3)

## LIST OF CONTENTS

1. History
2. Web Brower
3. Web - Server, Xampp
4. Installation and Configuration files
5. Variable Types
6. Constants
7. Function
8. Arrays

9. Date & Time, Image Uploading
10. WEB FEATURES: Sessions,Forms,GET and POST data, Cookies,HTTP Headers
11. Database Programming
12. AJAX
13. Error handling in PHP
14. File handling in PHP

**P: 30 TOTAL: 30 PERIODS**

**REFERENCES**

1. W.J.Gilmore "A Programmer's Introduction to PHP4.0", Apress, 2001.
2. W.Jason Gilmore," Beginning PHP and MySQL", Fifth Edition, Apress, 2014.

**15IT08L**

**PROGRAMMING IN PYTHON**

**L T P C**

**0 0 2 1**

**COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** Recognize and construct common programming idioms: variables, loop, branch, subroutine, and input/output. (K2)
- CO2:** Develop programs to solve real-world problem using the language idioms, data structures and standard library. (K2)

**LIST OF CONTENTS**

1. Python object types-Numeric types-Strings
2. Lists-dictionaries-files-tuples
3. Functions and generators
4. Statements, expressions, variables
5. Functions, logic, conditionals
6. DB Connectivity, Event-driven programming, local/global variable
7. Lists, keyboard input, the basics of modeling motion

**P: 30 TOTAL: 30 PERIODS**

**REFERENCES**

1. Mark lutz, "Learning Python", Fifth Edition, O'Reilly, 2013.
2. Steven F. Lott, "Building Skills in Object-Oriented Design",Steven F. Lott publisher, 2009.
3. Steven F. Lott, "Building Skills in Python", 2010.

**15IT09L**

**THEORY OF COMPUTATION**

**L T P C**

**1 0 0 1**

**COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

- CO1:** Explain the basics of finite automata and their capabilities. (K1)
- CO2:** Construct and prove the equivalence of languages described by pushdown automata and context free grammars. (K3)



## LIST OF CONTENTS

### 1. Regular Expressions and Finite Automata

Regular Expression - FA and Regular Expressions - Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions.

### 2. Context free Languages and push down automata

Context-Free Grammar (CFG) - Parse Trees - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG - Deterministic Pushdown Automata - Normal forms for CFG - Pumping Lemma for CFL

### 3. Turing machines and undecidability

Turing Machines - Programming Techniques for TM - Un-decidable problems about Turing Machine

**L: 15 TOTAL: 15 PERIODS**

## REFERENCES

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2007.
2. Anil Maheshwari, Michiel Smid, "Introduction to Theory of Computation"E-book,2016.

15IT10L

**BASICS OF COMPILER DESIGN**

**L T P C**

**1 0 0 1**

## COURSE OUTCOMES

Upon Completion of this course, the students will be able to

**CO1:** Analyze the source program and recognize the tokens.(K4)

**CO2:** Compare the various types of parser and their role for the design of compiler. (K2)

## LIST OF CONTENTS

### 1. Lexical Analysis

Representation of tokens and regular expression - Token reorganization and finite state automata

### 2. Syntax Analysis

Parser and its types - Top-down parser - Bottom-up parser

### 3. Intermediate code generation

Intermediate code generation- Need for Intermediate code - Types of Intermediate code - Representation of all language constructs by three-address code - Grammar symbols and attributes - Semantic routines for intermediate code generation - Directed Acyclic Graph

**L: 15 TOTAL: 15 PERIODS**

## REFERENCES

1. K.Muneeswaran, "Compiler Design", Oxford University Press, 2013.
2. Alfred Aho, Monica S.Lam, Ravi Sethi and Jeffrey D.Ullman, "Compiler Principles, Techniques and Tools", 3rd Edition, Addison Wesley, 2006.

15IT11L

**VIRTUALIZATION****L T P C****1 0 0 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

**CO1:** Describe the fundamental concepts of server and client virtualization. (K2)

**CO2:** Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS). (K3)

**LIST OF CONTENTS****1. Introduction to Cloud Computing**

Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Cloud,

Features of a cloud, Infrastructure-as-a-Service, Software-as-a-Service, Platform-as-a-Service, Google App Engine, Microsoft Azure;, Amazon EC2; Challenges and Risks.

**2. Cloud Technologies Hypervisor**

Introduction, Types of Hypervisor. Virtualization Technology: Virtual machine Technology, virtualization applications in enterprises.

**3. Network storage**

Network Attached Storage (NAS), Storage Area Network (SAN), Network Virtualization,

Server Virtualization, Pitfalls of virtualization.

**L: 15 TOTAL: 15 PERIODS****REFERENCES**

1. Rajkumar Buyya, James Broberg , Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", John Wiley & Sons, First Edition, 2011.
2. Mitch Tulloch with Nigel Cain, Alvin Morales, Michel Luescher, Damian Flynn , "Microsoft System Center: Building a Virtualized Network Solution", Microsoft Press, 1st edition, 2014.

15IT12L

**PROGRAMMING IN RUBY****L T P C****0 0 2 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

**CO1:** Develop server-side Ruby scripts for publishing on the Web. (K3)

**LIST OF CONTENTS**

1. Classes,objects and Variables
2. Expressions,Exceptions,I/O
3. Containers,Blocks and iterators
4. Threading

5. Ruby and web
6. Networking
7. Meta programming- Basics

**P: 30 TOTAL: 30 PERIODS**

#### REFERENCES

1. Dave Thomas, Chad Fowler and Andy Hun, "Programming Ruby 1.9(The Pragmatic Programmers' Guide)",3rd edition, The Pragmatic Bookshelf,North Carolina Dallas, Texas, 2009.
2. Dave Thomas, "The Ruby ObjectModel and Meta programming", The Pragmatic Bookshelf,North Carolina Dallas, Texas, 2009.

**15IT13L                      SOCIAL MEDIA APPLICATION DEVELOPMENT                      L T P C**  
**1 0 0 1**

#### COURSE OUTCOMES

Upon Completion of this course, the students will be able to

**CO1:** Explain various concepts in developing Social Media Applications. (K2)

#### LIST OF CONTENTS

1. Overview of Graph theory
2. Strong and Weak Ties
3. Positive and Negative Relationships
4. Evolutionary Game Theory
5. Modeling Network Traffic using Game Theory
6. Auctions
7. Markets and Strategic Interaction in Networks
8. Bargaining and Power in Networks
9. Information Cascades
10. Power Laws
11. Cascading Behavior in Networks

**L: 15 TOTAL: 15 PERIODS**

#### REFERENCES

1. Easley D. Kleinberg J., "Networks, Crowds, and Markets – Reasoning about a Highly Connected World", Cambridge University Press,2010.
2. Jackson, Matthew O., "Social and Economic Networks", Princeton University Press, 2008.

**15IT14L                      iOS DEVELOPMENT USING SWIFT 2.0                      L T P C**  
**0 0 2 1**

#### COURSE OUTCOMES

Upon Completion of this course, the students will be able to

**CO1:** Define key programming terms relevant to Swift and iOS programming. (K2)

**CO2:** Explain and summarize iOS API features.(K2)

**LIST OF CONTENTS****1. Swift**

Introduction- Control- Function and closure-Class and structure

**2. iOS**

User Interactivity - Multiple View Controllers &amp; Navigation -webservice

**3. Persistence & Networking**

Introduction to Developing for tvOS –Location- Locomotion and Motion

**P: 30 TOTAL: 30 PERIODS****REFERENCES**

1. Vandan Nahavandipour, "iOS 8 Swift Programming Cookbook Solutions & Examples for iOS Apps", O'Reilly Media, 2014.
2. Boisy G. Pitre, "Swift for Beginners: Design and Development", PEACHPIT PRESS, 2013.
3. Christian Keur and Aaron Hillegass, "iOS Programming: The Big Nerd Ranch Guide -Big Nerd Ranch Guides", 4th Edition, 2011.

**15IT15L****E-COMMERCE SECURITY****L T P C****1 0 0 1****COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

**CO1:** Discuss security issues in online forums and services.(K2)**CO2:** Describe various security techniques to secure client computers.(K2)**LIST OF CONTENTS**

1. Online Security Issues- Overview
2. Security for Client Computers
3. Communication Channel Security
4. Security for Server Computers
5. Organizations that provide Computer Security
6. Payment Systems for Electronic Commerce
7. Online Payment Basics
8. Digital Wallets
9. Internet Technologies and the Banking Industry
10. Criminal Activity and payment systems: Phishing and Identity Theft

**L: 15 TOTAL: 15 PERIODS****REFERENCES**

1. Gray P. Schneider, "Electronic Commerce", Course Technology, Cengage Learning, USA, 10<sup>th</sup> Edition, 2012.
2. Anup K. Ghosh, "E-Commerce Security and Privacy (Advances in Information Security)", Springer, 2001.

15IT16L

COMPUTER ANIMATION

L T P C

0 0 2 1

### COURSE OUTCOMES

Upon Completion of this course, the students will be able to

**CO1:** explain and demonstrate procedural approaches in 2D & 3D computer animation.(K2)

**CO2:** demonstrate the use of animation, digitized sound, video control, and scanned images.(K4)

### LIST OF CONTENTS

1. Introduction & Learning perspective drawing - Drawing for Animation: Gesture Drawing, Action Drawing, Line of action
2. 2D, 3D Design concepts & Composition.
3. Principles of Animation.
4. Process film making & Editing Tools (Adobe After Effect CS6 ,Cyber link power director)
5. Editing & Animatics.
6. Input Sound - Sound Effects – Sound Recording.

**P: 30 TOTAL: 30 PERIODS**

### REFERENCES

1. Andy Chong, "Basics Animation: Digital Animation", Ava Publishing, Vol: 2, 2007.
2. Rick Parent," Computer Animation", Morgan Kaufmann publisher, 2012.

15IT17L

HADOOP ARCHITECTURE AND INSTALLATION

L T P C

0 0 2 1

### COURSE OUTCOMES

Upon Completion of this course, the students will be able to

**CO1:** Install and build a Hadoop cluster capable of processing large data. (K6)

**CO2:** Monitor the file system, job progress, and overall cluster performance. (K4)

### LIST OF CONTENTS

1. Hadoop Architecture
2. Installing Ubuntu with Java 1.8 on VM Workstation 11
3. Hadoop Versioning and Configuration
4. Single Node Hadoop 1.2.1 installation on Ubuntu 14.4.1
5. Multi Node Hadoop 1.2.1 installation on Ubuntu 14.4.1
6. Linux commands and Hadoop commands 1.8. Cluster architecture and block placement
7. Pseudo Distributed Mode
8. Fully Distributed Mode
9. Master Daemons(Name Node, Secondary Name Node, Job Tracker)
10. Slave Daemons(Job tracker, Task tracker)
11. Task Instance

12. Hadoop HDFS Commands
13. Accessing HDFS
14. CLI Approach
15. Implementation of Map/Reduce using Java

**P:30 TOTAL: 30 PERIODS**

**REFERENCES**

1. [https://www.tutorialspoint.com/hadoop/hadoop\\_tutorial.pdf](https://www.tutorialspoint.com/hadoop/hadoop_tutorial.pdf).
2. Tom White, "Hadoop: The Definitive Guide, Storage and Analysis at Internet Scale", O'Reilly Media / Yahoo Press, Third Edition, 2012.

**15IT18L**

**MICROCONTROLLER AND RASPBERRY PI**

**L T P C**

**1 0 0 1**

**COURSE OUTCOMES**

Upon Completion of this course, the students will be able to

**CO1:** describe the architecture and applications of microcontroller.(K2)

**CO2:** describe the functionality of raspberry Pi and its interfacing(K2)

**LIST OF CONTENTS**

1. Introduction to microcontroller- Architecture of 8051 Microcontroller.
2. Instruction sets and Addressing modes.
3. Signals and I/O ports, Timers and interrupt.
4. Interfacing -keyboard, LCD, ADC & DA. Applications- Stepper motor- Power plant control, Traffic light controller
5. Raspberry Pi
6. HDMI output
7. Connection with VGA, VIM text editor
8. Switch relay ,Servo Control ,GUI interface
9. Simple Arduino application

**L: 15 TOTAL: 15 PERIODS**

**REFERENCES**

1. Kenneth J.Ayala, "The 8051 microcontroller Architecture, Programming and applications" Third Edition, Minneapolis West Pub, 2005.
2. Eben Upton, Gareth Halfacree, "Raspberry Pi User Guide" ,Third Edition ,Wiley, 2014.

**B.Tech. – INFORMATION TECHNOLOGY**  
**OPEN ELECTIVE COURSES**

**Open Elective Course (OEC)**  
**Group - I (Inter-disciplinary courses)**

|                |                                       |          |          |          |          |
|----------------|---------------------------------------|----------|----------|----------|----------|
| <b>15ID01E</b> | <b>PRODUCT DESIGN AND DEVELOPMENT</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                                       | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**COURSE OUTCOMES**

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

- CO1: analyze various global trends and identify the scope of a new product (K4)
- CO2: perform requirement analysis and convert the requirements into design specification (K4)
- CO3: translate conceptual idea into detailed design (K6)
- CO4: create prototype to demonstrate the product (K6)
- CO5: perform sustenance engineering to improve the longevity of the product (K6)

**UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9**

Global Trends Analysis and Product decision: Types of various trends affecting product decision - Social Trends-Technical Trends- Economical Trends- Environmental Trends- Political/ Policy Trends- PESTLE Analysis.

Introduction to Product Development Methodologies and Management: Overview of Products and Services- Types of Product Development- Overview of Product Development methodologies - Product Life Cycle and PLM - Product Development Planning and Management .

**UNIT II REQUIREMENTS AND SYSTEM DESIGN 9**

Requirement Engineering: Types of Requirements- Requirement Engineering- Analysis -Traceability Matrix and Analysis- Requirement Management

System Design and Modeling: Introduction to System Modeling- Introduction to System Optimization- System Specification-Sub-System Design- Interface Design.

**UNIT III DESIGN AND TESTING 9**

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques - Concept Screening and Evaluation - Concept Design - S/W Architecture - Hardware Schematics and simulation

Detailed Design: Component Design and Verification - High Level Design/Low Level Design of S/W Programs - S/W Testing-Hardware Schematic - Component design - Layout and Hardware Testing.

**UNIT IV IMPLEMENTATION AND INTEGRATION 9**

Prototyping: Types of Prototypes -Introduction to Rapid Prototyping and Rapid Manufacturing.

System Integration- Testing- Certification and Documentation: Introduction to Manufacturing/Purchase and Assembly of Systems- Integration of Mechanical, Embedded and S/W systems- Introduction to Product verification and validation processes - Product Testing standards, Certification and Documentation.



**UNIT V SUSTENANCE ENGINEERING AND BUSINESS DYNAMICS 9**

Sustenance - Maintenance and Repair – Enhancements Product End of Life (EoL):  
Obsolescence Management-Configuration Management - EoL Disposal.

The Industry - Engineering Services Industry overview - Product development in Industry  
versus Academia

The IPD Essentials - Introduction to vertical specific product development processes -  
Product development Trade-offs - Intellectual Property Rights and Confidentiality- Security  
and configuration management

**L:45; TOTAL:45 PERIODS**

**TEXT BOOKS**

1. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development“, Tata McGraw-Hill Education, 4<sup>th</sup> Edition, 2009, ISBN-10-007-14679-9.
2. George E Dieter, Linda C Schmidt, “Engineering Design”, McGraw-Hill International Edition,4<sup>th</sup> Edition, 2009, ISBN 978-007-127189-9

**REFERENCES**

1. Kevin Otto, Kristin Wood, “Product Design”, Indian Reprint 2004, Pearson Education, ISBN 9788177588217
2. Yousef Haik, Shahin T M M, “Engineering Design Process”, Cengage Learning,2<sup>nd</sup> Edition Reprint, 2010, ISBN 0495668141
3. Clive L Dym, Patrick Little, “Engineering Design: A Project-based Introduction”, John Wiley & Sons, 3rd Edition, 2009, ISBN 978-0-470-22596-7
4. Kevin Otto & Kristin Wood, “Product Design Techniques in Reverse Engineering and New Product Development”, Pearson Education (LPE), 2001.
5. James R Evens, William M Lindsay “The Management and control of Quality” Pub:southern (www.swlearning.com), 6th edition.
6. AmitavaMitra, “Fundamentals of Quality control and improvement” Pearson Education Asia, 2<sup>nd</sup> edition, 2002.
7. Montgomery D C, “Design and Analysis of experiments”, John Wiley and Sons, 2003.
8. Phillip J Rose, “Taguchi techniques for quality engineering”, McGraw Hill, 1996.
9. Reddy G B, “Intellectual Property Rights and the Law”, Gogia Law Agency, 7<sup>th</sup> Edition Reprint, 2009.
10. Subbaram N R, “Demystifying Intellectual Property Rights”, Lexisnexis Butterworths Wadhwa, 1<sup>st</sup> Edition, 2009.

**15ID02E**

**DISASTER MANAGEMENT**

**L T P C**

**3 0 0 3**

**COURSE OUTCOMES**

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

- CO1: classify the various types of disaster. (K2)
- CO2: interpret various natural and manmade disasters. (K2)
- CO3: choose a Hazard Assessment procedure. (K3)

CO4: construct the protection measures against Disaster. (K3)

CO5: apply Science and Technology in Disaster Management. (K3)

**UNIT I INTRODUCTION TO DISASTER 8**

Hazard, risk, vulnerability, disaster significance, nature, importance, dimensions and scope of disaster management - national disaster management frame work- financial arrangements- disaster- management cycle.

**UNIT II SOURCES OF DISASTER 10**

Natural disasters- significance, nature, types and effects - floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves, climatic change - global warming - sea level rise - ozone depletion. Manmade disasters- nuclear , chemical, biological, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents and sea accidents.

**UNIT III DISASTER MITIGATION AND HAZARDS ASSESMENT 10**

Factors affecting damage – types, social status, habitation pattern, physiology and climate - Factors affecting mitigation measures - prediction – preparation - communication - area and accessibility - population - physiology and climate - Vulnerability Assessment and seismic strengthening of buildings - Vulnerability Assessment of Buildings procedure - Hazard Assessment-Visual Inspection and Study of Available Documents

**UNIT IV DISASTER MANAGEMENT 9**

Disaster management - efforts to mitigate natural disasters at national and global levels - international strategy for disaster reduction- Rescue ,relief And Rehabilitation, Role Of National And International Agencies In Disaster Management-National Disaster Policy Of India (Salient Features).

**UNIT V APPLICATIONS OF SCIENCE AND TECHNOLOGY AND CASE STUDIES 8**

Applications of Science and Technology (RS, GIS, GPS) - Early Warning And Prediction Systems- Earthquake, cyclone, landslides, fire accidents, accidents- case studies

**L: 45; TOTAL: 45 PERIODS**

**TEXTBOOKS**

1. S.K.Singh, S.C. Kundu, Shobha Singh A ,”Disaster management”, William Publications, New Delhi, 1997.
2. Vinod K Sharma, “Disaster Management”, IIPA, New Delhi, 1995

**REFERENCE**

1. Annual Report, 2009-10,Ministry of Home Affairs, GOI

**15ID03E**

**ENERGY ENGINEERING**

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

**COURSE OUTCOMES**

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

- CO1: explain the operation of Solar Thermal application and Solar Photovoltaic. (K2)
- CO2: explain the operation of wind energy systems. (K2)
- CO3: describe the concepts of various Bio-Energy Conversion techniques. (K2)
- CO4: illustrate the concepts of other conventional and nonconventional power plants. (K2)
- CO5: explain the concepts of hydrogen and fuel cell technology. (K2)

**UNIT I INTRODUCTION TO SOLAR ENERGY 9**

Sun - Earth Geometry, solar radiation, Solar Collectors - Application of solar thermal systems. Direct Electricity Conversion - Types of Solar cell - Solar Photovoltaic system and types.

**UNIT II WIND ENERGY 9**

Wind energy potential, Principle of wind energy conversion; Basic components, types and their constructional features; design considerations: wind data and site selection.

**UNIT III BIO-ENERGY 9**

Biomass: sources, characterization, principles of energy transfer technologies. Biogas: Feedstock, types of Biogas plant- parameters affecting biogas production.

**UNIT IV OTHER POWER PLANTS 9**

Layout of Hydel - thermal - Nuclear - Gas turbine - Diesel - MHD- Geo thermal - OTEC - Tidal Power Plants.

**UNIT V HYDROGEN AND FUEL CELLS 9**

Energy carrier: Types - Hydrogen: generation, storage, transport and utilization - thermal energy storage: Principle and utilization - Fuel cells: Technologies, types and applications.

**L:45; TOTAL:45 PERIODS**

**TEXT BOOKS**

1. Soteris Kalogirou, "Solar Energy Engineering: Processes and Systems", Academic Press, 2014.
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K, 3<sup>rd</sup> Edition, 2012.

**REFERENCES**

1. Mukund R Patel, "Wind and Solar Power Systems", CRC Press, 2<sup>nd</sup> Edition, 2006.
2. Hart A B and Womack, G J, "Fuel Cells: Theory & Applications", Prentice Hall, 1997.
3. El-Wakil M M, "Power Plant Technology", Tata McGraw-Hill, 2010.
4. Khandelwal K C and Mahdi S S, "Biogas Technology" - A Practical Handbook,

- Tata McGraw Hill, 1986.
5. Duffie J A and Beckman W A, "Solar Engineering of Thermal Processes", Wiley, 4<sup>th</sup> Edition, 2013.
  6. Chetan Singh Solanki, "Solar Photovoltaics Fundamentals, Technologies and Applications", Prentice Hall of India, 3<sup>rd</sup> Edition, 2015.

**Group - II (Trans disciplinary courses)**

|                |                             |                |
|----------------|-----------------------------|----------------|
| <b>15TD01E</b> | <b>INDIAN BUSINESS LAWS</b> | <b>L T P C</b> |
|                |                             | <b>0 0 0 3</b> |

**COURSE OUTCOMES**

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

- CO 1: explain the elements of a valid contract.
- CO 2: discuss main provisions relating to Sale of Goods Act and Negotiable Instruments Act.
- CO 3: explain provisions relating to incorporation and functioning of company and partnership firm.
- CO 4: understand the fundamentals of Consumer Protection Act and Foreign Exchange Management Act.
- CO 5: understand the basic knowledge of Information Technology Act and RTI Act.

**UNIT I THE INDIAN CONTRACT ACT, 1872**

Definition of a Contract and its essentials - Formation of a valid Contract - Offer and Acceptance, Consideration - Capacity to Contract - Free consent - Legality of object - Discharge of a Contract by performance - Impossibility and Frustration - Breach, Damages for breach of a contract - Quasi contracts - Special Contracts - Contract of Indemnity and Guarantee - Contract of Bailment and Pledge - Contract of Agency.

**UNIT II THE SALE OF GOODS ACT, 1930**

Definition of a Contract of Sale - Conditions and Warranties - Passing of Property - Right of Unpaid Seller against the Goods - Remedies for Breach - The Negotiable Instrument Act, 1881

Definition and characteristics - Kinds of negotiable instruments - Promissory Note - Bill of Exchange and Cheques - Holder and Holder in due course - Negotiation, Presentment, Discharge from Liability - Noting and Protest – Presumption - Crossing of Cheques - Bouncing of Cheques.

**UNIT III THE COMPANIES ACT, 1956**

Nature and Definition of a Company - Registration and Incorporation - Memorandum of Association - Articles of Association – Prospectus - Kinds of Companies - Directors: Their powers and duties – Meetings - Winding up - The Indian Partnership Act, 1932 - Definition of Partnership and its essentials - Rights and Duties of Partners: Types of Partners - Minor as a partner - Doctrine of Implied Authority - Registration of Firms -

Dissolution of firms - Limited Liability Partnership Act, 2000.

#### **UNIT IV THE CONSUMER PROTECTION ACT, 1986**

Aims and Objects of the Act - Redressal Machinery and Procedure for complaints under the Act – Remedies – Appeals - Enforcement of orders and Penalties - Foreign Exchange Management Act 2000 - Definition and Main Provisions.

#### **UNIT V THE INFORMATION TECHNOLOGY ACT**

Definition, Digital Signature - Electronic Governance – Attribution - Acknowledgment and Dispatch of Electronic Records - Sense Electronic Records and Sense Digital Signatures - Regulation of Certifying Authorities Digital Signature Certificates - Duties of Subscribers - Penalties and Offences - The Right to Information Act, 2005 - Right to know - Salient Features of the Act - Obligation of Public Authority - Designation of Public Information Officer - Request for obtaining information - Duties of a PIO - Exemption from Disclosure of Information - Partial Disclosure of Information - Information Commissions - Powers of Information Commissions - Appellate Authorities – Penalties - Jurisdiction of Courts.

#### **TEXT BOOKS**

1. Kuchhal M.C, “Business and Industrial Laws”, 3<sup>rd</sup> Edition, JBA Publishers, New Delhi, 2013.
2. Gulshan S.S, “Merchantile Law”, 3<sup>rd</sup> Edition, JBA Publishers, New Delhi, 2007.

#### **REFERENCES**

1. Mulla D.F, “The Sale of Goods Act and the Indian Partnership Act”, 10<sup>th</sup> Edition, LexisNexis Ltd., India, 2012.
2. Dabas J, “Negotiable Instruments Act”, 2<sup>nd</sup> Edition, JBA Publishers, New Delhi, 2013.
3. Avtar S, “The Principles of Mercantile Law”, 9<sup>th</sup> Edition, Eastern Book Company, India, 2011.

**15TD02E LEADERSHIP AND PERSONALITY DEVELOPMENT L T P C**  
**0 0 0 3**

#### **COURSE OUTCOMES**

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

- CO 1: identify the various leadership skills.
- CO 2: understand group dynamics and factors influencing the team performance.
- CO 3: describe the personality dimensions based on personality theories.
- CO 4: explain personality determinants and personality types.
- CO 5: apply effective training program for personality development.

### **UNIT I INTRODUCTION**

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership- Leader, Followers and Situations - Leadership Skills – Basic Leadership Skills - Building Technical Competency - Advanced Leadership Skills - Team Building for Work Teams - Building High Performance Teams.

### **UNIT II TEAMS AND LEADERSHIP**

Assessing Leadership & Measuring Its Effects - Group- Nature, Size, Roles, Norms, Cohesion, and Stages of Group Development - Teams and their Leadership – Effective Team Characteristics and Team Building - Ginnetts Team Effectiveness Leadership Model.

### **UNIT III PERSONALITY**

Personality - Meaning, Concept, Personality Patterns, Symbols of Self, Moulding the Personality Pattern, Persistence & Change - Personality & Personal Effectiveness - Psychometric Theories – Cattelle and Big Five - Psychodynamic Theories - Carl Jung and MBTI - Transactional Analysis - Johari – Window - Personal Effectiveness.

### **UNIT IV PERSONALITY DETERMINANTS**

Personality Determinants – Heredity and Environment – Types of personality.

### **UNIT V PERSONALITY TRAINING**

Concept, Role, Need, Importance and types of personality Training - Understanding Process of Learning - Developing an Integrated Approach of Learning in Training Programme - Training Needs Assessment.

### **TEXT BOOKS**

1. Yukl G, "Leadership in Organisations", 8<sup>th</sup> Edition, Pearson Education Ltd., England, 2013.
2. Lall M, Sharma S, "Personal Growth Training & Development", Kindle Edition, USA, 2009.

### **REFERENCES**

1. Janakiraman B, "Training and Development", Wiley Dream tech, Biztantra, 2005.
2. Pareek U, "Understanding Organizational Behaviour", 2<sup>nd</sup> Edition, Oxford University Press, USA, 2007.

15TD03E      INTERNATIONAL BUSINESS MANAGEMENT

L T P C  
0 0 0 3

### **COURSE OUTCOMES**

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

- CO 1: understand the global business environment.
- CO 2: explain the impact of economic, legal, cultural, geographical and political factors on international business.
- CO 3: discuss the issues and problems of Multinational Enterprises.
- CO 4: discuss the role of various international financial institutions.
- CO 5: discuss about important aspects of WTO and GATT agreement.

### **UNIT I      INTERNATIONAL BUSINESS ENVIRONMENT**

International Business Environment - Globalization - Forces, Meaning, Dimensions and Stages in Globalization - Trading Environment of International Trade - Tariff and Non-tariff Barriers - Trade Blocks.

### **UNIT II      RISK ANALYSIS AND PRACTICES**

Country Risk Analysis - Political, Social and Economic - Cultural and Ethical practices - Responsibilities of International Business - Economic crisis in foreign countries.

### **UNIT III      MULTINATIONAL ENTERPRISES**

Managing Multinational Enterprises - Problems and Potential - Multinational Service Organizations - Indian companies becoming multinationals - Potential, Need and Problems.

### **UNIT IV      INTERNATIONAL FINANCIAL MANAGEMENT**

Introduction to International Financial Management - Balance of Trade and Balance of Payment - International Monetary Fund, Asian Development Bank and World Bank - Financial Markets and Instruments - Introduction to Export and Import Finance - Methods of Payment in International Trade.

### **UNIT V      INTERNATAIONAL AGREEMENT**

General Agreement on Trade and Tariffs, (GATT) - World Trade Organization - Seattle and Doha Round of Talks - Dispute Settlement Mechanism under WTO - Problems of Patent Laws - International Convention on Competitiveness - Global Sourcing and its Impact on Indian Industry - Globalization and Internal Reform Process.

### **TEXT BOOKS**

1. Bhalla V.K, Shivaramu S, "International Business Environment", 9<sup>th</sup> Edition, Anmol Publications Pvt. Ltd., Delhi, 2005.
2. Apte P.G, "International Financial Management", 5<sup>th</sup> Edition, Tata McGraw Hill, India, 2008.
3. Cherulinam F, "International Business", 5<sup>th</sup> Edition, Prentice Hall of India, New Delhi, 2010.

## REFERENCES

1. Rao, Rangachari, "International Business", Himalaya Publishing House, New Delhi, 2010.
2. Hill C, "International Business", 10<sup>th</sup> Edition, Tata McGraw Hill Education, New Delhi, 2014.
3. Daniels J.D, "International Business Environment", 15<sup>th</sup> Edition, Prentice Hall of India, New Delhi, 2014.

**15TD04E**

**BASICS OF MARKETING**

**L T P C**

**0 0 0 3**

## COURSE OUTCOMES

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

CO 1: describe the basic concepts of marketing.

CO 2: discuss the significance of consumer behavior and market segmentation.

CO 3: discuss brand, trade mark, after- sales service and product life cycle concepts.

CO 4: formulate strategies for pricing and channels of distribution.

CO 5: analyze and selection of best promotional technique.

## UNIT I INTRODUCTION

Nature and Scope of Marketing - Importance of Marketing – Concepts: Traditional and Modern - Selling Vs. Marketing - Marketing Mix - Marketing Environment.

## UNIT II CONSUMER BEHAVIOR AND MARKET SEGMENTATION

Nature, Scope and Significance of Consumer Behavior - Market Segmentation - Concept and Importance - Bases for Market Segmentation.

## UNIT III PRODUCT PLANNING

Concept of Product - Consumer and Industrial Goods - Product Planning and Development - Packaging - Role and Functions - Brand Name and Trade Mark - After- Sales Service - Product Life Cycle Concept.

## UNIT IV PRICING AND PHYSICAL DISTRIBUTION

Price - Importance of Price in the Marketing Mix - Factors Affecting Price of a Product/Service - Discounts and Rebates - Distribution Channels - Concept and Role - Types of Distribution Channels - Factors Affecting Choice of a Distribution Channel - Retailer and Wholesaler - Distributions Channels and Physical Distribution.



## **UNIT V PROMOTION**

Definition - Methods of Promotion - Optimum Promotion Mix - Advertising Media - Their Relative Merits and Limitations - Characteristics of an Effective Advertisement - Personal Selling - Selling as a Career - Classification of a Successful Sales Person - Functions of Salesman.

### **TEXT BOOKS**

1. Etzel M.J, Walker B.J, Stanton W.J, "Fundamentals of Marketing", 13<sup>th</sup> Edition, McGraw Hill, New York, 2004.
2. Tanner J, Raymond M, "Principles of Marketing", University of Minnesota Libraries Publishing, New York, 2015.

### **REFERENCES**

1. Rajan Nair N, Varma M.M, "Marketing Management", 2<sup>nd</sup> Edition, S.Chand & Sons, New Delhi, 2005.
2. Ramaswamy V.S, Namakumari S, "Marketing Management", 3<sup>rd</sup> Edition, Macmillan India Limited, London, 2002.

**15TD05E**

**RETAILING AND DISTRIBUTION MANAGEMENT**

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

### **COURSE OUTCOMES**

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

- CO 1: explain the concepts of retailing and distribution management.
- CO 2: analyze and solve retailers' problems to make decisions in retail organizations.
- CO 3: plan and formulate strategy for retail management process.
- CO 4: discuss about various distribution technology and stores management.
- CO 5: analyze the issues and challenges in Logistic Management

## **UNIT I INTRODUCTION**

Meaning and Nature of Distribution and Retail Industry - Future of Retailing and Distribution in India - Distribution Channels – Concept, Role and Types - Factors Affecting Choice of Distribution Channel.

## **UNIT II TYPES OF RETAILING**

Stores Classified by Owners - Stores Classified by Merchandising Categories - Wheel Of Retailing - Traditional Retail Formats Vs. Modern Retail Formats in India - Store and Non-Store Based Formats - Cash and Carry Business - Retailing Models – Franchiser Franchisee, Directly Owned - Wheel of Retailing and Retailing Life Cycle – Issues in Retailing.

### **UNIT III MANAGEMENT OF RETAILING OPERATIONS**

Meaning - Functions of Retail Management - Strategic Retail Management Process - Retail Planning - Importance and Process - Developing Retailing Strategies.

### **UNIT IV TECHNOLOGY IN DISTRIBUTION**

Bar-Coding – RFID – Electronic Payment Systems - Store Administration - Floor Space Management – Managing Store Inventories and Display Action Plans - Pricing Strategies and Location Strategies.

### **UNIT V LOGISTICS OF RETAIL MANAGEMENT**

Components and Functions; Distribution Related Issues and Challenges - Gaining Competitive Advantage through Logistics Management.

### **TEXT BOOKS**

1. Agrawal D. K., "Distribution & Logistics Management: A Strategic Marketing Approach", Macmillan Publishers India Limited, New Delhi, 2007.
2. Berman B, Evans J.R, "Retail Management – A Strategic approach", 12<sup>th</sup> Edition, Pearson Education Ltd., England, 2013.
3. Cox R, Brittan P, "Retailing an introduction, Financial Times Management", 5<sup>th</sup> Edition, Pearson Education Limited, England, 2004.

### **REFERENCES**

1. Rushton A, Croucher P, Baker P, "The Handbook of Logistics & Distribution Management", Kogan Page Limited, London, 2006.
2. Coughlan A.T, Anderson E, Stern L.W, El-Ansary A.I, "Marketing Channels", 7<sup>th</sup> Edition, Prentice Hall, New Jersey, 2006.
3. Sinha P. K, Uniyal D.P, "Managing Retailing", Oxford University Press, India, 2007.

**15TD06E**

**INTERNATIONAL ECONOMICS**

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

### **COURSE OUTCOMES**

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

- CO 1: discuss the impact of globalization.
- CO 2: identify and analyze different theoretical models of international economics in light of 'real world' situations.
- CO 3: examine the consequences of trade policies.
- CO 4: explain the importance of international financial markets.
- CO 5: discuss the important aspects of international banking.

### **UNIT I INTRODUCTION**

Background of International Business Economics - Globalization and International Business – The Emergence of Global Institutions – Drivers of Globalizations - The Globalization Debate.

### **UNIT II THE INTERNATIONAL TRADE THEORY**

The Law of Comparative Advantage – The Demand and Supply, Offer Curves - The Terms of Trade – Factor Endowments and the Heckscher – Ohlin Theory – Implications of Trade Theories - Economics of Scale - Imperfect Competition.

### **UNIT III INTERNATIONAL TRADE POLICY**

Trade Restrictions - Tariffs, Non –Tariff Trade Barriers - Tariff Vs. Quota - The New Protectionism – Economic Integration - Custom Unions and Free Trade Areas - Major Regional Trade Agreements - Foreign Exchange Market – Types of Foreign Exchange Transactions – Reading Foreign Exchange Quotations – Forward and Futures Market – Foreign - Currency Options – Exchange Rate Determination – Arbitrage – Speculation and Exchange - Market Stability.

### **UNIT IV WORLD FINANCIAL ENVIRONMENT**

Global Foreign Exchange Markets – Economic Theories of Exchange - Rate Determination - International Regime for FDI and MNC - Consequences of Economic Globalization.

### **UNIT V INTERNATIONAL BANKING**

Reserves, Debt and Risk - Nature of International Reserves – Demand for International Reserves – Supply of International Reserves – Gold Exchange Standard – Special Drawing Rights – International Lending Risk – The Problem of International Debt – Financial Crisis and The International Monetary Fund – Eurocurrency Market.

### **TEXT BOOKS**

1. Krugman P.R, Obstfeld M, “International Economics Theory and Policy”, 8<sup>th</sup> Edition, Prentice Hall, Boston, 2008.
2. Carbaugh R.J, “International Economics”, 15<sup>th</sup> Edition, South Western College publication, USA, 2014.

### **REFERENCES**

1. Daniels J, Radebaugh L, Sullivan D, Salwan P, “International Business”, 12<sup>th</sup> Edition, Pearson Education, New Delhi, 2010.
2. Suranovic S, “International Economics: Theory and Policy”, Flat World Knowledge, USA, 2010.

15TD07E

INDIAN ECONOMY

L T P C

0 0 0 3

### **COURSE OUTCOMES**

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

- CO 1: discuss the current economic development in India
- CO 2: describe the key indicators of estimation of national income
- CO 3: explain elementary concepts of economic planning and development in India
- CO 4: discuss the concept of public finance and preparation of budget
- CO 5: discuss the influence of infrastructure growth on economic development

### **UNIT I ECONOMIC DEVELOPMENT**

Meaning - Measurement of Economic Development - Characteristic of underdeveloped and developed economies - Causes for Indian economic underdevelopment - Major issues in development - Strategies for economic development Import substitution and Export oriented strategies - Determinants of economic development.

### **UNIT II NATIONAL INCOME**

The National Income and its estimates in India - Limitations of National income estimation - Trends in National income of India: Growth and Structure - Inter-state variations in National income - Income distribution - Measurement of poverty in India.

### **UNIT III ECONOMIC PLANNING**

Planning and economic development in India - Planning models in India (Elementary concepts) - Capital formation - Growth of Public and Private sector in India – Industrial policies an assessment - Capital formation and domestic saving.

### **UNIT IV INDIAN PUBLIC FINANCE**

Budgetary policies of the central government - Composition and trends in public revenue and expenditure - Expenditure control and government consumption expenditure - concepts of Budgetary deficits and implications - state budget.

### **UNIT V INFRASTRUCTURE AND ECONOMIC DEVELOPMENT**

Power and energy - Transport system in India's economic development - Communication system in India - Urban infrastructure - Science and technology - Private investment in infrastructure - Outlook and prospects.

### **TEXT BOOKS**

1. Dutt R, Sundaram K.P.M, "Indian Economy", S.Chand and Co., New Delhi, 2006.

2. Agarwal A.N, Agarwal M.K, "Indian Economy: Problems of Development and Planning", 41<sup>st</sup> Edition, New Age International Ltd., New Delhi, 2016.

## REFERENCES

1. Arvind P, "India: The Emerging Giant", Oxford University Press, USA, 2008.
2. Government of India, Economic Survey, (2010 -11 to 2014 -15).

**15TD08E**

**RURAL ECONOMICS**

**L T P C**

**0 0 0 3**

## COURSE OUTCOMES

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

- CO 1: discuss the role and importance of agriculture in economic development of India.
- CO 2: describe the impact of agricultural farming in rural employment, wage policy, technological change and green revolution.
- CO 3: analyze the relationship between rural and urban society.
- CO 4: recognize the formation and system of rural social institutions.
- CO 5: compare the social changes in the rural society after modernization and globalization.

## UNIT I INTRODUCTION

Nature and Scope of Rural Economy - Importance of Agriculture in Economic Development of India - Nature of Land Problems - Evolution of Policy – Land Tenure System - Land Reform Measures.

## UNIT II AGRICULTURE AND FARMING

Agricultural Holdings - Fragmentation and Sub-Division of Holdings, Cooperative Farming-Rural Labour Problems - Nature of Rural Unemployment - Employment and Wage Policy - Sources of Technological Change and Green Revolution.

## UNIT III RURAL SOCIETY

Rural Society Structure and Change - Village and its Social Organization - Indian Village and its Types - Rural-Urban Continuum and Rural-Urban Relationships.

## UNIT IV RURAL SOCIAL INSTITUTIONS

Rural Social Institutions - Family, Property, Caste, Class, Agrarian Structure - Indebtedness and Poverty - Jajmani System - Religion, Village, Panchayat Raj and Community Development Programmes – Problems.

## **UNIT V SOCIAL CHANGES**

Social Change in Rural India-Impact of Westernization - Secularization, Urbanisation, Industrialisation, Migration, Transportation, Modernization of Indian Rural Society - Post Modernization and Globalization and Indian Villages.

### **TEXT BOOKS**

1. Carver T.N, "The Principles of Rural Economics", Ginn and company, USA, 1911.
2. Desai A.R, "Rural Sociology in India", 5<sup>th</sup> Edition, Popular Prakashan Ltd., Mumbai, 2011.

### **REFERENCES**

1. Dube S.C., "India's changing villages", Psychology Press, UK, 2003.
2. Datt R, Sundharam K.P.M, Datt G, Mahajan A, "Indian Economy", 72<sup>nd</sup> Edition, S.Chand & Co., New Delhi, 2016.
3. Chaudhari, C.M., "Rural Economics", Sublime Publication, Jaipur, 2009.

**15TD09E**

**INTERNATIONAL TRADE**

**L T P C**

**0 0 0 3**

### **COURSE OUTCOMES**

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

CO 1: discuss the importance of international trade in developing countries.

CO 2: describe the impact of Trade agreements in international Business environment.

CO 3: explain the role of foreign exchange and their impact on trade and investment flows.

CO 4: discuss the benefits of Multinational Corporation in Internal Trade

CO 5: analyze the key role of globalisation in Indian economy.

## **UNIT I INTRODUCTION**

International Marketing - Trends in International Trade - Reasons - Global Sourcing and Production Sharing - International Orientations - Internationalization Stages and Orientations - Growing Economic Power of Developing Countries – International Business Decision.

## **UNIT II INTERNATIONAL BUSINESS ENVIRONMENT**

Trading Environment - Commodity Agreements – State Trading - Trading Blocks and Growing Intra-Regional Trade - Regional Groupings – SAARC, BRICS, ECM, ASEAN - Trade Liberalization - The Uruguay Round-Evaluation – UNCTAD – GATT – WTO.

### **UNIT III INTERNATIONAL FINANCIAL ENVIRONMENT**

International Money and Capital Markets - Foreign Investment Flows – Pattern, Structure and Effects - Movements in Foreign Exchange and Interest Rates and their Impact on Trade and Investment Flows - Exchange Rate Mechanism and Arrangement.

### **UNIT IV MULTINATIONAL CORPORATIONS**

Definition - Organizational Structures - Dominance of MNC's - Recent Trends - Code of Conduct - Multinationals in India - Issue in Investment, Technology Transfer, Pricing and Regulations - International Collaborations and Strategic Alliances.

### **UNIT V INDIA IN THE GLOBAL SETTING**

India an Emerging Market - India in the Global Trade - Liberalization and Integration with Global Economy - Factors Favouring and Resisting Globalization - Trade Policy and Regulation in India - Trade Strategies - Export-Import Policy - Regulation and Promotion of Foreign Trade in India.

### **TEXT BOOKS**

1. Daniels J.D, Radebaugh L.H, Sullivan D.P, "International Business: Environment and Operations", 12<sup>th</sup> Edition, Prentice Hall, USA, 2009.
2. Ricky W.G, Michael W.P, "International Business: A Managerial Perspective", Prentice Hall, USA, 2009.

### **REFERENCES**

1. Bhattacharya B, Varshney R.L, "International Marketing Management", 25<sup>th</sup> Revised Edition, S. Chand & Sons, New Delhi, 2015.
2. Verma M.L, "International Trade", Common wealth Publisher, New Delhi, 2010.

**15TD10E**

**GLOBAL CHALLENGES AND ISSUES**

**L T P C**

**0 0 0 3**

### **COURSE OUTCOMES**

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

CO 1: understand the various global issues.

CO 2: demonstrate a reasonable understanding of environmental debates and issues.

CO 3: explain the developmental issues relating to food, health and energy.

CO 4: demonstrate the economical issues in international trade.

CO 5: describe the civilization issues relating to human rights and social justice.

**UNIT I SECURITY ISSUES**

Nuclear Issues - Global and South Asian Context - Small Weapons Proliferation and Internal Arms Race - Chemical and Biological Weapons – Terrorism - Causes, Consequences And Trends - Cyber Terrorism – Counter Terrorism.

**UNIT II ENVIRONMENTAL ISSUES**

Global Warming and Climate Change - Threats to Bio-Sphere and Space - Pollutions, De-Forestation, Solid, Chemical and Nuclear Wastes and their Management - Preserving the Green Cover and Wild Life.

**UNIT III DEVELOPMENTAL ISSUES**

Food Security - Poverty and Hunger - Energy Security - Supply and Demand - Traditional and Alternative Sources of Energy – ITER - Health Security – Health for all - Development Vs. Environment - Sustainable Development.

**UNIT IV ECONOMIC ISSUES ON INTERNATIONAL TRADE**

International Trade - GATT, WTO - Regional Associations - ECM, ASEAN, OPEC, BRICS - Financial Crisis - ASEAN, Mexico and Greece - Global Issues in Trade and Commerce.

**UNIT V CIVILIZATION ISSUES**

Human Rights - Issues Relating to Freedom of Speech and Expression - Right to Self Determination - Preservation of Cultures and Cultural Diversities - Rights of Women and Children - Dividends of Globalization and Social Justice – Good Governance.

**TEXT BOOKS**

1. Payne R, "Global Issues", 4<sup>th</sup> Edition, Pearson Education Ltd., New York, 2013.
2. Owens P, Baylis J, Smith S, "The Globalization of World Politics", 3<sup>rd</sup> Edition, Oxford University Press, USA, 2013.

**REFERENCE**

1. Chirco J.A, "Globalization: Prospects and Problems", Sage Publications, New Delhi, 2013.

**15TD11E**

**INDIAN CULTURE AND HERITAGE**

**L T P C**

**0 0 0 3**

**COURSE OUTCOMES**

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

CO1: describe Indian culture, civilization and its features.

CO2: demonstrate stone age, Indian races and their contribution in pre-historic culture.

CO3: explain historical development of Indian culture.

CO4: explain the significance, conditions and development of Vedic culture.



CO5: analyze the advent of Islam and European culture.

#### **UNIT I INTRODUCTION**

Introduction to Culture - Meaning and Scope - Culture and Civilization - General Characteristics Features of Indian Culture - Geographical Impact on Indian Culture.

#### **UNIT II PRE-HISTORIC CULTURE**

Dravidian Culture - Old Stone Age - New Stone Age - Metal Age - Indian Races and their Contribution to Indian Culture.

#### **UNIT III HISTORICAL DEVELOPMENT OF INDIAN CULTURE**

Indus Valley Culture - City Planning - Social and Religious Conditions - Vedic and Later Vedic Cultures - Dharmasastras and Caste Systems - Comparison of Indus and Vedic Culture - Importance of Indus Valley and Vedic Cultures.

#### **UNIT IV CULTURE IN SANGAM AGE AND POST SANGAM AGE**

Sangam Literature - Society - Political and Economical Conditions - Trade - Religion and Fine Arts.

#### **UNIT V ADVENT OF ISLAM AND EUROPEAN CULTURE**

Impact on Indian Culture and Heritage – Reform Movements - Brahma Samaj, Ariya Samaj, Self Respect Movement – Post Colonial Development.

#### **TEXT BOOKS**

1. Luniya B.N, "Evolution of Indian Culture", Lakshmi Narain Agarwal Publishers, Agra, 1986.
2. Jeyapalan N, "History of Indian culture", Atlantic publishers, New Delhi, 2001.
3. Sharma H.C, "Indian Culture and Heritage", Neha Publishers & Distributors, New Delhi, 2012.

#### **REFERENCES**

1. John G.A, "Dictionary of Indian Philosophy (Sanskrit-English)", University of Madras, Madras, 1998.
2. Misra R.S, "Studies in philosophy and Religion", Bharathiya Vidya Prakasans, Varanasi, 1991.
3. Misra S.K, "Culture and Rationality", Sage publications India Pvt. Ltd., New Delhi, 1988.
4. Suda J.P, "Religious in India", Sterling Publishers Pvt. Ltd., New Delhi, 1978.

15TD12E

INDIAN HISTORY

L T P C

0 0 0 3

**COURSE OUTCOMES**

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

- CO1: illustrate the basics of Indian cultural heritage.
- CO2: describe interaction between Ancient Indian cultural heritage and Islamic culture.
- CO3: demonstrate Innovation by rulers of medieval period in the area of Administration, and their contact with the Europeans.
- CO4: analyse modern Indian movements, Economic history and Impact of the British rule on India.
- CO5: demonstrate the concepts of Indian National Movement and the history of freedom struggle in India.

**UNIT I ANCIENT INDIAN CULTURE**

Ancient Indian Cultural Heritage - Social, Political, Legal and in the Area of Religion and Philosophy.

**UNIT II LAW RELATING TO CULTURE**

Law Givers and Dispute Resolution Systems in Ancient India (Administration of Justice in Ancient India - Pre-Islamic Period) - Law Relating to Culture - The Advent of Islam - Interaction between Ancient Indian Cultural Heritage and Islamic Culture - The Emergence of Synthetic Indian Culture.

**UNIT III ADMINISTRATION IN ANCIENT INDIA**

Innovation by Rulers of Medieval Period in the Area of General and Revenue Administration - District Administration - Court Systems - Indian Contact with the Europeans.

**UNIT IV SOCIO-ECONOMIC HISTORY**

Socio-Religious Reform Movements in Modern India and its Legal Culture - Economic History of India During British Period - Impact of the British Rule on India – Education.

**UNIT V EUROPEAN CULTURE IMPACT**

Impact of European Culture and Liberal Thought on India – The Indian National Movement - The History of Freedom Struggle in India upto 1947.

**TEXT BOOKS**

1. Sreenivasa M.H.V, "History of India Part I and II", JBA Publishers, New Delhi, 2015.
2. Agarwal R.C, Bhatnagar M, "Constitutional Development and National Movement of India", S. Chand Publishers, New Delhi, 2005.

**REFERENCES**

1. Altekar S, "State and Government in Ancient India", Motilal Banarsidass Publishers, New Delhi, 2002.

2. Majumdar R.C, "History and Culture of the Indian People", Vol. 2, The Age of Imperial Unity, Bharatiya Vidya Bhavan, New Delhi, 2001

**15TD13E SUSTAINABLE DEVELOPMENT AND PRACTICES L T P C**  
**0 0 0 3**

### **COURSE OUTCOMES**

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

- CO 1: recognize the sustainable development and the way to achieve the sustainable development.
- CO 2: outline the concept, factors governing the sustainability and their linkages.
- CO 3: explain the environmental impact assessment and environmental audit.
- CO 4: describe the environmental planning and managing the resources.
- CO 5: acquire the knowledge about the environmental problems and their solutions.

### **UNIT I SUSTAINABLE DEVELOPMENT**

Need for Sustainability - Nine Ways to Achieve Sustainability - Economics as the Dismal Science - Population, Resources and Environment.

### **UNIT II CHALLENGES OF SUSTAINABLE DEVELOPMENT**

Concept of Sustainability - Factors Governing Sustainable Development - Linkages among Sustainable Development, Determinants of Sustainable Development - Case Studies on Sustainable Development.

### **UNIT III ENVIRONMENT IMPACT ASSESSMENT AND AUDIT**

Concepts-process-evaluation methodology-EIA and EMS integration-setting up of audit programme - typical audit process - carrying out the audit-benefits of environmental auditing-environmental audit programmes in India.

### **UNIT IV ENVIRONMENTAL PLANNING**

Introduction - Perspective of Environmental Planning - land resource development planning - Planning and managing the natural resources - landscape ecological planning - information and decision of environmental planning - Land use policy in India.

### **UNIT V ENVIRONMENTAL EDUCATION**

Knowledge about the environment - Knowledge about the environment and population growth - Knowledge about the solution and environmental problems - Environmental education (EE) – Strategies for EE – Models for future Environmental Education Systems.

### TEXT BOOKS

1. Rogers P, Jalal K.F, Boyd J.A, "An Introduction to Sustainable Development", Earth scan Publications Ltd., UK, 2006.
2. Santra S.C," Environmental Science", 3<sup>rd</sup> Edition, New Central Book Agency (P) Ltd., London, 2013.

### REFERENCES

1. Stavins R.N. "Economics of the Environment: Selected Readings", 5<sup>th</sup> Edition, W.W. Norton and Company, New York, 2005.
2. Sachs J.D, "The Age of Sustainable Development", Columbia University Press, New York, 2015.

15TD14E

WOMEN IN INDIAN SOCIETY

L T P C

0 0 0 3

### COURSE OUTCOMES

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

- CO1: Demonstrate historical perspective about women in Indian society.
- CO2: Explain social problems of women.
- CO3: Understand the legislation for women protection in India.
- CO4: Demonstrate the involvement of women literacy, career and politics.
- CO5: Analyse the role of NGO's in women empowerment.

### UNIT I INTRODUCTION

A Historical Perspective - Early Vedic, Colonial and Modern Periods - Position of Women in Contemporary India.

### UNIT II SOCIAL ISSUES

Issues of Girl Child - Female Infanticide and Foeticide, Sex Ratio, Child Marriage, Dowry and Property Rights - Women's Health and Birth Control - Reproduction - Violence against Women - Domestic Violence - Female Headed Households - Women in the Unorganized Sector of Employment - Women's Work- Status and Problems - Problems of Dalit Women.

### UNIT III PROTECTIVE LEGISLATION FOR WOMEN

Protective Legislation for Women in the Indian Constitution - Anti Dowry, SITA, PNDDT, And Prevention Sexual Harassment At Workplace (Visaka Case) - Domestic Violence (Prevention) Act.

### UNIT IV WOMEN AND EDUCATION

Formal and Non-Formal Literacy - Post Literacy - Vocational Training - Dual Career Modernization – Women and Politics - Political Status - Global Movements and Indian Movements.

## **UNIT V           ROLE OF NGO'S IN WOMEN EMPOWERMENT**

Gender Economy - All India Women's Conference (AIWC) – Women's India Association (WIA) - National Council of Women in India (NCWIE) - Indian Association of Women's Studies – Women Development Cells - Self Help Groups.

### **TEXT BOOKS**

1. Majumdar M, "Social Status of Women in India", Wisdom Press, New Delhi, 2012.
2. Harish R, Harishankar V.B, "Re-Defining Feminisms", Rawat Publications, Jaipur, 2011.

### **REFERENCES**

1. Rathod P.B, "An Introduction to Women's Studies", ABD Publishers, Jaipur, 2010.
2. Ray R, "Hand Book of Gender", Oxford University Press, New Delhi, 2012.

**15TD15E**

**INDIAN CONSTITUTION**

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

### **COURSE OUTCOMES**

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

- CO1: describe the basic understanding of the Indian Constitution.
- CO2: understand the structure and functions of parliament.
- CO3: demonstrate the organization and working of the Judiciary.
- CO4: understand the structure and functions of state legislature.
- CO5: understand the 73<sup>rd</sup> and 74<sup>th</sup> Constitutional Amendments.

## **UNIT I           INDIAN CONSTITUTION**

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties.

## **UNIT II           PARLIAMENTARY SYSTEM**

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker.

## **UNIT III          THE JUDICIARY**

Organisation and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

#### **UNIT IV STATE GOVERNMENTS**

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature.

#### **UNIT V LOCAL GOVERNMENTS**

73rd and 74th Constitutional Amendments – Federalism - Center – State Relations.

#### **TEXT BOOKS**

1. Basu D.D, "Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

#### **REFERENCES**

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, NewDelhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.

**15TD16E**

**BIO MECHANICS IN SPORTS**

**L T P C**

**0 0 0 3**

#### **COURSE OUTCOMES**

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

- CO1: discuss the basics of biomechanics in sports & movement technique accurately.
- CO2: discuss the basics of linear kinematics and its applications in the field of sports.
- CO3: demonstrate the linear kinematics in the field of sports.
- CO4: discuss the basics of angular kinematics and its applications in the field of sports.
- CO5: demonstrate the angular kinematics in the field of sports.

#### **UNIT I INTRODUCTION**

Meaning, Aim and Objectives, Importance of Biomechanics in Sports - Types of Motion Linear, Angular, Curvilinear and Circular Motion.

#### **UNIT II LINEAR KINEMATICS**

Speed, Velocity, Acceleration, Motion, Projectile Motion – Application of Linear Kinematics in The Field of Physical Education and Sports.

### **UNIT III      ANGULAR KINEMATICS**

Angular Speed - Angular Velocity - Angular Acceleration - Relationship between Linear and Angular Motion – Application of Angular Kinematics in the Field of Physical Education and Sports.

### **UNIT IV      LINEAR KINETICS**

Mass, Weight, Force, Pressure, Work, Power, Energy, Impulse, Momentum, Impact, Friction, Newton's Law of Motion - Law of Inertia and Types of Inertia.

### **UNIT V      ANGULAR KINETICS**

Levers, Equilibrium and Centre of Gravity – Friction and its Types, Centrifugal and Centripetal Force Bio Mechanical Principles Involved in Designing Sports Equipments.

### **TEXT BOOKS**

1. Singh S.K, "Biomechanics in Sports", Neha Publishers & Distributors, New Delhi, 2009.
2. McGinnis P.M, "Biomechanics of Sports and Exercise", 2<sup>nd</sup> Edition, Human Kinetics Publishers, USA, 2004.

### **REFERENCES**

1. Saxena A, "Biomechanics in Sports", Neha Publishers & Distributors, New Delhi, 2011.
2. Heyward V.H, Gibson A.L, "Advanced Fitness Assessment and Exercise Prescription", 7<sup>th</sup> Edition, Human Kinetics, USA, 2014.